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Performance Measures for Congestion Control Techniques in a Wireless Sensor Network

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Abstract- Internet communication this day’s houses different types of data transmitted concurrently and as such requires a well-organized and unfailing transmission method which is crucial to achieve high performance in networking environment. Congestion happens when data to be transmitted by the network is more than the strength available for the network to accommodate. Limited capacity of the network results to a long time waiting for these data to be processed while in transient and transmitted to the receiver. Data are lost as a result of prolonged waiting and as such could not get to their respective destinations. It is noted that congestion during data transmission is as a result of the way protocols are implemented, tight transportation routes, size of packets, speed of the sender and receivers machine which brings about packet lost. During congestion, the amount of data passing through the network may reduce to nothing and data waiting to be processed may become very high. A technique for controlling congestion will help a network recuperate from its blocked status. Control techniques are recovery tools for a congestion territory. Various techniques are in existence for managing a network congested territory. Our focus is to analyze congestion control techniques using standard measures and choose the best amongst the selected technique to perform control as many researchers have proposed techniques for controlling it.

Key Words- Congestion, Packet Loss, Throughput, Link Utilization,

I. INTRODUCTION

Packet loss is a very big issue in networking environment as users struggle to access same properties concurrently. Therefore, it is eminent to avoid extraordinary rate of loss during transmission of data from senders to receivers. More so, once packets are lost before getting to its required destination, resources put in place are wasted. Congestion happens when the space to be occupied by the data for processing before sending to their respective destinations is minute to carry out this task in a network. Data loss is as a result of but not limited to poor signal strength at the terminus, normal or human intrusion, unwarranted noise, hardware disaster, software exploitation, or overtaxed network nodes, protocol in use [9]. Control can be successfully attained by allocating the signal for processing across several connections in a network. In linkages, overcrowding brings about all-inclusive channel standards to reduce and loss rates to increase, which results in buffer drops and increased delays. Node-level congestion and link-level congestion are basically the two congestions that could take place. Buffer overflow is a type of node-level congestion that brings about packet loss and long waiting time for data to be processed [8]. To mention but a few, the outcome of packet loss are severe defacement of acknowledged data, fragmented pictures, partial deficiency of received data [9]. Network resource management and traffic control are general ways of dealing with congestion. They extend resources to quieten bottleneck when it happens. Power control and multiple radio links are ways to expand signal processing and incapacitate congestion.

II. CONGESTION

Congestions happens in a communication network when applied load is more than the space the load can accommodate. Congestion control are techniques and scheme used to manage overloading when it occurs and keeps the load below its expected range. Congestion is unavoidable in a network because the devices like routers and switches have spaces that hold data and after it has been processed. Once an incoming packet arrives the router, the packet in there undergoes 3 different stages before it is finally sent to its terminus.

1) The queue in the router houses the arrived packet while waiting to be checked.
2) Packet is processed.
3) Processed packet remains in the queue and waits for its turn to leave and be transmitted.

We also need to know that if the rate at which packets arrives the queue is more than the rate packets are processed, arriving packets will have to wait in the queue for a longer time before it be processed. Also, if the rate at which the processed packets leave the queue is slower than the processing rate, packets in queue waits longer before circulation.

III. PACKET LOSS

Packet loss is said to occur when one or more packets transmitting in a network could not get to their respective destinations. This could be as a result of overcrowing. Packet loss is inevitable in communication links in as much as the routers used has a particular queue size and once the queue is full and can no longer accommodate more packets, definitely there will be loss.
IV. TWO GENERAL METHODOLOGY FOR TRAFFIC CONTROL IN A NETWORK

A. Hop-By-Hop
It is a control system that reciprocates fast to actions. Habitually, it is challenging to regulate the packet-forwarding rate at in-between nodes.

B. End-to-End
This type of control system can inflict precise level modification at source node and streamline the strategy at in-between nodes. It consequences are dawdling actions and depends immensely on round-trip time (RTT).

Inevitable congestion in networks happens when data submitted is more than space available for its processing. Congestion causes channel standards to reduce and loss rates increase. This brings about packet drops, enlarged interruptions, squandered drive, and requires re-transmissions and in a great deal lessen the production and networks lifespan. Also, networks have restrictions on drives, retention and information measures. Therefore, dynamic and well-organized data broadcast protocols are essential to lessen bottle neck emanating from dwindling stations and additional load.

V. SOURCES AND CAUSES OF CONGESTION
Linkages comprises of nodes dispersed within a region by means of individual or added sinks. As traffic produces, such nodes increase in size, the provided data overshoot accessible volume in addition the system turn out to be over loaded. The foremost bases of congestion consist of buffer overflow, passage conflict, intrusion, packet accidents, etc. Buffer overflow happens when the volume of sent packets is more than offered space. Conflict happens between separate flows and separate packets. Intrusion occurs when there is concurrent transmissions among several paths within corporal closeness [2]. Packet accidents points out beneath side by side bottleneck which progresses to packet loss. As such, congestion brings about the deterioration of passage performance and loss rate increases. Throughput reduces as a result of the harmful nature of Congestion. This situation furthermore causes waste of assets, energy, as well as event detection consistency.

VI. SELECTTED TECHNIQUES FOR CONTROLLING NETWORK CONGESTION
Congestion control monitors the procedures of overseeing the overall inflow of data to keep movement points on a satisfactory rate. It is all about directing entries to escape congestive breakdown, endeavoring to side step excess subscription. Congestion control takes into consideration, size and use necessities of the network [5]. A number of methods were projected to address these encounters. The commonly used congestion control techniques remain:

A. Drop Tail
Current internet routers commonly use this technique because of its simplicity. It is a passive queue management (PQM) algorithm that applies first-in-first out (FIFO) based queue of restricted size, that humbly drops arriving data when queue is filled. Due to its simple and decentralized nature, its implementation is stress-free, it is appropriate to heterogeneity. It offers better link consumption and it fascinate bus ty traffic. Current internet uses TCP Reno router on Drop tail technique. It has two main weaknesses as discussed in [1] which is, its lock-out behavior and full queue phenomena. Lock-out behavior includes the exploitation of accessible bandwidth by a particular or a limited sources whose end results to worldwide harmonization [7]. When a queue is full, it is referred to as full queue. This has its major downside and subsequently outcomes to bulky end-to-end delays. Approaches like Drop front or Indiscriminate drop resolves problem of lock out behavior nonetheless are incapable to resolve the problems of full queues. To handle these problems, early congestion detection matters a lot and consequently to accept the causes that brings about congestion through a notice earlier before queue gets filled up. Drop tail is best used to implement network schedulers in network equipment with limited size. Drop tail does not distribute buffer space fairly since there is no differentiation of traffic from different sources. Sources with higher traffic volume will take more buffer space. Hence it is not suitable for networks with multiple TCP connections because a buffer overflow will cause TCP global synchronization, which reduces the network throughput and utility significantly.

B. Additive Increase/Multiplicative-Decrease
This applies feedback control algorithm. It is majorly used to implement TCP window adjustment as discussed in [3]. It exhibits fair behavior with bulk data transfer. It is best used for TCP Reno and Tahoe Routers. When congestion occurs, AIMD in a straight line increases the congested space with rapid reduction. This technique increases the congestion space by 1 maximum segment size (MSS) every round trip time (RTT) up to the discovery of packet loss. Upon discovery of packet loss, there is multiplicative decline in space size. As a feedback control method best known for its use in TCP congestion control, AIMD is best used for networks with several TCP connections. It is appropriate for applications such as bulk data transfer. On the contrary, all of its flows have the same RTT and its network response arrive same time to all users even when they have same RTT.

C. Partial Buffer Sharing
This technique plays a crucial role in controlling congestion in routers. It meritoriously pedals the distribution of buffer to numerous traffic sessions according to their delay limitations. Its enthusiasm is to meet the different requests of Quality of Service (QoS) which can be succeeded by refining the loss performance of high precedence traffic while degrading the performance of the low precedence traffic. Packets get into the queue in descending order and a checker is installed to check the delay limitation as to know is of higher precedence.

PBS Algorithm works as follows:
1) Step 1: Set descending sequence of threshold to Ni (Ni >0, i=1, 2... R) corresponding to Q with finite capacity & single
server having R priority classes

2). Step 2: To meet desired QoS demands adjust threshold values under different load conditions accordingly

3). Step 3: The highest priority jobs of class can join the queue subject to space availability in Q

4). Step 4: Jobs with lower priority class i (i = 2… R) can only join the Q if total jobs in Q, N< Ni (Ni ≤ Ni-1)

5). Step 5: Once the number of jobs waiting for service reaches Ni, all jobs with lower priority will be lost on arrival but higher priority jobs can still join the queue until it reaches threshold value, Nj (j = 1,…, i-1).

Fig-1: Threshold based PBS technique [7].

The figure above adopts a buffer using single FIFO queue. Resolution is centered on Maximum Entropy Approach for an unaverting GE/GE/1/N censored queue with a particular server, finite size and several sessions of traffic in PBS technique in relations of the mutual collection ME queue length distribution \{P(n), n ∈ Ω\} is given by [7],

\[
P(0) = \frac{1}{Z}
\]

\[
P(k) = \sum_{i=1}^{R} \text{Prob}(Q_{i,k})
\]

\[
= \frac{1}{Z} \left( \prod_{j=1}^{R} x_j^{k_j} \right) \sum_{j=1}^{R} k_j \left( \sum_{i=1}^{R} k_i - N_j \right)! \prod_{j=1}^{R} \left( k_i - N_j \right)! g_j y_j^{\delta(k)}
\]

The external busy movement in addition to service interval have remained demonstrated by means of the generalized exponential (GE) circulation. The overcrowding or packet loss possibility is given as [7]:

\[
\pi_i = \sum_{k=0}^{N_i} \delta_i (k) (1 - \sigma_i)^{N_i-k} P_{N_i} (k)
\]

Where

\[
\delta_i (k) = \begin{cases} 
\frac{r_i}{r_i (1 - \sigma_i) + \sigma_i}, & k = 0 \\
1, & \text{otherwise}
\end{cases}
\]

PBS is best used when there is need for reservations or different services that provide QoS.

VII. COMPARISON OF CONTROL TECHNIQUES

This section tends to compare the methods for network congestion control discussed in section 4. The comparisom is based on the analysis using some standard performance measure as follows.

A). Throughput (T)

In data transmission, it refers to the volume of data moved positively starting from one abode to another in a specified time frame. It is measured in megabits per second (Mbps) or gigabits per second (Gbps).

B). Packet Loss Probability (PLP)

Packet loss occurs when packets flop to get to their terminus. The loss ratio of each flow should be very close to loss ratio of the combined traffic. Then it can be concluded that the estimated loss possibility of aggregated traffic can remain as individual packet loss probability.

C). End-to-End Delay or Latency (EEDL)

End-to-end delay or one-way delay (OWD) is the time taken for a packet to be transmitted from source to destination.

EEDL= processing time + queuing time + transmission time + propagation time.

Table 1: Comparison of Drop tail, AIMD and PSB

<table>
<thead>
<tr>
<th>METHODS</th>
<th>T</th>
<th>PLP</th>
<th>EEDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop Tail</td>
<td>Once buffer is full, it reduces throughput.</td>
<td>A packed queue status results to packets dropping.</td>
<td>Full queue results transmission delay.</td>
</tr>
<tr>
<td>AIMD</td>
<td>Once there is congestion and packet loss at hand, window size reduces.</td>
<td>Upon congestion, packets are lost and congestion space is improved by 1 maximum segment size (MSS) every round trip time (RTT)</td>
<td>End-to-end delay intensifies as window size drops.</td>
</tr>
</tbody>
</table>
PBS Figure 2 indicates throughput values for delay sensitive traffic and delay tolerant streams which varies by increasing the threshold position.

Figure 3 showcases that once there is an increase in threshold location, the packet loss probability for delay sensitive traffic reduces.

Figure 4 shows that, there is an increase in response time as threshold positions increases.

VIII. RECOMMENDATIONS

To successfully control the distribution of buffer to different circulations, the Partial buffer sharing methods is best as it has to do with the application of delay constraints. We recommend this technique for congestion control considering the important role it plays towards its successful management of network congestion. PBS addresses the demand of QoS by refining the loss show of the high precedence traffic while degrading the show of the low precedence traffic.

Fig-2: Outcome of threshold positions on throughput [7]

It is noted that, once threshold point intensifies, the packet loss probability for delay sensitive traffic drops although it rises in instance of delay tolerant traffic as shown below.

Fig-3: Outcome of threshold positions on packet loss Possibilities [7]

The figure below indicates rise in mean response time and a rise in threshold locations together in event of DS and DT traffic streams.

Fig-4. Effect of threshold positions on mean response time [7]

IX. CONCLUSIONS

In this work we have presented a fair study of congestion control techniques using more or less key performance measures including Throughput (T), Packet Loss Probability (PLP), End-To-End Delay or Latency (EEDL). It is perceived that no particular congestion control technique is a one fix all scheme owing towards the comprehensive quantity of considerations that partake on system’s performance. Observations show that currently, high speed network and its nature of congestion is not
well-known and cannot characterize the diverse intensities of congestion alongside with facts such as; what is an extreme condition of congestion? How long it is lost and what is the ratio of fallen packets? Thus, for this study’s drive, putting into consideration results on our analysis we recommend Partial Buffer Sharing (PBS) method for Congestion Control.

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The Anti-hyperuricemic Effect of Torbangun (Coleus amboinicus Lour) Aqueous Extract

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Abstract-The study aimed to analyze the effect of Torbangun to reduction uric acid in woman with hypercholesterolemia. Design experiment used in this study was pre and post test controlled group design. The first step of this study was analyzed bioactive compound of torbangun aqueous extract. The next step was administered orally of Torbangun extract to control and woman with hypercholesterolemia for 30 days, with 30 subjects placed in two groups, viz, experimental (CC group) and placebo (PC group). The first group received one capsules of CC (each capsule contains 500 mg extract) while the second group received one capsules of PC (comprised of 500 mg fillers) one times daily for both groups. Uric acid (UA) and total cholesterol (TC) were measured in the first and the end of intervention. Oral administered of Torbangun extract exhibited reduce of hyper uric acid and hyper total cholesterol in woman with hypercholesterolemia. Data were analyzed with paired sample t test with 95% significance level. The results show that there was significant decrease in UA and TC on day 30, compared to control (PC group). In CC group, the capsules significant reduction in UA levels (p=0.001) and TC levels (p=0.000). Studies clearly demonstrated that Torbangun (Coleus amboinicus Lour) aqueous extract possesses antihyperuricemic activity in woman with hypercholesterolemia.

Index Terms- uric acid, antihyperuricemic, torbangun extract

I. INTRODUCTION

Hyperuricemia is abnormal high level of uric acid, it is a common metabolic disorder with a worldwide distribution. It has been considered as an important risk factor for gout [1]. Hyperuricemia, a concentration of urate in serum above the limit of solubility (≥ 7.0 mg/dL), is the most important risk factor of increased uric acid production, impaired renal uric acid excretion, or a combination of these mechanisms [2]. Clinically reported, the key factor uric acid is related not only to an increased risk of gout, but also to an increased risk of cardiovascular disorder, nephrolithiasis, diabetes, obesity, and dyslipidemia [3]. The mammals and birds will store their excess fat not only in their adipose tissue, but also in their liver and serum (triglycerides), often in association with the development of insulin resistance and elevated blood pressure [4]. The recent studies suggest a role for nucleic acid metabolism, in which stimulation of adenosine monophosphate (AMP) deaminase promotes fat storage and insulin resistance, whereas activation of AMP activated protein kinase stimulates fat degradation and decreases gluconeogenesis [5]. A key factor that appears to promote fat storage is the AMP deaminase product, uric acid [6]. Here we will briefly discuss the studies incriminating uric acid in these conditions.

Medicinal plants are believed to be an important sources of new chemical substances with potential therapeutic effect. Plant based medicines are gaining prominence in treatment of metabolic disease. Many flavonoid containing plants serve as a hidden wealth of diabetes and dyslipidemia control. Torbangun is an aromatic shrub widely distributed in Indonesia. The literature survey revealed torbangun leaf extract to have an antioxidant property. The leaves of torbangun have been used in Indonesian traditional medicine for treatments of antihyperglycemia and antihyperlipidemia [7]. The hyperuricemia is present in 5–30% of the general population and seems to be increasing worldwide. Therefore, there is an obvious need for therapeutic strategies that could act on the physiological regulation of uric acid levels and prevention of uric acid-related diseases. Herein, we reported the hypouricemic effect of torbangun in woman with hypercholesterolemia.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

2.1. Plant materials.

Torbangun (Coleus amboinicus Lour) were collected from a traditional market in Jakarta Indonesia, in the months of December 2017. The leaf separated, cleaned, air-dried, coarsely powdered, and subjected for Soxhlet-extraction by using aqueous. Powder weighing 70 g was extracted with 600 ml of aqueous for 72 h for each batch. The solvent was recovered using rotovapor. The semisolid mass obtained was concentrated under reduced pressure and stored in an air tight container[8]. Each 500 mg Coleus amboinicus Lour capsule (CC) containing 90 % dry extract of CC plant and 10 % filler and was registered for sale in Indonesia.
2.2. Design study

This study was conducted between Oktober 2017 – Oktober 2018, and was a double-blind design, randomized controlled clinical trial, conducted in woman with hypercholesterolemia in Cawang East Jakarta, Indonesia. The Ethics Committee of the Faculty of Medicine, Christian University of Indonesia, East Jakarta, Indonesia reviewed the research protocol used and approved it (Reg. no. 127/PT02. FK/ETIK/2012).

Inclusion criteria for all woman was long-term treatment by Torbangun (*Coleus amboinicus* Lour) leaf aqueous extract in woman with hypercholesterolemia with an increased TC > 200 mg/dL, aged over 30 years and willing to give informed consent. Exclusion criteria were suffering from other confounding diseases, including chronic inflammatory diseases, acute infections. Thirty woman were randomly assigned into two groups: CC group and the PC group. This study was a randomized double-blind placebo-controlled clinical trial, with 30 subjects placed in two groups, viz, experimental (CC group) and placebo (PC group). The first group received one capsules of CC (each capsule contains 500 mg extract) while the second group received one capsules of placebo (comprised of 500 mg fillers) one times daily, for 30 days for both groups. TC was measured by Autocheck, multi monitoring system. The body mass index, and compliance of all the subjects were assessed using a questionnaire at the end of study. Blood samples were collected twice at baseline and day 30 of study. The values of UA was determined from blood cholesterol. The UA was measured using methods by assays an automated chemistry analyzer.

2.5. Statistical analysis:
The collected data were analyzed using the statistical software SPSS, version 22. (SPSS Inc., Chicago, IL, USA) and the results were expressed as the mean ± SD. The changes in anthropometric measurements and blood parameters of the participants between the beginning and end of the trial were compared by paired sample t test with 95% significance level. Differences between the data were considered significant at \( P<0.05 \).

### III. RESULTS

All the woman with hypercholesterolemia (15 woman in CC group and 15 woman in PC group) completed the study (Fig.1). Compliance was good, with all the Torbangun leaf aqueous extract capsule prescribed being consumed during the study period. No side effects were reported from participans during the study period.
Biochemical and general characteristics of participants at the beginning and end of the study are shown in Table 1. There were no significant differences between group in BMI and BP in the beginning of the study and after 4 weeks of intervention (p= 0.151) and (p=0.989 and p=0.675). Uric acid and total cholesterol levels significantly change in CC group after intervention compared to their baseline value (p=0.001 and p=0.000), are shown in Table 2.

Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before Mean</th>
<th>N</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>25.298</td>
<td>15</td>
<td>3.500</td>
</tr>
<tr>
<td></td>
<td>24.612</td>
<td>15</td>
<td>3.805</td>
</tr>
<tr>
<td>UA</td>
<td>6.267</td>
<td>15</td>
<td>1.222</td>
</tr>
<tr>
<td></td>
<td>5.640</td>
<td>15</td>
<td>1.202</td>
</tr>
<tr>
<td>TC</td>
<td>258.800</td>
<td>15</td>
<td>28.917</td>
</tr>
<tr>
<td></td>
<td>224.333</td>
<td>15</td>
<td>35.361</td>
</tr>
<tr>
<td>BP Sistole</td>
<td>137.133</td>
<td>15</td>
<td>16.221</td>
</tr>
<tr>
<td></td>
<td>137.200</td>
<td>15</td>
<td>12.924</td>
</tr>
<tr>
<td>BP Diastole</td>
<td>78.267</td>
<td>15</td>
<td>8.216</td>
</tr>
<tr>
<td></td>
<td>79.533</td>
<td>15</td>
<td>8.114</td>
</tr>
</tbody>
</table>

BMI: body mass index; TC: Total Cholesterol, BP: Blood Pressure; SD: Standard Deviation

Table 2. Paired samples t test

<table>
<thead>
<tr>
<th>Hipotesis</th>
<th>Paired Differences</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI_before - BMI_After</td>
<td>.686</td>
<td>1.519</td>
<td>14</td>
<td>0.151</td>
<td>No Significant</td>
</tr>
<tr>
<td>UA_before - UA_After</td>
<td>.627</td>
<td>4.375</td>
<td>14</td>
<td>0.001</td>
<td>Significant</td>
</tr>
<tr>
<td>TC_before - TC_After</td>
<td>34.467</td>
<td>6.413</td>
<td>14</td>
<td>0.000</td>
<td>Significant</td>
</tr>
<tr>
<td>BP sistole_Before – BP sistole _After</td>
<td>-.067</td>
<td>17.950</td>
<td>-.014</td>
<td>0.989</td>
<td>No Significant</td>
</tr>
<tr>
<td>BP diastole_Before – BPdiastole _After</td>
<td>-1.267</td>
<td>11.467</td>
<td>-.428</td>
<td>0.675</td>
<td>No Significant</td>
</tr>
</tbody>
</table>

BMI: body mass index; TC: Total Cholesterol, BP: Blood Pressure; SD: Standard Deviation

Table 2 illustrated changes in paired samples t test, the levels of BMI, UA, TC and BP of studied group and during 4-weeks period of study. No significant differences were in BMI and BP between two study groups. The results show that there were significant decrease in UA and TC on day 30, compared to control (P group). In CC group, the capsules strongly significant reduction in UA levels (p < 0.05).
IV. DISCUSSION

The development of renal disease may have direct role of uric acid. Oxonate, a selectively competitive uricase inhibitor, blocks the effect of hepatic uricase, and produces hyperuricemia in rodents [9]. The aim of the present study is to investigate hypouricemic effect of Torbangun aqueous extract on the uric acid level in woman with hypercholesterolemia. This randomized, double-blind, placebo-controlled 4 week trial represents a uric acid comparison between woman with hypercholesterolemia individuals taking a 500 mg/day of Torbangun leaf aqueous extract capsule (CC) versus a placebo group (PC). The biomarkers examined included uric acid, total cholesterol, blood pressure. Body mass index was measured of body fat based on high and weight that applies to woman. The present study was conducted to assess the antihyperuricemic activity of Torbangun leaf aqueous extract in woman with hypercholesterolemia. However, of these 52 volunteers, 22 could not participate throughout the entire study period and were excluded from the study. The remaining 52 volunteers were assigned to either the control or trial group. The volunteers in both groups were also given information/educational intervention from the physicians and gave informed consent. None of the volunteers had either diabetic, hypertension, hepatic or renal diseases. All of the volunteers in both groups were educated on diet control and doing exercises. Therefore, it could be considered that there were similarities between the volunteers assigned to each group.

This work also indicate that the capsule extract, especially the dose of trial 500 mg after 4 weeks of intervention produced more alleviating effects. This observation confirms the fact that Torbangun leaf aqueous extract capsule of plants are generally known for their high contents in chemical compounds capable of producing biological activities [10]. With regard to the lowering uric acid concentrations in woman with hypercholesterolemia, it could be proposed that Torbangun may act by (1) stimulating biological activity by producing satiety and reducing food intake [11], (2) polyphenols and a water extract of these polyphenols exhibited cholesterol-lowering abilities in vitro and vivo [12], (3) reduce the re-absorption of bile cholesterol[13], (4) reduce uric acid product. Base on results of body mass index no significant decrease, and the blood pressure of sistole and diastole levels were slightly increased, but the uric acid and total cholesterol level of respondents there were strongly significant decreased.

Studies are warranted to evaluate the effect of Torbangun leaf aqueous extract on human with hyperglicemia. Despite in vitro and in vivo evidence of the uric acid and cholesterol-lowering benefits of polyphenols, there is not enough clinical evidence to support these results. Therefore, it is important for additional studies to be conducted to detect the specific mechanisms of polyphenols for lowering uic acid and cholesterol. These alleviating effects clearly denote the antihyperuricemic and antihypercholesterolemic potential of Torbangun. It could also be suggested that the effect of Torbangun leaf aqueous extract capsule pass through a decrease in intestinal cholesterol absorption or a decrease in the biosynthesis of cholesterol specifically by decreasing the activity of HMG-CoA reductase inhibitors and the AMP deaminase product, uric acid[14]. Although Torbangun leaf aqueous extract revealing antihyperuricemic potential, further phytochemical investigations are needed to identify their active constituents.

V. CONCLUSION

In conclusion, the present study indicates treatment of woman with hypercholesterolemia by administration of Torbangun (Coleus amboinicus Lour) leaf aqueous extract capsule, for four consecutive weeks could restore the biotransformation by shifting the balance of uric acid and cholesterol metabolism. The extract showed significant antihyperuricemic with very crucial effects on cholesterol levels.

VI. ACKNOWLEDGEMENT

This research was funded by Christian University of Indonesia, Jakarta 13630, Indonesia. We thank to Mr and Mrs Taka Jacobs of Torbangun (Coleus amboinicus Lour) garden. The authors are grateful to all woman volunteers for their participation, as well as to Miss Vina Irhamna for her helpful participants.

CONFLICTS OF INTEREST DISCLOSURE

None of the authors have any conflict of interests associated with the study. A conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

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Role of the HR function in line with government requirements in Libya

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Abstract- Libya became independent in 1951 on the basis of a decision of the United Nations General Assembly of 1949. A federal government and governments were formed in three provinces (Tripoli, Barga, Fezzan). Each province had its own independence and its basic constitutional law, which essentially did not differ from the laws that applied to other provinces. Subsequently, in order to achieve a comprehensive unity in Libya, constitutional amendments were made, and the most important amendments included the change of the federal system and the replacement of the single state system. The main challenge for the changing society is to find leaders who work in a way that encourages inclusion, dialogue and cooperation. In a broader sense, good governance means a favorable political framework for conditions for social, ecological and market-oriented development, as well as the responsible use of political power and public resources by States. Public institutions should conduct public affairs without misuse and corruption and in an efficient way. The formal characteristics of today's decision-making process in Libya are: participation, which means involvement of citizens in the decision-making process and creation of opportunities to make significant contributions to it; openness, which means that decision-making institutions work openly, which is accessible and understandable to the general public and transparency, is also a consequence of the participation and inclusion of information accessibility of people and clarity on the political decision. This study examined the function of human resource management in the state administration. Our conclusion is that HR is a continuous cycle of change and evolution. There is clear evidence that the role of the HR is becoming versatile, but this role does not confuse traditional HR roles, but it intertwines, adding to the diversity, challenge and complexity of HR in the public sector. Our findings show that changes in HRM in the public sector have progressed far more than previously suggested. From a policy perspective, it is clear that the government's "agenda" for change will come into force. However, there is evidence that in some organizations, such as the police, the full potential of the function is slowed down by extensive and lengthy procedures. Therefore, there is a need to explore new ways of streamlining and reducing the burden of the process, as well as more detailed research on how tensions and conflicts within the role can be solved. Additional topics such as new technologies, evolving world order and value-creating systems, transform the nature of society and economy in Libya. Computer and communication technologies go beyond the national borders by introducing global standards of services, quality and costs at the organizational level and requiring related learning and forgetting on a personal level. The assessment of the HR function could help redefine the role of the HR function in line with government requirements, develop new HR capabilities, and redesign HR products and systems. The HR function should be positioned to raise its own profile and focus on roles that give value to organizations in the public sector and administration. It is necessary to overcome a narrow view of the HR function and HR professionals. Stereotypes in Libya still exist and the perception is that the HR functions are too high, reactive, and equipped with the rules of the rule that insist on work only within the parameters of policies and procedures.

Index Terms- public administration, Libya, human resources, management

I. INTRODUCTION

Human resource management practices that affect the organization's performance are related to human resource planning, performance assessment, reward, and compensation. In reality, rewards result in motivation of employees, acceptance of additional obligations, increased satisfaction and opportunities to participate in organizational activities, which ultimately leads to an increase in organizational performance (Katou, 2008). The performance of the organization is defined as efficiency, effectiveness, development, satisfaction, innovation and quality. Zairi and Mahat (2006) divided organizational performance into employee satisfaction and employee performance. However, internal and external factors are a prerequisite for achieving performance, because the survival of an organization depends on them. There are several studies on employee relations in developing countries. Most of the works on this topic from the Western world due to multinational companies, as HRM allows resources to be managed globally. Therefore, the relationship between employers and employees should be set up to allow for efficient communication and performance enhancement. The only way to improve productivity and organizational growth is to ensure that employees are well organized and that there are good relationships between them. Therefore, the attitude of employees is precisely defined as a situation in which there is a cordial relationship between employers and employees. The Department of Employee Relations (HR) helps organizations to maintain healthy co-operation between employer and workers. They assist in resolving and managing conflicts at the workplace, whereby employers minimize potentially negative behavior. The employer is clearly identified and avoided the crisis in advance, and helps
employees focus on their professional development and support organizational goals. HR promotes a culture that recognizes and takes into account the interests and well-being of employees. Employee satisfaction can be defined as the level to which employees like their jobs. When an employee is satisfied with his job, the manifestation is that he will increase productivity and organizational growth. The promotion will orchestrate organizational performance. Empirical research shows that the establishment of well-defined organizational goals influences employee formation and productivity. Organizational direction and support have a major impact on employee satisfaction and overall commitment to the organization. The perception of organizational support strongly affects employees' dissatisfaction, as well as the commitment of employees to their organizations. Strategic human resource planning is an organization's effort to anticipate future requirements in the field of knowledge, skills, attitudes and behavior of employees arising from business strategy and environmental change, planning ways, time and resources to meet future needs. The purpose of the plan is to provide conditions for achieving the goals of the organization, including anticipating possible shortages (or surplus) of the workforce, planning employment activities, planning educational activities, planning succession. Strategic human resource planning combines the strategic business plan and strategic plan of HR functionality and the joint activity of management and experts in the field of human resources management. The human resources function is an integral part of the strategy's strategy and its application. Human Resource Managers are managers, The basic functions of Managing HRM in human resources management are (Noe, Hollenbeck, Gerhart, Wright, 2012): 1. Selection and employment, 2. Training and promotion, 3. Monitoring and performance evaluation, 4. Rewarding.

When formulating the strategy, a human resources manager is introduced to a strategic planning team on the potential of employees, which makes it one of the basic inputs when choosing a strategy. In this way, the reality of the implementation of various alternatives is immediately considered. After mastering the plan, instead of mere recruitment, human resources management has the function of implementing the plan in a wider sense, applying different mechanisms, with the ultimate goal of creating a competitive advantage. The basic principle of human resources management (MHRR) should be: the right man at the right time, in the right place. Contemporary human resources management definitely strives to do so. Namely, contemporary tendencies in human resources management go towards the relationship between cooperation and creative solution of set goals in the company. In return, such a relationship promotes and raises the level of personality, integrity and initiative of each employee. The role that organizational units have for human resources can best be explained by setting the main goals to be achieved at the organizational level as an individual or with the help of other organizational units. Bearing in mind the strategic performance of the organization of the new era and the constant change in the development of organizations where the business environment and the way of business of modern entrepreneurial organizations are changing, which are primarily expressed as (Noe, Hollenbeck, Gerhart, Wright, 2012):

All these changes work side by side and in their interaction action create a new civilization, where instead of traditional economies focused on material production, new economies based on creativity and sophisticated knowledge are being recognized. Material production and physical labor as a subsidiary product of the new economy are dislocated into less developed regions of the world. Human Resource Management Objectives represent the planned and expected results that an organization wants to achieve in the context of its strengths and weaknesses and opportunities and threats to the environment. The goals arise from the strategic approach itself, that is, from the mission and goals of the organization as a business system. In this sense, the objectives may vary depending on the nature of the organization's activities. In order to gain a competitive edge and a leading position in the market, organizations form the whole complex of human resources management objectives that are primarily related to investing in human resources. Modern MLPP aims to create a good climate in the organization, which will enable employees to feel their important work (Bundschuh-Rieseneder, 2008).

II. ROLE OF THE HR FUNCTION IN LINE WITH GOVERNMENT REQUIREMENTS IN LIBYA

Libya became independent in 1951 on the basis of a decision of the United Nations General Assembly of 1949. A federal government and governments were formed in three provinces (Tripoli, Barga, Fezzan). Each province had its own independence and its basic constitutional law, which essentially did not differ from the laws that applied to other provinces. After that, in order to achieve a comprehensive unity in Libya, constitutional amendments were made, and the most important amendments included the change of the federal system and the replacement of the single state system. Based on the law on local governance, Libya was divided into gubernias: Tripoli - Benghazi - Sebha - Misurata - Albeida - Gharian - Derna - Alkhoms - Ubrai, as well as the provinces and directions. After the revolution in Libya, a socialist system was introduced, similar to self-management, so that it was not possible to talk about leadership in companies, in any respect, except in political (and the leader was only one leader). The current system of business of the company and its management was created after the speech of the leader of the revolution in September 1978, in which he was sent a call to workers to instruct them to march to factories and private companies and to manage them. The current system of companies is regulated by two regulations issued by the commission of the General Assembly of Nations, a financial regulation issued in April 1979 and an administrative regulation of July 1980. In the end, Law no. 13/1981 which provides for the
management of the people. In enterprises, National Committees were formed consisting of a group of members of the company (who were leaders, leaders in one respect), each member came from one of the affiliated units in the company or institution. In addition to three members elected by the manufacturer, the secretary of the committee was elected by the government. The number of members of the committees of the people could not count more than 7 members. Competencies of the committee (leader) were:

1. Planning and making programs necessary for achieving the goals of the company or monitoring their implementation,
2. Prepare an assessment of the balance sheet,
3. Monitoring the activities of a company or institution in order to verify or establish plans and programs,
4. Undertaking the measures necessary for providing the company with the needs or establishing conditions for production and operation,
5. Preparation of the draft balance sheet and final account of the company or institution,
6. Drafting by-laws of the company,
7. Undertaking the measures necessary for the preservation of the assets of the enterprise,
8. Development of training plans in an enterprise or institution.

The latest Libyan revolution in 2011 was different from those in Egypt and Tunisia, followed by large-scale violence. The Libyan Revolution has produced a series of local conflicts and tensions. These conflicts jeopardized the social structure of the country, divisions widened, and relations between communities became weaker. It is clear that today there is an urgent need to provide opportunities for different groups in Libya to understand the colors of each other. It is important to build true peace in a Libyan society. A key part of this process are "transformation leaders" that are better able to manage conflicts and play a greater role in making positive changes in their communities. The main challenge for the changing society is to find leaders who work in a way that encourages inclusion, dialogue and cooperation. Such people are "transformational" leaders. Transformational leaders have the ability to influence the visions, attitudes and behaviors of others in the community of which they are a part. Since the uprising in 2011, Libyan leaders have had problems finding a community with critical mass in public. This is partly because of the lack of functional political institutions and the deep public distrust. Building trust and cooperation requires a new, horizontal approach to management. Leaders who recognize the need to end the war and rebuild the state must begin by acknowledging and correcting longstanding injustices against their fellow citizens. The second need is for the leaders to recognize the extent of the statelessness we inherited, and cooperation, sacrifice and collective effort are necessary for security and stability. Libya is not a functional state today. In order to build a safe and functional Libyan state, we must break with the old leadership models. Libyan leaders should make a move forward.

One precondition for good governance is the mobilization of civil society, which can be defined as a policy arena in which groups, movements and individuals organize and try to articulate values, create associations and solidarity, and are relatively able to advance their interests autonomously from the state. The relationship between civil society and the government is characterized by multiple understanding, such as:

1. Civil society as a source of stability and legitimacy for the government,
2. Civil society as a source of resistance against the arbitrary, repressive and victorious government,
3. Civil society as a development in partnership with the government,

In Western countries, civil society includes trade unions, employers’ organizations, non-governmental organizations, professional associations, grassroots, charitable organizations independent of social movements, neighborhood associations, religious groups and intellectual organizations. All these entities are platforms of specific interest and are trying to influence ruling machines in the shape of a lobby. As stated earlier, the Libyan way of democracy has created an additional civil society structure, which makes democratic platforms, which have the same importance for administrative leadership as civil society. Therefore, it may be of some interest to describe attributes as well as institutional and personal instruments of good governance. Libya has followed a special way for democracy, which in some way is contradictory to the rule of law. Representative democracy based on the rule of law has been partly replaced by the concept of people's sovereignty. Contrary to the law as a product of MP's representatives and implemented by the bureaucrats, this concept - nowadays somewhere between the idea and the reality - requires the direct involvement of people in the political decision-making process. Participation means deciding to create the power of people in all steps of administration. It is organized at national congresses at local, regional and national level. These entities define the political issues and objectives for parallel existing administrative bodies responsible for the implementation of the decision. The formal characteristics of the administrative decision-making process in Libya are:

1. Participation, which means involvement of citizens in decision making process and creation of opportunities to achieve significant contributions to it,
2. Openness, which means that decision-making institutions are open-source, accessible and understandable to the general public,
3. Transparency is also a consequence of the participation and inclusion of information accessibility of people and clarity on the political decision.

The public sector is today seen as an "employer", and the conditions of service are at the forefront of the reform of employment and innovation. The concept of an employer model covered the best practice principles and found the case in the private sector in terms of fair treatment of employees and the provision of good working conditions, including a high level of work safety, certain remuneration and good pensions (Burke, Noblet and Cooper, 2013). The development of public services and public regulatory agencies is the result of a relatively long-lasting process of the metamorphosis of the modern state or
administration, because they are state, administrative systems “primary” regulatory systems. Contemporary management is characterized by tendencies of increasing number of administrative organizations, systemic differentiation, and reduction of the role of coercion, professionalization, and the tendency of constant modernization or “reform” of administrative systems could be mentioned. It is precisely the differentiation of modern administration, which, in addition to repressive, performs other important functions in modern society (service and development functions), has led to the development of the so-called “public services”, and therefore with regard to public regulatory agencies. These agencies perform certain state administrative tasks, which in the past have been reserved exclusively for the state or state authorities. In this context, it is also necessary to warn of certain dangers, the most important of which is the danger of reducing the level of responsibility for decision-making in some important public law areas (in particular, the reduction of the degree of democratic control or the reduction of the degree of ministerial responsibility before the parliament). There are certain problems in this area, among other things, problems of high terminological imprecision, which often lead to a certain degree of misunderstanding of the position and function of modern public agencies and other regulatory bodies in modern public administration.

III. CONCLUSION

There is clear evidence that the role of the HR is becoming versatile, but this role does not confuse traditional HR roles, but it intertwines, adding to the diversity, challenge and complexity of HR in the public sector. Our findings show that changes in HRM in the public sector in Libya have progressed far more than previously suggested. From the perspective of politics, it is clear that the government’s “agenda” for change will come into force. However, there is evidence that in some organizations, such as the police, the full potential of the function is slowed down by extensive and lengthy procedures. Therefore, there is a need to explore new ways of streamlining and reducing the burden of the process, as well as more detailed research on how tensions and conflicts within the role can be solved. Labor law is an essential element of a quality solution for HRM potentials. Adaptation of all labor contracts and harmonization of them with current laws in Libya are necessary to create not only a positive climate in the public sector, but also to prevent the occurrence of possible situations in which misinterpretation of labor rights and obligations could occur, and consequently to painstaking, long-lasting and expensive labor disagreements that are not desirable to the employee, nor to the state as an employer. By incorporating such a module within the human resources management system and its application at all levels, from lower-ranking officials, students in temporary work or practice to the level of managers and analysis of legal aspects of managerial contracts, it is possible to eliminate all possible use of specially designed reports shortcomings and fully harmonize all contracts with current laws, regulations and contracts. The efficiency of state and municipal institutions depends to a large extent on the education of public officials, competencies and capabilities. It is important to note that the system for the motivation of human resources has a major impact on the efficiency of institutions. At present, the problem of the performance of institutions and public officials is being monitored, the conditions required to discover their abilities and potentials are not created. In order to increase the efficiency of the work of institutions, the system for the motivation of human resources needs to be improved. Motivation of public officials is related to the motives of human behavior, i.e., with personal motives to seek well for society and the company that provides them with services. One of the main discourses of scientists and business members are factors that influence the motivation of employees. A number of scientific analyzes have been carried out to identify motivation factors in the public sector. However, there is no common approach among students to the concept of employee motivation and the ability to properly assess the motivation of workers and its impact factors.

In order to evaluate the effectiveness of the motivation tools that were applied by the leaders of the state administration services of state and municipal institutions, the aspects of motivation are divided into five groups of factors: material, recognition, self-expression, social and security factors. In the group of material factors, wages are most motivated by employees, while other assets (bonuses, premium allocation, one-time payments prescribed by the government) are rated as inadequate funds for increasing employee motivation. In the group of recognition factors, the most effective motivation modes are the participation of employees in the decision-making process, more responsibility and authority, thank-you, career opportunities; inadequately motivation funds are nominal gifts and state awards. In the self-expression group, the ability to work interesting and responsible work and the possibility of constant improvement (training, training courses, rotations, internships, missions) are well rated. In the group of social factors, the most effective motivation tools were the attention of the leaders, informal discussions, teamwork, and the appropriate leadership style. In the group safety factors, appropriate working conditions, equipped workplace, social security and insurance are well rated. In short, the most effective motivation tool in the private sector is social security, insurance, appropriate working conditions, equipped workplace, the possibility of continuous improvement. The least efficiently motivating asset in the private sector is the one-off payment prescribed by the government, state awards, bonuses, nominal gifts.

REFERENCES

AUTHORS

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Growth Performance of Different Cacao Clones at Varying Rates of Sodium Chloride Fertilization

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**Abstract** - The increasing prices of commercial fertilizers lead to the utilization of natural products as source of plant nutrients. Relatively, several researches were conducted on the use of common salt (NaCl) as fertilizer and reported to have different effects on varying crop species. Hence, this study was conducted to 1) compare the growth of different cacao clones in response to varying NaCl rates, 2) assess the effects of NaCl on cacao growth and nutrient uptake and 3) determine the optimum NaCl rate that would hasten the growth of a certain cacao clone. The experiment was arranged in a 2x6 factorial in randomized complete block design (RCBD) with three replications. Cacao clones (BR 25 and UF 18) served as factor A and Factor B was composed of varying K2O:NaCl ratios (control; 100% K2O + 0% NaCl; 75% K2O + 25% NaCl; 50% K2O + 50% NaCl; 75% K2O + 25% NaCl and 0% K2O + 100% NaCl). Other nutrients were applied in blanket to all treatment plants except for the control. Results show that BR 25 and UF 18 cacao clones have had comparable stem diameter (SD) and canopy spread (CS) at varying K2O:NaCl ratios. On the other hand, varying K2O:NaCl ratios failed to exhibit increment of SD and CS of two cacao clones. Moreover, no significant interaction effects were observed between clone and K2O:NaCl ratios on cacao SD and CS. Lastly, although D-leaf tissue analysis showed no significant differences in nutrient (N, P, K, Ca, Mg and Na) uptake amongst cacao clone, K2O:NaCl ratios and their treatment combinations, a Na uptake positive regression trend was observed.

**Index Terms** - salt fertilizer, sodium chloride, potassium, cacao growth, Theobroma cacao

I. INTRODUCTION

Cacao (*Theobroma cacao* L.) is a tree crop highly suitable in different cropping systems. Demand for cocoa is expected to grow in coming decade between 2.5%-3.0% or around 100,000 MT's (Philippine Cacao Industry Roadmap, 2017), following growth pattern of worldwide GDP. Hence, local farmers have increased their interest in the cultivation of cacao due to the huge demand in the local and international markets, and with persistently favourable prices.

Cacao is a perennial crop which requires huge amount of nutrient. Like other crops, cacao plants absorb more potassium than any other mineral element except nitrogen. Cost of fertilizer inputs may be a burden to farmers who will venture on cacao production. Thus, alternative fertilizer program that is cheaper and effective would be essential. One of the possible alternatives is to use common salt or sodium chloride (NaCl) as component of the fertilizer program for cacao.

The use of common salt (NaCl) as fertilizer has little importance in crop production as huge amount of sodium (Na) and chlorine (Cl) were reported to be toxic to most crop species and these elements inevitably have an adverse effect on soil fertility. Contrary to these reports, NaCl was utilized as component of the fertilizer program for coconut (Margate and Magat, 1988) and sugar beet crops (Wakeel, 2008). It has been reported (Wakeel, 2008) that Na is more important nutrient than potassium for sugar beet although Na has still not been shown to be essential for most higher plants with a little exception on certain types of C4 plants (Subbarao et al., 2003). Although Na is not essential for many species, application of Na has been found to stimulate the growth of asparagus, barley, brocolli, caraway, carrot, cotton, millet, oat, sugar beet, red beet, and turnip (Harmer and Benne, 1945; Larson and Pierre, 1953; Lehr, 1953; Montasir et al., 1966). Moreover, Margate and Magat (1988) reported that the application of NaCl at 1.76-7.04 kg tree⁻¹ year⁻¹ in coconut palms resulted to high germination percentage of seednuts, better girth and leaf production of seedlings.

The ever increasing prices of commercial fertilizers especially sources of K₂O give realization to cacao growers to formulate a cheaper and effective fertilizer program. One of the potential alternatives is to use NaCl as fertilizer. Gattward et al (2012) reported that Na can partially replace K in the nutrition of cacao, with significant beneficial effects on photosynthesis, water use efficiency and mineral nutrition of this crop. Hence, this study was conceptualized to 1) compare the growth of different cacao clones in response to varying NaCl rates, 2) assess the effects of NaCl on cacao growth and nutrient uptake and 3) determine the optimum NaCl rate that would hasten the growth of a certain cacao clone.

**MATERIALS AND METHODS**

The study was conducted at Central Mindanao University, Musuan. Maramag, Bukidnon from November 2016 to October 2017. The existing one month-old cacao clonal garden under coconut plantation was utilized in this study. Prior to treatment application, soil sampling was done. Composite soil sample (0-30 cm and 31-60 cm depths) was brought to Soil and Plant Analysis Laboratory (SPAL) of Central Mindanao University.
(CMU) to determine the nutrients available in the soil. The soil of the experiment area was classified as Adtuyon clay. Soil texture was clay loam based on feel method assessment. Soil pH was slightly acidic for cacao plants. Organic matter, extractable phosphorus (P), extractable Ca and Mg were below critical levels, whereas extractable K was at optimum level (Table 1).

‘UF-18’ and ‘BR-25’ cacao clones were provided by the Department of Agriculture-Bureau of Plant Industry in Davao City, Philippines. Three-month old “PBC-123” seedlings (rootstock) was grafted with “UF-18” and “BR-25” scions. The grafted ‘UF-18’ and ‘BR-25’ cacao clones with five to seven mature leaves and with uniform height were utilized as the test plants. Transplanting of cacao seedlings was done on November 2017. Each cacao plant was supplied with 100 grams 14-14-14 fertilizer, 50 grams dolomite and 500 grams vermicast through basal application. Prior to treatment application, baseline data of cacao plant growth parameter (stem diameter=7mm, number of leaves=7, number of branches=1.33, number of shoots=2.63, canopy spread= 15 cm) were gathered.

The experiment was laid out in a 2x6 factorial in randomized complete block design (RCBD) with three replications. Cacao clone (BR-25 and UF-18) served as Factor A, whereas Factor B was composed of varying K2O:NaCl ratios (control; 100% K2O + 0% NaCl; 75% K2O + 25% NaCl; 50% K2O + 50% NaCl; 25% K2O + 75% NaCl and 0% K2O + 100% NaCl) as shown on Table 2. Other nutrients were supplied based on the fertilizer recommendation of PCARRD (1989) as cited by Magat and Secretaria (2007) as shown on Table 3. Ammonium sulphate (21-0-0-24S), solophos (0-20-0) and muriate of potash (0-0-60) were used as substitute to complete fertilizer to meet the desired K2O:NaCl ratio without deviation of N and P2O5 requirements of the crop. The fertilizers were applied by digging four holes (10 cm depth) in the ground parallel to the cacao plant canopy. Each hole was then covered with soil after fertilizer application to prevent nutrient volatilization.

### Table 1

**Soil physical and chemical characteristics of the experiment area**

<table>
<thead>
<tr>
<th>Soil Depth (cm)</th>
<th>pH</th>
<th>Organic matter (%)</th>
<th>Extractable P (%)</th>
<th>Exchangeable K (%)</th>
<th>Ca (%)</th>
<th>Mg (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30</td>
<td>5.25</td>
<td>2.86</td>
<td>0.00027</td>
<td>0.0039</td>
<td>0.44</td>
<td>0.024</td>
</tr>
<tr>
<td>31-60</td>
<td>6.51</td>
<td>2.76</td>
<td>0.00017</td>
<td>0.0054</td>
<td>0.86</td>
<td>0.028</td>
</tr>
<tr>
<td>Average</td>
<td>5.88</td>
<td>2.81</td>
<td>0.00022</td>
<td>0.0046</td>
<td>0.65</td>
<td>0.026</td>
</tr>
<tr>
<td>Critical level</td>
<td>6.00*</td>
<td>3.00*</td>
<td>0.20000**</td>
<td>2.0000**</td>
<td>0.50**</td>
<td>0.450**</td>
</tr>
</tbody>
</table>

*- Wessel (1985)  
**- Ling (1990)

Tip pruning was employed using a pruning shear at 4 months after transplanting (MAT), 7 MAT and 10 MAT. Chupons were removed at early detection. Recommended insecticide was applied as foliar spray at monthly interval to control insect pests. Manual weeding (round weeding and weed slashing) was employed to control weeds.

D-leaf sampling for plant tissue analysis was done at 12.5 MAT. This was done by collecting 18 leaves (3rd leaf from the tip, mature in plants half-shade) per plot based on the recommended guidelines of de Mello Prado and Caione (2012). Collected leaf samples were brought to SPAL at Central Mindanao University for nutrient analysis.

### Data Gathered

Vital growth parameters of cacao clones measured in this study include stem diameter and canopy spread.

1. Stem diameter was gathered at bimonthly interval starting at four months after transplanting (MAT). This was done by measuring the stem diameter (2.54 cm above the graft union) using a pre-calibrated vernier caliper.
2. Canopy spread was measured using a pre-calibrated measuring stick. This growth parameter was taken at 12.5 MAT.
3. D-leaf nutrient (N, P, K, Ca, Mg, Na) uptake was determined through plant tissue laboratory analysis conducted by SPAL staff at Central Mindanao University.

### Statistical Analysis

Data were analyzed using the MStatC software 1998 version.

### Table 2

**Treatments of the study**

<table>
<thead>
<tr>
<th>Cacao clone (Factor A)</th>
<th>K2O:NaCl rates (Factor B)</th>
<th>Other nutrients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR 25</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 3
Fertilizer recommendation for juvenile cacao plants (PCARRD, 1989 as cited by Magat and Secretaria, 2007)

<table>
<thead>
<tr>
<th>MONTHS AFTER TRANSPLANTING</th>
<th>AMOUNT OF 14-14-14 FERTILIZER *kg ha⁻¹</th>
<th>grams tree⁻¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50.80</td>
<td>46.0</td>
</tr>
<tr>
<td>4</td>
<td>67.43</td>
<td>60.7</td>
</tr>
<tr>
<td>8</td>
<td>67.43</td>
<td>60.7</td>
</tr>
<tr>
<td>12</td>
<td>101.57</td>
<td>91.4</td>
</tr>
</tbody>
</table>

*amount is based on 1,111 plants ha⁻¹

II. RESULTS AND DISCUSSION

Stem Diameter

Stem diameter of cacao regardless of clone was similar in response to varying K₂O:NaCl (Figure 1) ratios across different ages after transplanting. Both BR 25 and UF 18 clones have comparable stem diameter although BR 25 tend to be wider at latter growth stages. Moreover, cacao clones applied with varying rates of K₂O:NaCl ratios have had comparable stem diameter to cacao clones with no K₂O and NaCl (Figure 2) application. Furthermore, the interaction of cacao clones and the varying levels of K₂O:NaCl ratios have had no significant influenced on the stem diameter of cacao plants at varying growth stages (Figure 3). Results indicate that the stem diameter of young BR 25 and UF 18 cacao clones in the field is not affected by the application of varying K₂O:NaCl ratios employed in this study. NaCl at the rate of 40.21 kg ha⁻¹ in four split applications to newly established cacao plantation have no negative effects on stem diameter. In the Philippines, NaCl is utilized as component of fertilizer program in coconut plantations (Margate and Magat, 1988) of which cacao is being planted as intercrop. In fact, Gattward et al (2012) reported that Na can partially replace K in the nutrition of cacao, with significant beneficial effects on photosynthesis, water use efficiency and mineral nutrition of this crop. However, in this study the effects of NaCl on the stem diameter of one year old cacao seedlings was not displayed.

Figure 1. Stem diameter of two cacao clones in response to varying K₂O:NaCl ratios
Canopy Spread

The data on canopy spread of two cacao clones subjected to varying K₂O:NaCl ratios are shown in figures 4, 5, and 6. Canopy spread of BR 25 and UF 18 cones were statistically comparable (Figure 4). However, it was noted that numerically BR 25 cacao clone have wider canopy spread compared to UF 18. Moreover, the varying levels of K₂O:NaCl ratios have no effects on the canopy spread of BR 25 and UF 18 cacao clones (Figure 5). However it was noted that numerically the application of 50:50 K₂O:NaCl ratio resulted to plants with wider canopy spread compared to different K₂O:NaCl ratios. Further, in terms of numerical value, no application of K₂O and NaCl produced the narrowest cacao canopy spread. Furthermore, interaction of clones and varying ratios of K₂O and NaCl have no significant influence on the canopy spread (Figure 6) of cacao.

D-Leaf Nutrient Uptake

All treatment plants have had comparable nutrient uptake as revealed by the D-leaf tissue analysis (Table 3). N and P surpassed the critical levels, whereas K, Ca and Mg were below the critical levels. In terms of Na uptake, UF 18 had higher accumulated Na than BR 25 cacao clone although not significant. It was observed further that there is an increasing Na accumulation of cacao plant as higher rate of NaCl was applied in UF 18 cacao clone. On the other hand, Na was absent in BR 25 cacao clone in all ratios of K₂O and NaCl.
The result indicates that BR 25 cacao clone inevitably has more exclusion property to Na. Further, this result shows that different cacao clones could have different response to Na application.

### Table 3

*D-leaf nutrient accumulation of one year old cacao plants. UF 18 R² value for Na=0.5689*

<table>
<thead>
<tr>
<th>TREATMENT</th>
<th>N</th>
<th>P</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Na</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cacao clone (A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BR 25 (A1)</td>
<td>2.33</td>
<td>0.68</td>
<td>1.02</td>
<td>0.40</td>
<td>0.40</td>
<td>0.0000</td>
<td>ns</td>
</tr>
<tr>
<td>UF 18 (A2)</td>
<td>2.20</td>
<td>0.60</td>
<td>1.01</td>
<td>0.34</td>
<td>0.37</td>
<td>0.0142</td>
<td>ns</td>
</tr>
<tr>
<td>Significance</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>K₂O:NaCl (B)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 (B1)</td>
<td>2.41</td>
<td>0.61</td>
<td>1.14</td>
<td>0.38</td>
<td>0.37</td>
<td>0.0000</td>
<td>ns</td>
</tr>
<tr>
<td>100:0 (B2)</td>
<td>2.30</td>
<td>0.52</td>
<td>0.93</td>
<td>0.39</td>
<td>0.41</td>
<td>0.0000</td>
<td>ns</td>
</tr>
<tr>
<td>75:25 (B3)</td>
<td>2.00</td>
<td>0.83</td>
<td>1.16</td>
<td>0.31</td>
<td>0.34</td>
<td>0.0008</td>
<td>ns</td>
</tr>
<tr>
<td>50:50 (B4)</td>
<td>2.40</td>
<td>0.59</td>
<td>1.01</td>
<td>0.34</td>
<td>0.39</td>
<td>0.0023</td>
<td>ns</td>
</tr>
<tr>
<td>25:75 (B5)</td>
<td>2.26</td>
<td>0.53</td>
<td>0.95</td>
<td>0.38</td>
<td>0.40</td>
<td>0.0056</td>
<td>ns</td>
</tr>
<tr>
<td>0:100 (B6)</td>
<td>2.22</td>
<td>0.63</td>
<td>0.92</td>
<td>0.42</td>
<td>0.42</td>
<td>0.0341</td>
<td>ns</td>
</tr>
<tr>
<td>Significance</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>A x B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1B1</td>
<td>2.37</td>
<td>0.74</td>
<td>1.28</td>
<td>0.36</td>
<td>0.33</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>A1B2</td>
<td>2.31</td>
<td>0.45</td>
<td>0.79</td>
<td>0.49</td>
<td>0.45</td>
<td>0.0000</td>
<td></td>
</tr>
</tbody>
</table>

Figure 5. Effect of K₂O:NaCl ratio on the canopy spread of cacao

Figure 6. Effects of the different treatment combinations on the canopy spread of cacao
A1B3  2.15  1.05  1.11  0.34  0.36  0.0000
A1B4  2.51  0.61  1.08  0.35  0.41  0.0000
A1B5  2.40  0.55  0.85  0.38  0.46  0.0000
A1B6  2.24  0.66  1.03  0.48  0.42  0.0000
A2B1  2.45  0.48  0.99  0.40  0.40  0.0000
A2B2  2.28  0.59  1.08  0.29  0.38  0.0000
A2B3  1.84  0.61  1.22  0.28  0.32  0.0016
A2B4  2.28  0.56  0.93  0.33  0.37  0.0000
A2B5  2.13  0.50  1.05  0.38  0.36  0.0012
A2B6  2.21  0.60  0.82  0.36  0.41  0.0061
Significance  ns  ns  ns  ns  ns  ns
Critical level\textsuperscript{1/}  2.00  0.20  2.00  0.50  0.45  NA
CV (%)  5.96  16.33  39.36  90.95  9.67  18.42

\textsuperscript{1/} Prado and Caione (2012)

ns- not significantly different at 0.05 level of DMRT

III. CONCLUSION AND RECOMMENDATION

Although there were trends observed in this study on the growth of BR 25 and UF 18 cacao clones at varying K\textsubscript{2}O and NaCl ratios, results are found not significant and thus inconclusive. Hence, further study would be essential. Flowering and pod development of BR 25 and UF 18 cacao clones at varying K\textsubscript{2}O:NaCl ratios is also recommended to be monitored.

ACKNOWLEDGMENT

The authors extend their sincere appreciation to Central Mindanao University for funding this research. DOST-Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development and Bureau of Plant Industry-Davao are likewise acknowledged for the provision of BR 25 and UF 18 cacao seedlings used as test plants.

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Influence of Enclosure Conditions and Visitors on the Behavior of Captive Malayan Tapir (Tapirus indicus): Implications for Ex-Situ Management and Conservation

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Abstract- The population of Malayan tapirs (Tapirus indicus) in the wild is experiencing a radical decline mainly due to habitat destruction throughout their regions. Therefore, as an initiative measure to sustain the population, ex-situ conservation was established. However, the ability of captive management to maintain and breed endangered species has been proved challenging. In this study, we investigated how the behavior of Malayan tapirs in captivity is affected by enclosure conditions; type (semi-natural versus zoo enclosures/artificial) and weather (temperature and humidity), and visitors. Behaviors (categorized as resting, locomotion, ingestion, swimming, investigative) were observed using instantaneous sampling over 20 minute periods with intervals of 30 seconds, and analyzed using generalized linear mixed-effects model, glmer. Enclosure type had a significant effect on feeding behavior where tapirs in semi-natural enclosures fed more frequently than tapirs in artificial environments, mirroring natural feeding activity. Significant adverse effects from background noises and visitors caused tapirs in artificial enclosure to be more alarmed and increased their investigative behaviors. High number of visitors overall lowered the activity of tapirs, while low humidity caused tapirs to suffer from dryness, and thus resulted in frequent ingestion (drinking) and locomotion behavior which indicative of thermal stress. Overall from this study, it is concluded that unsuitable enclosure conditions of extreme dryness and number of visitors are prone to be potential stressors that lower the activity pattern which possibly alter the natural behaviors of Malayan tapir in captivity. Therefore, further evaluation on exhibit design and management practices are encouraged to identify variables that could increase the well-being of captive Malayan tapirs.

Index Terms- Malayan tapir, behavior, visitors, humidity, enclosure condition

I. INTRODUCTION

Captivity often results in behavioral changes, abnormalities or stereotypic behaviors in wild animals [1,2]. This is particularly hazardous for endangered species, because it can affect their reproductive behaviors, hence their reproductive success, physiology and life expectancy due to social, and demographic changes [3-6]. For example, female Southern white rhinoceros (Ceratotherium simum simum) show an increase in their adrenal stress response in captivity that subsequently affects their reproductive physiology [7]. Therefore, zoos worldwide take measures to enhance animal husbandry primarily implementing environmental and behavioral enrichments [8]. To design appropriate species-friendly enclosures, we need to understand the focal species’ specific needs that can be determined only through scientific research and behavioral observation.

In this study, we focus on the Malayan tapir (Tapirus indicus) which is currently listed as an endangered species by the International Union for Conservation of Nature (IUCN) Red List with an estimated population size of approximately 2,500 individuals in the wild [9]. Malayan tapir are susceptible to extinction due to increased hunting pressure, accidental trapping, and large scale deforestation resulting in habitat loss [9]. Because tapirs are strongly K-selected mammal [10], they have extremely low reproductive rates and produce one calf per parturition [9, 11, 12] after a gestation period of up to 399 ± 3 days [12, 13] with a calving interval of up to 14-18 months [12].

Malayan tapirs are important seed dispersers for a wide variety of plant species [14, 15] and are able to carry and excrete seeds across distances of up to 3.3 kilometers [14, 16]. Therefore, it is crucial to conserve this species at a sustainable population size to maintain the biodiversity of Malayan ecosystems. In recognition of these imperatives, Malayan tapirs are currently bred in government-organized ex-situ breeding programs in Malaysia, but studies that investigate potential stressors that could affect the conservation and welfare of captive individuals are still lacking.

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Therefore, we undertook this study to identify potential stressors (quantified through behavioral observations) for both male and female Malayan tapirs in captivity by evaluating 1) the effects of enclosure type (semi-natural and artificial enclosures), and 2) the presence and number of human visitors (which has been shown to increase the faecal cortico-stress hormone levels in related species such as black and white rhinoceros (Diceros bicornis and Ceratotherium simum); [17]) and to have substantial effects on the behavioral repertoire of others [5, 18]. In addition, we assessed 3) the relationship between tapir behaviors and weather variables (i.e., temperature and humidity), as wild animals kept under environmental conditions that differ from their natural habitat are prone to exhibit stereotypical behaviors [19].

II. MATERIALS AND METHODS

A. Study Sites and Subjects

This study was conducted in Peninsular Malaysia in three enclosures (Sungai Dusun Padlock A (SDA), Padlock B (SDB) and Padlock C (SDC)) at the Sungai Dusun Wildlife Reserve Centre: 3.4075° N, 101.2382° E (henceforth termed ‘semi-natural’) and in two zoo enclosures (Zoo Negara (ZN): 3.2091° N, 101.7582° E, and Zoo Melaka (ZM): 2.2765° N, 102.2989° E; henceforth termed ‘artificial’). Semi-natural enclosures in this study are surrounded by forest and no visitors permitted therefore the amount of background noise are minimal compared to artificial enclosures that are surrounded by buildings, traffics and open to visitors, whereas, the other captive facilities are akin between semi-natural and artificial enclosures (Table 1). We observed a total of 7 adults, three in the semi-natural (male = 2, female = 1) and four in artificial (male = 2, female =2).

Table 1: Description of study sites

<table>
<thead>
<tr>
<th>Place</th>
<th>Enclosure type</th>
<th>Surrounding</th>
<th>Visitors Permitted (yes/no)</th>
<th>Fence height (high/low)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoo Negara (ZN)</td>
<td>artificial</td>
<td>buildings</td>
<td>yes</td>
<td>high</td>
</tr>
<tr>
<td>Zoo Melaka (ZM)</td>
<td>artificial</td>
<td>traffic</td>
<td>yes</td>
<td>low</td>
</tr>
<tr>
<td>Sungai Dusun Wildlife Reserve Centre Padlock A (SDA)</td>
<td>semi-natural</td>
<td>forest</td>
<td>no</td>
<td>high</td>
</tr>
<tr>
<td>Sungai Dusun Wildlife Reserve Centre Padlock B* (SDB)</td>
<td>semi-natural</td>
<td>forest</td>
<td>no</td>
<td>high</td>
</tr>
<tr>
<td>Sungai Dusun Wildlife Reserve Centre Padlock C* (SDC)</td>
<td>semi-natural</td>
<td>forest</td>
<td>no</td>
<td>high</td>
</tr>
</tbody>
</table>

*The same male individual was placed in different enclosures at different times: SDB (March-July), SDC (August onwards).

B. Behavioral Observation

The behavioral observations were conducted over a period of 24 weeks (6 months) between March and August 2016, divided into two week periods and alternating between semi-natural and artificial enclosures to control for any variation due to month and weather. Tapir behaviors were recorded by instantaneous sampling method using a digital video camera (Brand: Sony, Model: FDR-AXP35) and camera traps (Brand: Scout Camera, Model: DTC-560K) with video mode wherever direct observations were not possible. Behaviors were recorded during a continuous 20-minute sampling period at an interval of 30 seconds with a 15 minute break in between different sampling periods [20, 21] for 8 consecutive hours from 0900 to 1700. Number of visitors that visited tapirs’ enclosure during each sampling period were counted manually at artificial enclosures, and the outdoor temperature and humidity were recorded using Hygro-Thermometer Clock (Extech Instruments, Model: 445702) during each sampling period at all enclosures and averaged per week for each individual. The layout of each enclosure were drawn and measured using SketchUp Pro 2016 Software Version 16.1.1449 (Fig. 1).

C. Ethogram

An ethogram compiled from literature reviews of Tapirus sp. and other mammals belonging to the order Perissodactyla was used in this study [7, 21-24; Table 2].
Figure 1: (a) Layout of Zoo Negara, ZN, (b) Layout of Zoo Melaka, ZM, (c) Layout of Sungai Dusun Wildlife Reserve Centre Padlock A, SDA, (d) Layout of Sungai Dusun Wildlife Reserve Centre Padlock B, SDB, (e) Layout of Sungai Dusun Wildlife Reserve Centre Padlock C, SDC

Table 2: Ethogram used for this study

<table>
<thead>
<tr>
<th>Behavioral Grouping</th>
<th>Behavior Subgrouping</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingestion</td>
<td>Eating</td>
<td>The animal in upright position ingesting edible material using the tongue, teeth and mouth, with movement of upper and lower jaw to crush, chew and swallow. Intake of liquid by using snout to suck water.</td>
</tr>
<tr>
<td></td>
<td>Drinking</td>
<td></td>
</tr>
<tr>
<td>Locomotion</td>
<td>Walking</td>
<td>The movement of feet (forefeet and hind feet) by alternately setting each pair of feet forward, with at least one pair of feet on the ground.</td>
</tr>
<tr>
<td></td>
<td>Running</td>
<td>The quick forward movement using two feet by alternatingly making a short jump off either pair.</td>
</tr>
<tr>
<td>Stationary</td>
<td>Standing</td>
<td>The animal remains stationary in an upright position either in a bipedal or quadrupedal manner.</td>
</tr>
<tr>
<td>Swimming</td>
<td>Swimming</td>
<td>Sitting, standing, lying or swimming in the water with their head out of the water, leading with their snout or fully submerged in the water.</td>
</tr>
<tr>
<td>Aggression</td>
<td>Bite</td>
<td>Opening and closing of the jaws with the teeth grasping a conspecific or an object. Movement of one leg lifting off the ground and rapidly extending forward toward conspecific or object.</td>
</tr>
<tr>
<td></td>
<td>Kick</td>
<td>The animal uses force by pressing the head, neck, shoulder, chest, body or rump against conspecific or an object in an attempt to move it violently.</td>
</tr>
<tr>
<td></td>
<td>Push</td>
<td></td>
</tr>
<tr>
<td>Resting</td>
<td>Lying Down</td>
<td>The animal rests on the ground in a horizontal or prostrate position while fully or partially conscious.</td>
</tr>
<tr>
<td></td>
<td>Sitting</td>
<td>The animal in a position where its forelimb extended straight and rump on the ground.</td>
</tr>
<tr>
<td></td>
<td>Sleeping</td>
<td>The animal is in a complete state of unconsciousness; in a dormant state, with eyes closed, resting on the ground.</td>
</tr>
<tr>
<td>Investigating</td>
<td>Alert/</td>
<td>The body is in sitting or standing position, raising its head and staring at another species or objects with eyes wide open and alert to surroundings.</td>
</tr>
<tr>
<td></td>
<td>Observing</td>
<td>The inhalation of air by touching or extending the snout towards an object, sites or in the air.</td>
</tr>
<tr>
<td></td>
<td>Smelling</td>
<td>The animal uses force by pressing the head, neck, shoulder, chest, body or rump against conspecific or an object in an attempt to move it violently.</td>
</tr>
</tbody>
</table>
D. Data Analysis

All statistical analyses were run in the R Statistical Package Version 3.3.2. We fitted generalized linear mixed-effects models using the glmer function in lme4 package [25] and model averaging based on information criteria, AICc (Akaike's Information Criterion; [26] in MuMIn package [27]. The Y-axis represents the frequency of behaviors (number of times a behavior occurred at each sampling point, see Table 2) averaged per week for each individual. The fixed effects included enclosure type, sex, weather, and number of visitors. We standardized the visitor, temperature and humidity variables to a mean of zero and a standard deviation (SD) of two [28]. The weather variables were inter-correlated (i.e. if temperature (°C) increased, humidity (%) decreased; r = -0.80, p<0.05), thus we included only humidity in the models. Individual identity and month were included as random effects in all models to control individual-specific and weather-dependent variation. We used an information-theoretic (IT) approach to select sets of plausible models and to estimate the overall importance of each fixed effect [29, 30]. Models were ranked by their AICc value, such that the top model had the lowest AICc value [29] and we considered the top model to be the only plausible model if model rank (∆AICc) was ≤ 7. A model's relative Akaike weight (ω) was calculated as the model's relative likelihood (exp [−0.5 * ∆AICc]), divided by the sum of the likelihoods for all models considered (whether plausible or not). We used the ‘average method’ (averaged over all plausible models in which the given parameter was included, weighted by the summed weights (ω) of these models to estimate model-averaged parameters [26, 30]. The 95% confident interval for model-averaged parameter estimates were calculated using the model.avg function in R. The relative importance of each fixed effect was calculated as the total ω of all plausible models that included the fixed effect of interest.

III. RESULTS

A. Enclosure Type

Enclosure type had a significant effect on the feeding behavior of tapirs with individuals kept in semi-natural enclosures (SDA, SDB and SDC) fed more frequently than those kept in artificial enclosures (ZN and ZM) (Table 3A; Fig 2a). Tapirs in artificial enclosures performed more investigative behaviors than tapirs in semi-natural enclosures (Table 3E; Fig 2b). There were no pools in the semi-natural enclosures, thus swimming behavior was investigated in artificial only where we observed that tapirs swam more frequently in ZM enclosure compared to ZN (Table 3D; Fig 2c).

B. Humidity

Humidity had a significant effect on most of the recorded behaviors. Tapirs were found ingesting, moving and resting more frequently during low humidity (55-69%) and warmer temperatures (31-33°C) (Table 3A, 3B and 3F; Fig. 3a, 3b and 3c). In addition, we observed swimming behavior was continuously increasing with increase in humidity (Table 3D; Fig 3d).

C. Number of Visitors

The higher the number of visitors, the less locomotion was observed (Table 3B; Fig 4a). Tapirs also swam (Table 3D; Fig 4b) and investigate (Table 3E; Fig 4c) less frequently when the visitor numbers were high. In contrast, tapir resting behavior increased with higher visitor numbers (Table 3F; Fig 4d).
Table 3: Model-averaged parameter estimates over all submodels with Delta Akaike’s Information Criterion (ΔAICc) < 7; see Table S1-S7) testing the relationship between variables and groups of behaviors in both, artificial and in semi-natural enclosures. All continuous data were standardized to a mean of zero and a standard deviation of two. β (CI) = Estimated value (95% Confidence Interval) and RI = Relative Importance. Bold estimates had a confidence interval that did not overlap zero.

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>A. Ingestion</th>
<th>B. Locomotion</th>
<th>C. Stationary</th>
<th>D. Swimming</th>
<th>E. Investigation</th>
<th>F. Resting</th>
<th>G. Aggression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β (CI)</td>
<td>RI</td>
<td>β (CI)</td>
<td>RI</td>
<td>β (CI)</td>
<td>RI</td>
<td>β (CI)</td>
</tr>
<tr>
<td>Intercept</td>
<td>2.59</td>
<td>-</td>
<td>3.42</td>
<td>-</td>
<td>4.28</td>
<td>-</td>
<td>1.77</td>
</tr>
<tr>
<td></td>
<td>(1.92, 3.28)</td>
<td></td>
<td>(2.88, 3.95)</td>
<td></td>
<td>(1.62, 6.85)</td>
<td></td>
<td>(0.40, 3.14)</td>
</tr>
<tr>
<td>Sex</td>
<td>0.29</td>
<td>0.34</td>
<td>0.16</td>
<td>0.47</td>
<td>0.14</td>
<td>0.14</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td>(-0.16, 0.74)</td>
<td></td>
<td>(-0.29, 0.38)</td>
<td></td>
<td>(-1.26, 0.97)</td>
<td></td>
<td>(-1.42, 2.72)</td>
</tr>
<tr>
<td>Enclosure type</td>
<td><strong>0.45</strong></td>
<td>1.00</td>
<td>0.23</td>
<td>0.24</td>
<td><strong>-0.84</strong></td>
<td><strong>0.53</strong></td>
<td><strong>0.89</strong></td>
</tr>
<tr>
<td></td>
<td>(0.23, 0.67)</td>
<td></td>
<td>(-0.25, 0.14)</td>
<td></td>
<td>(-1.53, -0.15)</td>
<td></td>
<td>(0.60, 1.17)</td>
</tr>
<tr>
<td>Visitor</td>
<td>-0.08</td>
<td>0.55</td>
<td>-0.19</td>
<td>0.93</td>
<td>-0.19</td>
<td>1.00</td>
<td>-0.02</td>
</tr>
<tr>
<td></td>
<td>(-0.16, 0.01)</td>
<td></td>
<td>(-0.28, -0.09)</td>
<td></td>
<td>(-0.25, -0.14)</td>
<td></td>
<td>(-0.18, 0.13)</td>
</tr>
<tr>
<td>Humidity</td>
<td><strong>-0.13</strong></td>
<td>0.69</td>
<td><strong>0.23</strong></td>
<td>0.25</td>
<td><strong>0.43</strong></td>
<td>1.00</td>
<td>-0.19</td>
</tr>
<tr>
<td></td>
<td>(-0.25, -0.003)</td>
<td></td>
<td>(0.06, 0.40)</td>
<td></td>
<td>(0.33, 0.53)</td>
<td></td>
<td>(-0.24, -0.13)</td>
</tr>
</tbody>
</table>

Fixed effects: sex (male = 0; female = 1); Enclosure type (ZN=1; ZM=2; SDA=3; SDB= 4; SDC= 5). Full model: Behavior = glmer (Type of behavior (A-G) ~ (1 | month) + (1 | individual) + sex + enclosure type + humidity + visitor, data = A-G, na.action = na.fail, family = poisson
Figure 2: The relationship between (a) ingestion behavior, (b) investigation behavior, (c) swimming behavior and type of enclosures.

Figure 3: The relationship between (a) ingestion behavior, (b) locomotion behavior, (c) resting behavior, (d) swimming behavior and humidity, %.
IV. DISCUSSIONS

A. Enclosure Condition

We found that Malayan tapirs in artificial fed less often compared to those kept in semi-natural enclosures. Previous study on Malayan tapirs’ feeding behavior in artificial enclosures showed that Malayan tapirs fed comparatively lower than other captive animals such as horse and elephant with evidence of a low defecation frequency, which linked to their low food intake [31]. In addition, all subjects in this study did not feed with the same diet. At artificial enclosure (ZN and ZM), tapirs were fed with Mallothus biaceae and Artocarpus heterophyllus, respectively, and the same plant species were provided every day throughout the study period. In contrast, semi-natural tapirs consumed several types of plants such as Melastoma spp., Artocarpus heterophyllus, Mallothus biaceae and Macaranga spp. Therefore, limited food choice could be another possible reason. In the wild, Malayan tapirs are known to be selective browsers [32] and therefore, in environments with a higher variety of food choices, the anticipatory behavior of animals increased; concomitantly they were also willing to exert more energy and effort to search for food items if diet was varied. However, when variation in their diet was kept low, anticipation was also low, resulting not only in reduced feeding behaviors [33, 34] but potentially also in nutritional stress and behavioral abnormalities [35].

Investigative behaviors were strongly affected by the enclosure conditions. Investigation through sniffing, general alertness or observation of their surroundings either while standing (stationary), or sitting/lying down (resting) were observed to be higher in artificial than in semi-natural environments. These could be explained by the likelihood of tapirs in artificial expose to loud noises from the surrounding area, such as building renovation, traffic and noises from visitors. All other tapirs in SDA, SDB and SDC engaged with investigative behavior only when they were exposed to noise, for example, during the monthly grass cutting activity in their enclosure. Irrespective of enclosure type, we observed that tapirs became more frightened (tensing, alert, flee to hide) by loud noises, which often resulted in trembling. In addition, the low fences in ZM made tapirs more susceptible to bullying by visitors such as poking using sticks and pouring water onto them in order to wake the animal. Consequently, tapirs in ZM were more alert and more vigilant to their surroundings compared to tapirs in ZN and they preferred to spend more time hiding inside the pool as a defensive mechanism. Higher fences and accumulation of stones along the fence at observation areas prevented the tapirs in ZN from resting near the fence, and thus helped them to avoid the disturbance from visitors (Fig. 1a). High exposure to noise and the associated elevated stress levels likely result in potential adverse psychological and physiological effects that may alter their habitat use, courtship and mating behavior [36, 37]. Therefore, appropriate plans for enclosure design and location are crucial for tapir welfare.

Wallows or pools are essential elements during the dry season because access to water is important for tapirs to regulate their body temperature [11]. Typically, air humidity was high (70-75%) in the morning between 0900 to 1000hr both in artificial and in the semi-natural enclosures, and drier (55-69%) from 1100 to 1700hr. Nevertheless, higher frequency of swimming in high humidity (70-
75%) showed that tapirs in artificial enclosures were still suffering from the dryness although the suggested outdoor temperature was not exceeded 35°C (humidity of 50%) [38]. This was also supported with increase in locomotion (moving) behavior looking for shaded area to rest and ingestion (drinking) during lower humidity in both artificial and semi-natural enclosures showing tapirs were seriously affected by the extreme heat. Lack of a pool, water and wallow are the major welfare issues that need immediate action in these ex situ breeding facilities. Further, increasing the amounts of shade and a concurrent decrease to the exposure of light could also help to control temperature [21] and prevent over-heating that would lead to heat stress in tapirs.

B. Visitors

Tapirs in ZM and ZN were negatively affected by the number of visitors: Tapirs showed significantly more locomotion, swimming and investigation when visitor numbers were low and became more passive (resting) during periods of high numbers of visitors. This could be explained by the amount of noise and disturbance caused by large crowds causing tapirs to reduce their activity and to ignore the presence of visitors (personal observation).

V. CONCLUSION

Findings of this study showed that Malayan tapir behaviors were affected significantly by the enclosure conditions (enclosure type and humidity) and number of visitors. Enclosure type caused differences in their feeding behavior and the environment surrounding them had affected their investigative and resting behaviors. As a suggestion a wide variety of plants need to be provided and the leaves should be spread around the enclosure rather than piled in a fixed placed to enhance anticipation in foraging and feeding behavior. This step will help to introduce tapirs to finding their own food. As independent foraging is vital for their survival in the wild, gaining experience in finding their own food is particularly important for tapirs in ex-situ breeding programs to enable them to be released successfully into wild. Moreover, tapir enclosures need to be placed away from exposure to loud noises such as road traffic, and if any renovation takes place in, or in the vicinity of, any tapir enclosure, the animals should be removed temporarily or a sound absorbent barrier should be put in place to reduce the detrimental effects on their welfare due to prolong investigation to the surrounding and lack of resting.

When the air humidity was low, and no swimming pool or water hole was provided within enclosure, tapirs were observed suffered from over-heating, thus engaged in more drinking and moving behavior to find shaded area. When air humidity was high, and despite being within the suggested outdoor temperature of 35°C, tapirs still engaged in swimming behavior. Therefore, further analysis is needed to suggest a suitable outdoor temperature. Furthermore, plenty of shade trees should be planted, and a pool with clean water as well as a mud wallow should always be provided for tapirs to allow them to regulate their body temperature and prevent heat stress.

ACKNOWLEDGEMENTS

We are grateful to the Department of Wildlife and National Parks (PERHILITAN) well as the Zoo Negara and Zoo Melaka for permitting us to study the behavior of their Malayan tapir populations. We thank Dr. Mat Naim Bin Haji Ramli, Dr. Kavita, CEO of Zoo Melaka, the zoo staffs, keepers and veterinarians for their kind support in this study. We also profoundly thankful to the Malaysia Nature Society (MNS) for funding this project under Tapir Project Grant and Mr. Balu Perumal and Mr. Sony for allowing us to borrow their camera traps. During this study, CDB held a Poleberry Foundation Research Fellowship.

ETHICAL APPROVAL

All animal handling procedures were approved by the University of Putra Malaysia ethics committee (Reference: UPM/IACUC/AUP-R033/2016).

REFERENCES


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SUPPORTING INFORMATIONS

Table S1: Models with Delta Akaike’s Information Criterion (ΔAICc) < 7 for ingestion behavior, df = degree of freedom, Δ=delta, ω= weight.

<table>
<thead>
<tr>
<th>Variable</th>
<th>df</th>
<th>Loglike</th>
<th>AICc</th>
<th>Δ</th>
<th>ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure type, Humidity, Visitor</td>
<td>6</td>
<td>-196.54</td>
<td>407.47</td>
<td>0.00</td>
<td>0.23</td>
</tr>
<tr>
<td>Enclosure type, Humidity</td>
<td>5</td>
<td>-197.96</td>
<td>407.59</td>
<td>0.12</td>
<td>0.22</td>
</tr>
<tr>
<td>Enclosure type, Visitor</td>
<td>5</td>
<td>-198.42</td>
<td>408.52</td>
<td>1.94</td>
<td>0.14</td>
</tr>
<tr>
<td>Enclosure type, Sex, Humidity, Visitor</td>
<td>7</td>
<td>-195.76</td>
<td>408.81</td>
<td>1.34</td>
<td>0.12</td>
</tr>
<tr>
<td>Enclosure type, Sex, Humidity, Visitor</td>
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<td>-197.21</td>
<td>408.82</td>
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<td>0.12</td>
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<tr>
<td>Enclosure type</td>
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<td>409.73</td>
<td>2.26</td>
<td>0.07</td>
</tr>
<tr>
<td>Enclosure type, Sex, Visitor</td>
<td>7</td>
<td>-197.81</td>
<td>410.02</td>
<td>2.55</td>
<td>0.06</td>
</tr>
<tr>
<td>Enclosure type, Sex</td>
<td>5</td>
<td>-199.72</td>
<td>411.12</td>
<td>3.64</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Table S2: Models with Delta Akaike’s Information Criterion (ΔAICc) < 7 for locomotion behavior, df = degree of freedom, Δ=delta, ω= weight.

<table>
<thead>
<tr>
<th>Variable</th>
<th>df</th>
<th>Loglike</th>
<th>AICc</th>
<th>Δ</th>
<th>ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humidity, Visitor</td>
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Table S3: Models with Delta Akaike’s Information Criterion (ΔAICc) < 7 for stationary behavior, df = degree of freedom, Δ=delta, ω= weight.

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Table S4: Models with Delta Akaike’s Information Criterion (ΔAICc) < 7 for swimming behavior in captivity, df = degree of freedom, Δ=delta, ω= weight.

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Table S5: Models with Delta Akaike’s Information Criterion (ΔAICc) < 7 for investigation behavior, df = degree of freedom, Δ=delta, ω= weight.

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Table S7: Models with Delta Akaike’s Information Criterion (ΔAICc) < 7 for aggression behavior, df = degree of freedom, Δ=delta, ω= weight.

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growth of Urban Population in Malwa (Punjab)

Kamaljit Kaur

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Abstract: This study deals with the spatial analysis of growth of urban population. Malwa region has been taken as a case study. During 1991-2001, the urban growth has been shown in Malwa region of Punjab. The large number of new towns has emerged in this region during 1991-2001 periods. Urban growth of Malwa region as well as distribution of urban centres is closely related to accessibility and modality factors. The large urban centres are located along major arteries. International border with an unfriendly neighbour hinders urban growth. It indicates that secondary activities have positive correlation with urban growth. More than 90% of urban population of Malwa region lives in large and medium towns of Punjab. More than 50% lives in large towns. Malwa region is agriculturally very prosperous area. So Mandi towns are well distributed throughout the region.

Keywords: Growth, Urban, Population, Development.

I. INTRODUCTION

The distribution of urban population and its growth reflect the economic structure of population as well as economic growth of the region. The urban centers have different socio economic value systems, degree of socio-economic awakening than the rural areas. Although Urbanisation is an inescapable process and is related to the economic growth of the region but regional imbalances in urbanization creates problems for Planners so urban growth need to be channelized in planned manner and desired direction. So the study of growth and distribution of urban population is necessary. There is no universally accepted definition of an urban area. Each country decides its own criteria for treating a place as rural or urban on the basis of the characteristics of that area. As per Indian census definition, the urban places are: (a) All places with a municipality corporation or cantonment or notified town area. (b) All other places which satisfy the following criteria. (i) Minimum population 5000. (i) At least 75 percent of the male working population engaged in non agriculture activities. (iii) A density of population of at least 400 persons/sq. km. The study deals with the spatial analysis of growth of urban population in Malwa region during 1991-2001, the study of urban population growth is the most sensitive index of dynamism of the region. The spatial pattern of urban population growth is an index of prosperity and economic development of an area. Urban growth has close correlation with growth of secondary sector and tertiary sector. Recently, Malwa region has experienced rapid urbanization and spatial pattern of this urbanization is important aspect of study. Spatial variations of tackled at an early stage help to solve various regional problems of development. Spatial variations of not tackled at proper time may result in urban distortions at regional level, local level as well as trans local level. The main objective of the present study are (a) To study the spatial pattern of urbanization in Malwa region. (b) To evaluate the factors responsible for spatial variation in urbanization and urban growth. (c) To suggest measures for balanced urban growth in the Malwa region.

II. THE STUDY AREA

Malwa is situated between river Satluj in the north and Ghaggar in the south. Shiwalik hills in the east and Pakistan to its west. Doaba and Majha lies on its north. Himachal Pradesh and harayana border on the east, south east and south. In the south west Rajasthan touches Malwa region. Malwa extends from 29° 30’ to 31° 9’ N latitude and from 73° 55’ to 76° 35’ E longitude. In 2001 out of 17 districts of Punjab, Malwa alone has districts namely Roopnagar, Ludhiana, Patiala, Fategharh sahib, Sangrur, Bathinda, Mansa, Moga, Faridkot, Muktsar and Firozpur. Now Mohali has been carved out a new district of Punjab thus Malwa region has 12 districts. The international boundary is in the west of Malwa region which effect the urban population. We find less urban towns in west.
III. METHODOLOGY

In order to understand the spatial pattern of urban population growth in Malwa region. The town is the unit of study. The census data of 1991 and 2001 has been used for this study. The size of urban population have been shown by proportional circles. Proportional circles have been drawn to show size of urban centres. Six town classes have been grouped in two three categories i.e. large, medium, and small towns. Proportional circles are given different colors in order to differentiate the towns with low medium and high growth rate. Choropleth method is used to show district wise population growth. Bar Diagram are drawn to show the percentage of urban population and number of towns in different size classes of towns.

IV. DISTRIBUTION OF URBAN CENTERS

In 2001 urban population in Malwa region was 4952363 where as Punjab’s total population was 8245566. Malwa’s urban population was 60.1% of Punjab’s total population. In general the western districts of Malwa rank lower in urban population as compared to eastern districts. The reason is the late adoption of new technology in agriculture pursuits. The agriculture remained backward due to semi arid climatic conditions. Sandy soils along with scarcity of rainfall had adverse effect on agriculture. So marker towns developed later than the other parts of the region. More distance from Chandigarh and distance from the G.T road have also hindered the development of industry in this part.

Out of 157 towns of Punjab 91 are in Malwa region alone. The towns are well distributed in the region because of absence of any significant physical hindrance. Moreover Malwa region of Punjab is significant in agriculture so market towns are well distributed throughout the region. The adverse climate presence of sand dunes and economic backwardness of western part may have hindered emergence of large urban centers in this part in the past. The distribution of towns has close association with the road and rail linkages in the region. Most of the medium and large urban centers are situated on major arteries i.e national highways and railway lines. Main arteries along which significant number of urban centers are developed G.T road, Chandigarh-Abobar highway, Abhar-Ferozpur road, Sangur-Ludhiana road. Only metropolis of the region is located along G.T road and Delhi-Amritsar railway line. Accessibility and nodality are major factors in distribution of urban centers in this region. The capital of Punjab i.e. Chandigarh is another factors which seem to have affected distribution of urban centres. Some towns are found in close proximity to Chandigarh like Roopnagar, Kurali, Kharar, Mohali, Zirkpur and Derabassi.
To conclude towns are well distributed in Malwa region. But accessibility of roads and railways have played a major role in concentration of towns. The location of Chandigarh in the east of region also bearing upon the distribution of urban population.

**Growth of urban center**

Malwa from 1991 to 2001 increased by 1316926 this change called absolute growth. The number of towns in Malwa region has increased 71 in 1991 to 2001. This increase signifies diversification in economy of the region. In 1991 the large towns (more than 1 lakh population) were only 5 but in 2001, there have increased to 8. It shows that large sized towns are growing at a rapid pace. The large sized towns share in region’s urban population was 52.61% in 1991 which increased to 53.65% in 2001. It shows that there is high concentration of urban population at few places. The size classes of towns have been given below: Growth of urban centers depends upon a number of physical, economic and administrative factors. Nodality plays a very significant role in growth of urban centers. The growth of industries in any urban center boosts the growth of that town. Growth of urban centers can also create distortion in urban development of any area. So pattern of growth of urban centers in the whole region should be channelized at required level distortion in growth of urban centers can give rise to primacy. The total urban population of Malwa in 1991 was 3635437 and it becomes 4952363 in 2001. So the population of
Fig. 3: Percentage of urban Population

The number of medium sized towns (20000 to 99999persons) has increased from 33 in 1991 to 37 in 2001. There accommodated 38.37% urban population of the region in 1991 and 36.84% in 2001. It shows that about 90% of Malwa urban population is living in large and medium sized towns. The small towns (less than 20000 persons) accommodated only 10% of urban population of Malwa as per1991 and 2001 census. The number of small towns in 1991 was 33 which increased to 47 in 2001. The increase in number of small towns in 2001 indicates rapid change in economy of the region. During 1991-2001, 21 towns have been added in this category. This shows a rapid trend towards urbanization in near future.

As the present study us concerned with the urban growth of Malwa we have studied the factors which are responsible for positive growth and negative growth. Accordingly all the urban centers of population divided into 3 categories.

1. Growth of urban centers having population more than 100,000

According to 2001 census there were eight urban centres in this category i.e. Ludhiana, Patiala, Bathinda, Moga, Abohar, Mohali, Maler Kotla and Khanna as shown below:
On the basis of percentage growth has been divided into three categories.

(i) Urban centres having high growth (above 30%)

Mohali and Khanna experienced very fast growth during 1991-2001 periods. Mohali is exceptionally fast growth is due to its location near Chandigarh. The various new industries, business activities etc. have got established in Mohali which has attracted immigrants in this city.

Khanna is located along G.T road and Delhi-Amritsar railway line. It is also the largest grain market of India. Accessibility is the main reason for fast growth of this city.

(ii) Urban centres having medium growth (20-30%)

During 1991-2001, Ludhiana, Patiala, Bathinda, Malerkotla and Moga experienced medium growth. Ludhiana enjoys central location and is the only metropolis of this region. Bathinda is largest urban centre in south western part of Punjab and is upcoming industrial centre.

(iii) Urban centres having slow growth (below 20%)

Abohar has experienced slow growth rate during 1991-2001. The reason can be its location near international border or location in one corner of the region.

Ludhiana, Patiala, Bathinda, Malerkotla and Moga experienced moderate growth (20-30%) during 1991-2001. Ludhiana enjoys central location and is the only metropolis of this region. Bathinda is the largest urban centre in south western part of Punjab and upcoming industrial centre. Abohar has experienced slow growth rate during 1991-2001. The reason can be its location near international border or location in one corner of the region.

2. Growth of medium urban centers

Accordingly 2001 census there were 37 urban centres lies in this category. On the basis of percentage growth has been divided into three categories.

(i) Urban centres having high growth (above 30%)

The high growth of urban centers have very specific spatial pattern. Towns in close proximity of Chandigarh like Kharar, Kurali have experienced high growth rate. Other towns with high growth rate are Nangal township Jalalabad, Patran, Gobindgarh, Sangrur, Dhuri and Zira. Development of industries seems to be the main reason of their fast growth.

(ii) Urban centres having medium growth (20-30%)
Medium growth was recorded by 16 towns namely Longowal, Firozpur, Barnala, Muktsar, Malout, Jagraon, Sunam, Roopnagar, Samana, Rampuraphul, Giddarbaha, Budhlada, Morinda, Bagha purana. Kotakpura, Roopnagar. The Kotakpura, Roopnagar, Morinda have highest growth rate in this category. Roopnagar ranks 5th urban population and Morinda is also town of Roopnagar district. Bagha Purana, Malout, Giddarbaha are located in western part of Malwa. International border hinders the urban growth. Longowal, Sunam, Rampuraphul are towns of Sangrur district. Moderate development of industries and agricultural prosperity are main causes of their moderate growth.

(iii) Urban centres having low growth (less than 20%)

Low growth has been recorded by 8 town namely Rajpura, Fazilka, Nabha, Firozpur cantt. Jaito, Maur, Ahmedgarh and Raikot. These urban centers are mostly located in western part of Malwa region. The lack of diversification and proximity to international border are responsible for their slow growth.

3. Growth of urban centers having population less than 20,000

According to 2001 census there were 46 urban centers in this category. The urban centers which have less than 20000 population are Raman, Lehragaga, Doraha, Bhawani, Tapa, Bassi Pathana, Dhanaula, Machiwar, Sanaur, Bhadur, Sardulgarh, Dera Bassi, Dharmkot, Bhikhi, Banur, Moonak, Bareta, Mulanpur Dakha, Talwandi bhai, Guru har sahai, Anadpur sahib, Bhucho mandi, Dirba, Gonyana, Amlo, Makhu, Khanouri, Nahn, Handaya, Cheema, Bhankpur, Khamano, Ghugga, Rurki kasba, Bariwala, Payal, Maloud, Akalgarh, Badni kalan, Mulapur, Garib das, Bhabat, Ghanour, Sangat, Bhisiana, Sekhpura. On the basis of percentage growth has been divided into three categories.

![Fig.6: Growth of urban centres](image)

(i) Urban centres having growth (above 30%)

Doraha, Tapa, Machiwar, Dera bassi, Moonak, Mulanpur, Rakhra, Talwandi bhai, Guruhar sahai, Anadpur sahib, Bhucho Mandi, Khamano urban centres are included in this category. There are some new towns. Doraha, Machiwar, Mulanpur Dakha lies in Ludhiana district. The agriculture prosperity and industry development has boosted the urban growth of the towns.

(ii) Urban centers having medium growth(20-30%)

In this category Lehragaga, Bhawani, Dharamkot, Bareta, Gonyana, Amlo, Payal are included. Lehragaga and bhawani lies in Sangrur district which is industrial developed. Urban growth has positive correlation with network transportation.

(iii) Urban centres having low growth (less than 20%)

Raman, Bassi Pathana, Dhanula, Sanaur, Samrala, Bhadur, Akalgarh are included in this category. Bassi Pathana and Sanaur has recorded minimum growth rate. Sahnewal, Sardulgarh, bhikhi, Dirba, Makhu, Khanori, Nahon. Handya, Cheema, Bhankpur,
Khamano, Ghugga, Rutki Kasba, Bariwala, Maloud, Mulapur Garid das, Bhabat, Ghanour, Bhisiana, Sekhpura are new towns. New towns are absent near border which signifies lack of development activities in this part of region.

V. CONCLUSION

The present study which is based on the secondary data has brought following facts. The results are mainly derives from pattern emerging on the maps. The Malwa region has shown a rapid urban growth during 1991-2001. A large number of new towns have emerged in this region during 1991-2001 periods. It also indicates diversification in economy of the region. Urban growth of Malwa region as well as distribution of urban centers is closely related to the accessibility and modality factors. In general large urban centres are along major arteries. The urban centers located along major arteries are growing at a high growth rate. The industrial centers are growing at a rapid pace. It indicates that secondary activities have positive correlation with urban growth. International border with an unfriendly neighbor hinders urban growth in western Malwa region. No new town has developed near border during 1991-2001. Even growth rate of urban centers is slow in this part of the region. Malwa region is agriculturally very prosperous area. So Mandi towns are well distributed throughout the region. More than 90% of urban population of Malwa region lives in large and medium towns of Punjab. More than 50% of urban population lives in large towns.

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Strong Motion Simulation for Kathmandu by Stochastic Method

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Abstract - The strong ground motion simulation of Kathmandu done through stochastic method. Time History of Gorkha Earthquake 2015 was generated using time domain simulation and compared with recorded time history of Kantipath seismological station. The simulation work stopped once the target and generated spectra matched. The ground motion calculated with consideration of source, site, and path with amplification effect of soil. Then after time domain simulation carried out. The simulation work started from noise generation work with windowing, Fast Fourier Transform (FFT) and Spectra matching (Target and Generated) to obtain Simulated Time History. The simulation work carried out using MATLAB programming language. The Simulated and Measured Time History changed in form of response spectra in the program to compare the result. The parameter of stochastic method for Kathmandu defined after the comparison of simulated time history to the Kantipath station of Kathmandu.

Index Terms- Gorkha Earthquake, Kathmandu Ground Motion, Nepal Earthquake, Stochastic Method, Time domain Simulation

I. INTRODUCTION

Nepal lies in the earthquake prone region due to two tectonic plates i.e. Indian and Eurasian plate. The Himalayan Mountain range formed by the collision of the Indian and Eurasian plates considered as earthquake prone zone. The Indian Plate under thrusts the Eurasian Plate occurs a number of earthquakes in near zone of India, Nepal, China and other south Asian countries. On 25 April 2015 at 11:56 Nepal Standard time, a massive 7.6 magnitude earthquake occur in Nepal with the epicenter in Gorkha District (north-west) of Kathmandu (Capital city). Hundreds of aftershocks (498 no of aftershocks of size more than 4 magnitude until 1 June 2018). It was the most powerful disaster to strike Nepal since 1934 Nepal-Bihar earthquake.

A simple and powerful method for simulating ground motions based on the assumption that the amplitude of ground motion at a site can specified in a deterministic way with a random phase spectrum modified such that the motion distributed over a duration related to the earthquake magnitude and to distance from the source (Boore, Simulation of Ground Motion Using the Stochastic Method, 2003). This method of simulating ground motions often goes by the name “the stochastic method.” (McGuire, 2004). It is particularly useful for simulating the higher-frequency ground motions of most interest to engineers. It is widely used to predict ground motions for regions in the world in which recordings of motion from damaging earthquakes are not available (McGuire, 2004). This simple method has been successful in matching a variety of ground-motion measures for earthquakes with seismic moments spanning more than 12 orders of magnitude. One of the essential characteristics of the method is it distills what is known about the various factors affecting ground motions (source, path, and site) into simple functional forms that can be used to predict ground motions. Stochastic methods (Boore, Simulation of Ground Motion Using the Stochastic Method, 2003) estimate ground motions during an earthquake based on physical properties of the energy release and the travel path of seismic waves. From the characteristics of the process in a time, an estimate can be made of spectral response, peak motion parameters, or any other desired measure (including nonlinear response).

Figure 1 Measured Time History of Gorkha Earthquake at Kantipath Station (Data source USGS)
II. METHODOLOGY

Stochastic Method prescribed by David M Boore (Boore, Simulation of Ground Motion Using the Stochastic Method, 2003) and McGuire (McGuire, 2004) are the key documents for this research works. MATLAB programing language used to find the result of this research work.

Figure 2 Flow Chart of Methodology Used in this Research

A. GENERATION OF TARGET SPECTRA

Equation used in this simulation is defined by the David M.Boore (Boore, Simulation of Ground Motion Using the Stochastic Method, 2003).

According to Boore, the Spectrum of ground Motion

\[ Y(Mo, f, R) = E(Mo, f)P(R, f)G(f)I(f) \]

Where, \( f \) is frequency, \( E(Mo, f) \) is Source Effect, \( P(R, f) \) is the Path Effect, \( G(f) \) is the site effect and \( I(f) \) is Filter control.

a) Source Effect \( E(Mo, f) \)

Different source model described by Boore in his paper.

The model used in the research is \( w \) square model.

\[ E(Mo, f) = CMoS(Mo) \]

Where \( C \) is constant and value depend on different parameter, \( S(Mo) \) is the displacement source spectrum and for \( w \) square model

\[ S(Mo) = \frac{1}{1 + \left( \frac{f}{f_c} \right)^2} \]

\[ C = \frac{R_{\theta \phi} FV}{4\pi \rho Ro(v_s)^3} \]

\( R \) = Distance from rupture point

\( R_{\theta \phi} \) = Effect of radiation pattern (0.55)

\( \rho \) = Density of the earth crust

\( v_s \) = Shear wave velocity

\( Ro = distance \ in \ Km \ generally \ taken \ as \ 1 \)

\( Mo = Seismic \ moment \)

\[ M = \frac{2}{3(logMo) - 10.7} \]

b) Path effect \( P(R, f) \)

The path effect is depend on geometrical spreading and \( q(f) \) function.

\[ P(R, f) = Z(R)\exp\left(-\frac{\pi f R}{q(f)c_q}\right) \]

Where,

\[ Z(R) = \frac{R_o}{R} \ for \ R<100 \ Km \]

\[ q(f) = 180f^{0.45} \ is \ quality \ factor \]

\[ C_q \ is \ velocity \ of \ soil \ layer \ 30m \ below \]

\( f \) is frequency of wave

c) Site Effect \( G(f) \)

The site effect is mainly dependent on frequency of the wave. It also represent the amplification and di-amplification of the soil (McGuire, 2004)

\[ G(f) = (2.024 + 0.65 \ln(f) + 0.263(\ln(f))^2) \]

\( f for \ 0.5 <= f < 5Hz \)

\[ G(f) = 3.75 \ for \ 5Hz \leq f \]

d) Filter control \( I(f) \)

\( I(f) \) is the diminution factor or filter for ground motion? Generally there are two types of filter are in used and Boore combine both the filter in his research (Boore, Simulation of Ground Motion Using the Stochastic Method, 2003)

\[ I(f) = I_1(f) \times I_2(f) \]

Where \( I_1(f) \) is the Butterworth Filter and \( I_2(f) \) is kappa filter
\[ I_1(f) = \left(1 + \left(\frac{f}{f_{\text{max}}}\right)^8\right)^{-0.5} \]

\[ I_2(f) = \exp(-\pi k f) \]

Where, \( f_{\text{max}} \) is the cut off frequency

\[ k = 0.01 \text{ to } 0.066 \text{ for different soil conditions} \]

After applying all parameter correctly the target spectra \( Y(M_0, f, R) \) is generated and that should be changed to time history by time domain simulation.

**B. TIME DOMAIN SIMULATION**

The cos function \( A \cdot \cos(wt + 2\pi \theta) \) is used for generation of Time History.

Where, \( \theta \) is random number between (-\( \pi \) to 2\( \pi \))

\( w = \)circular frequency

\( t = \)time in sec

\( A = \)constant value for random amplitude spectrum

This will generate the random time history and shaping of the time history is done by the envelop function.

i) Envelop Function

There are difference envelop function and the envelop Function used by Kanai Tajmi is used for simulation work in this research. The Envelop Function is calculated by equation

\[ E_t = a \left(\frac{t}{t_n}\right)^b \exp\left(-c \frac{t}{t_n}\right) \]

Where,

\[ b = -\epsilon \frac{\log(T_{90})}{1 + \epsilon \log(T_{90}) - 1} \]

\[ c = \frac{b}{\epsilon} \]

\[ a = \left(\frac{\exp(1)}{\epsilon}\right)^b \]

\( \epsilon = 0.4 \) called as normalized duration time when ground motion achieves peak

\[ T_{90} = \) value of the envelop function at 90 percent of the duration

\[ t_n = \) Time period of the envelop

![Figure 3 Shape of Envelop Function used in research, plotted through MATLAB](image)

ii) Fast Fourier Transfer

The simulated time history then changed to frequency domain by use of Fast Fourier Transform. Thus, the spectrum is named as matching spectra. The time history generation and spectrums matching works was done for different value of ground motion parameters until the two spectra and maximum value of time history do not match with target spectra and time history of Kanhipath station.

iii) Response Spectra

After the completion of simulation of Time History completed the response spectrum of the simulated and Kanhipath station Time History response spectra was calculated for the comparison of the two time histories.

**C. MATLAB**

The programing language called MATLAB was used to carry out the simulation, calculation, Figures generation, target and matching spectra generation work.
III. RESULTS

A. SPECTRA MATCHING

In the Figure, 4 generated spectra matched with target spectra. Figure 5 shows the portion of spectra matching work in zoomed form. The maximum value of Time History occur in the time range of 10-15 sec as shown in Figure 3. Since two spectra matched, the result of time history simulation is completed.

B. SIMULATED Time History

The simulated Time History of Gorkha Earthquake matches with measured Kantipath stations Time History (see Acceleration vs Time in Figure 7, a and c). The parameters used for this simulation are fixed for Kathmandu.
C. RESPONSE SPECTRA COMPARISON

The response spectrum describes the maximum response of SDOF system to a particular input motion. Here the simulated time history is the input motion. In addition, 5% damping was used to generate Response Spectra of SDOF and the shape of the response spectra was compared with the generated Gorkha earthquake response spectrum as shown in figure 7.

D. PARAMETERS VALUES USED IN THE TIME HISTORY SIMULATION

The ground motion parameters used in the simulations are as follows:

- Magnitude of Earthquake (Mw) = 7.8
- Closest Distance Between source to site (R) = 82 Km
- Stress drop (Δσ) = 80 Bars
- Diminution parameter (Kappa) = 0.05
- Radiation pattern = 0.55
- Maximum frequency = 30 Hz
- Density of Earthquake crust = 2800 Kg/m³
- Shear wave Velocity of rock (v_s) = 3.5 Km/sec
- Shear wave velocity C_q = 0.525 Km/sec
- Velocity adopted for path effect, which shows that the soil type of the area is Very Dense Soil
- Value of quality factor q(f) = 80 * f^0.45

IV. CONCLUSIONS

The research aimed to simulate the Gorkha earthquake Time History through stochastic method. Simulated Time History was compared with the Kantipath station measured Time History of Gorkha earthquake. The comparison showed similarity nature of these two Time Histories, which helped to fix the strong ground motion parameters for Kathmandu. The entire research done using MATLAB programing language to compare, calculate and generation of Figure presented in this research. The different ground motion parameters were used in trial basis to match the generated Fourier amplitude spectra to the target spectra. The time history whose Fourier spectra matched with target spectra is taken as simulated Time History and values used for generation of that time history is the strong motion parameters values for Kathmandu.

V. LIMITATION

Some limitations have been identified during the research work, which are listed below.

1. The matching of spectra and other iteration calculations are based on the judgement rather than is fixed by the program.
2. The Fourier Spectrum and each Time Series realization may diverge from the “target” Fourier spectrum Y(Mo, R, f).
3. In stochastic method, various components of motions and different wave types were ignored.
4. The stochastic method is empirical method, which adopts many assumptions.

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REFERENCES


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Management of Late Blight of Potato by Non-Chemical Methods at Gokuleshwar, Baitadi

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Abstract- A field experiment for the management of late blight of potato by non-chemical method was conducted at Horticulture plot of Gokuleshwar Agriculture and Animal Science College (GAASC) located in western hills of Baitadi district of Nepal during winter season of 2017. Field experiment was layed out in one factor RCBD which was replicated three times. Efficacy of 7 non chemical treatments was tested in Potato variety Desiree. The soil of experimental site was sandy loam with pH 5.93. The soil was medium in organic matter content and total nitrogen, high in available phosphorus and medium in available potassium. The disease severity was maximum in Panchagavya (36.00), while disease severity (22.67) was found less in timur applied plot (Xanthoxylum aromatum) during first data recording. But in second data recording was maximum disease severity (30.67) was recorded in no treatment applied plot, and minimum disease severity (22.66) was recorded in copper colloid applied plot. Similar result was also recorded in third. disease severity i.e maximum value (44.00) in treatment applied plot and minimum value (6.66) in panchagavya applied plot. Mean AUDPC value was maximum in no treatment applied plot (175.00) while minimum value (102.67) was recorded in copper colloid applied. 25 ppm a concentration of copper colloid gave best result against late blight and 1:5 (one part Panchagavya and 5 part Water) ratio gave higher economic yield as well as test weight Thus the optimum dose of copper colloid and panchagavya results low disease severity and higher yield in potato under hilly region of Baitadi district.

Index Terms- AGDP,ANOVA,AUDPC,CV

I. INTRODUCTION

Potato (Solanum tuberosum L.) has been regarded as one of the most important staple food and a major vegetable crops contribute to the total world food crop basket that feed more than 1 billion of the world population, with Asia and Europe as largest consumption region (FAO 2016) . About 50% of the potato grown in the world is produce and consumed in Asian region (FAOSTATA, 2016). It is the fourth leading crop of Nepal contributing nearly 5% of agriculture GDP (MoAD, 2014). Potato is grown in about 6.37% (193037 ha) of total cultivated area contributing nearly 5% of agriculture GDP (MoAD, 2014). It is the fourth leading crop of Nepal, with total production of 4500 mt and yield of 1000kg/ha (MoAD, 2015). There is a continue increasing global demand of potato which is expected to reach 341 million tons and in order to produce 80 million tons of more potato to fill this deficit, there is a need to enhance the productivity of potato from 7.62 to 17.8 tons/ha. Potato is the third most human- consumed crop (after rice and wheat). The main diseases that impaired production are Late blight, Bacterial wilt, Brown spot , Early blight, Wart etc. However, in hilly region of Nepal despite of difficult topographical features, late blight is major problem faced by Nepalese hilly farmers.

Late blight caused by Phytophthora infestans is an oomycete that cause the serious potato disease known as Late blight or potato blight. It is a major fungal diseases of potato, because of its wide distribution and destructiveness under favourable condition (Shrestha and Kharel, 1996). Depending on the cultivar susceptibility, environmental condition and management system, it causes yield loss upto more than 755 at high hills (Shrestha and Kharel 1996) and in terai losses have been recorded 50 to90 % in same year. This diseases has caused significant yield losses in different potato growing countries, eg. 38 to 65% in India (Rao and Veeresh, 1989) (Bisht et al., 1997), 22.8% losses in Poland (Pietkiewicz, 1991), 6 to 40% losses in Romania (Cupsa et al., 1983), 25 to 75% losses in Cameroon (Fontem and Aighewi, 1993). The disease first recorded in Nepal was between 1983 and 1987 (Shrestha , 1998) and has been appearing in epidemic proportions since mid 1990s. In the mid hill valley like Kathmandu and Pahchhkal where potato are grown twice a year autumn ans spring season, late blight become severe. It is prevalent throughout the potato growing area in the country. In Nepal, the disease causes the 15 to 20% yield reduction in susceptible varieties, but in the severe case, it goes up to 90% (Shrestha, 2000).

The disease can managed by planting resistant cultivars, application of fungicides, and manipulation of planting time, organic fertilizers, Farmer field school and irrigations (Sharma and Dhital, 2007). Late blight is a very difficult diseases to manage organically . Non-chemical diseases management is one of the most important practices for high production system in long run, but non-chemical diseases management may show slow response to potato pathogen, pest, as well as development pattern of pathogen population due to change of environment. Non-chemical diseases management is an essential component of organic farming and IPM, which includes management of...
diseases without the use of pesticides and other artificial chemicals and with use of relating to or derived from living matter. Panchagavya, an organic product has the potential to play the role of promoting growth and providing immunity in plant system. Panchagavya consists of nine products viz, cow dung, cow urine, milk, curd, jaggery, ghee, banana, tender coconut and water, when suitably mixed and use these have miraculous effects. Neem (Azadirachta indica) leaf extract accts as a potential source for the management of severe diseases in addition to its positive effect on growth parameter (Chaturbedi et al., 2003). Asuro (Adhatoda vasica) leaf extract containing vascine acetate and other chemical showed moderate anti pathogenic activity(R.Wise, 2008). Timur (Zanthoxylum alatum) fresh leaf containing essential oil and linalool, 2-decanone, sabinene exhibited potent antifungal activity (J.K and Hollomon, 1998). Sisnu (Urtica dioica) leaf extract containing several chemicals viz, acetylcholine, histamine, moroidin, formic acid etc shows anti pathogenic activity(Micheal.I and Greenberg, 2003). Copper colloid which is toxic to fungi and bacteria because of their ability to destroy protein in plant tissue (NASA). Bakino ( Melia azedarch) leaf extract containing tetratriterpenoids constitute an important toxic principle to pathogen(Baza Mendonca and dos Anjos, 2005). These seven product are essential to increase yield and management of late blight of potato, but severity of late blight increasing with low and excess use of this product. Among several factors of management of late blight these seven non-chemical product plays a key role. So, optimum use of these non-chemical product should be applied in appropriate time with good agriculture practices.

Hilly region of Baitadi district is quite backward in use of new technology. Many people use traditional methods in agriculture. A major fungal diseases late blight of potato emerge due to many reasons such as susceptible varieties, faulty agricultural practices and biotechnological methods and lack of use of fungicides. Mostly problem exist in these area is due to lack of fungicides, resistant varieties and occurrence of drought condition. People here are unknown about the proper information about new advanced technology, many are unknown about importance and use of non- chemical methods to control late blight of potato. People still give emphasis on local varieties which are susceptible to late blight.

Use of resistant varieties, organic fungicides and improved agricultural practices and biotechnological methods can reduce the effect of late blight which lead to more productivity. However, the use of resistant varieties and organic fungicides is most economical and environmental friendly method for the management of late blight but the resistance and organic fungicide is subject to breakdown due to appearance of new/more virulent race of the pathogen.

The productivity of potato in Baitadi district is 10000 kg/ha which is low as compared to national productivity 13125kg/ha (MoAD, 2016). Since food security and health is an important role of agricultural research in Gokuleshwar at present. People with large area also have to starve from potato, they have to depend on other cereal and vegetable such as rice, wheat, cabbage and leafy vegetables for sustenance, while people of poor economic background have to completely dependent on import market. Many people left to plant potato due to lack of planting materials, other inputs and low productivity. Late blight is major problem roaming in Baitadi district for low production. So, through this research, how non-chemical method can be capable to reduce late blight and at what proportion can imparted resistance and increases the size and weight of the tuber. While it also renders resistance to late blight of potato also. So people can understand the importance of non-chemical products and its impact on low and high proportions. By optimum use of non-chemical products in required time people can enhance the productivity of potato.

II. MATERIALS AND METHODS

It covers the description about the site, layout and design of the experiment along with the description of the test crop, land preparation, sowing, cultural practices, preparation of non-chemical pesticides, application, sampling, data recording, harvesting and methods of statistical analysis. The experiment was conducted at the pathology farm of Gokuleshwar Agriculture and Animal Science College (GAASC), Baitadi to study the management of late blight of potato by non-chemical methods in Desiree

3.1 Description of the field experiments

3.1.1 Experimental site

The experiment was carried out at the Gokuleshwar Agriculture and Animal Science college (GAASC), College field, Gokuleshwar, Baitadi. The elevation of the site i.e Gokuleshwar is at 700 masl with 24°75’N Latitude and 90°50’E longitude.
Table 1. Physiochemical properties of the soil of the experimental site of GAASC, Baitadi.

<table>
<thead>
<tr>
<th>Properties</th>
<th>Average content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical properties</td>
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</tr>
<tr>
<td>Sand(%)</td>
<td>30</td>
</tr>
<tr>
<td>Slit(%)</td>
<td>40</td>
</tr>
<tr>
<td>Clay (%)</td>
<td>20</td>
</tr>
<tr>
<td>Chemical properties</td>
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<tr>
<td>Soil pH</td>
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</tr>
<tr>
<td>Slightly acidic</td>
<td></td>
</tr>
<tr>
<td>Soil organic matters (%)</td>
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<td>Medium</td>
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<tr>
<td>Total nitrogen(%)</td>
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<tr>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Available phosphorus (Kg/ha)</td>
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<tr>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>Available potassium (Kg/ha)</td>
<td>79.2</td>
</tr>
<tr>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Texture /Rating</td>
<td>Slit loam</td>
</tr>
</tbody>
</table>

3.1.2 Climatic condition during experimentation

The experimental site lies in the subtropical humid climate belt of Nepal. The area has sub-humid types of weather condition with cool winter, hot summer and distinct rainy season with annual rainfall of about 1919.5mm. It is characterized by three distinct seasons: rainy season (June to October), cool winter (November to February) and hot spring (March to May). The meteorological data from cropping season was recorded from Mukteshwar Kumaon weather station and presented Figure 3.

The total rainfall of 170mm was received during the entire period of experimentation. The highest rainfall was recorded during Falgun (50 mm) and lowest during Poush (20 mm).

The minimum temperature during the experimental period ranged from 1.1˚c to 16.66˚c with average of 8.4˚c. The maximum temperature during the experimental period ranged from 11.6˚c to 21.5˚c.

3.1.3 Experimental details

3.1.3.1 Field layout

The experiment was laid out in single factor randomized complete block design with 3 replications having 8 treatments. The variety Desiree medium duration (80-90 days), generally late blight susceptible, drought resistance and high yielding was selected. The size of individual plot was 4.8m*4m (19.2 sq.m). There was a bund of 0.5m between two experimental plot. The crop geometry of potato was maintained at 60*40cm (Row-Row and Plant-Plant spacing) with one-two potato tuber per hill with 8 rows and 10 plants per row. The all row are treated as net plot rows for harvesting and diseases scoring observations.
3.1.3.2 Treatment details
The details of the treatments are given as follows:

<table>
<thead>
<tr>
<th>S.N</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Panchagavya</td>
</tr>
<tr>
<td>T2</td>
<td>Sisnu</td>
</tr>
<tr>
<td>T3</td>
<td>Neem</td>
</tr>
<tr>
<td>T4</td>
<td>Timore</td>
</tr>
<tr>
<td>T5</td>
<td>Bakino</td>
</tr>
<tr>
<td>T6</td>
<td>Copper colloid</td>
</tr>
<tr>
<td>T7</td>
<td>Asuro</td>
</tr>
<tr>
<td>T8</td>
<td>Control</td>
</tr>
</tbody>
</table>

3.1.3.3 Design of the experiment
The layout of the research plot was as follows:
- Each plot = 19.2 sq.m
- Distance between each plot = 0.5 m
- Net plot area = 19.2 * 3 = 57.6 sq.m

3.1.4 Cultivation practices
Date wise detail of various cultural practices recorded for potato tuber sowing to the harvesting is presented here under.

3.1.4.1 Land preparation
The experimental plots were prepared after manual digging 2-3 times and weeds were removed. Ridge and furrow were constructed.

3.1.4.2 Selection of tuber
Tuber of Desiree variety of potato were selected which were medium in shape, diseases free, well budded, and injury free.

3.1.4.3 Sowing of tuber
Three plot of 4m*4.8m were prepared for raising of potato plant. Potato tuber were sown on 4th puosh, 2073 with the seed rate of 90 kg/ha by ridge and furrow method. Sprouted tuber of approximately similar physiological were planted at 5-6 cm depth in ridge and furrow.

3.1.4.4 Preparation of non-chemical pesticides
We prepared 7 types of non-chemical pesticides which includes; Panchagavya, sisnu, bakino, neem, asuro, copper colloid, timore. Procedure for preparation of these non-chemical pesticide were as follows-

3.1.4.4.1 Panchagavya preparation and application
It uses only organic product and can be made at home. In cities through, the ingredients may prove a little difficult to find. The five or Pancha ingredients of Panchagavya are cow urine, fresh cow dung, cow milk, cow curd and cow ghee. To eliminate foul order and improve upon the initial five ingredients, others products were added. The product with their quantities and substitutes were-
- Cow milk-2 liters
- Cow curd-2 liters
- Cow urine-3 liters
- Cow ghee-0.5 kg
- Fresh cow dung-5 kg
- Sugarcane juice-3 kg (Substitute 500 gm of jaggery in 3 liters of water)
- Tender coconut water-3 liters
- Banana ripe-12 numbers
- Toddy or grape juice 2 liters (Substitute 100 gm of yeast powder).

Method of preparation
Panchagavya was prepared in a wide mouth container made of mud, concrete or plastic. The first step was to mix fresh cow dung and ghee in the container. We mixed it twice a day for three days. On the fourth day, we added the remaining ingredients to the container. We Starred the mixture twice a day for the next fifteen days. On the 19th day, the Panchagavya mixture was ready for use.
Doses of Panchagavya

For spraying; 16.6% of solution in water i.e 1 litre of Panchagavya was mixed to every 5 litre of water for one application.

3.1.4.4.2 Bakino (*Melia azedarach*)

Diseases free, tender, green leaf were collected.3 kg laef were kept in the plastic bucket for fermentation along with 100 gm yeast powder, 1.5 litres coconut water, 12 number banana and 1 kg jiggery. Fermented leaf extract containing tetranortriterpenoids constitute an important toxic principle to pathogen. We Staired the mixture twice a day for the next 20 days. On the 20th day, the bakino mixture was ready for use.

Doses of bakino

For spraying; 16.6% of solution in water i.e 1 litre of bakino was mixed to every 6 litre of water for one application.

3.1.4.4.3 Sisnu (*Urtica dioica*)

Diseases free, tender, green leaf were collected.3 kg laef were kept in the plastic bucket for fermentation along with 100 gm yeast powder, 1.5 litres coconut water, 12 number banana and 1 kg jiggery. Fermented leaf extract containing, acetylcholine, histamine, moroidin, formic acid constitute an important toxic principle to pathogen. We Staired the mixture twice a day for the next 20 days. On the 20th day, the sisnu mixture was ready for use.

Doses of sisnu

For spraying; 16.6% of solution in water i.e 1 litre of sisnu was mixed to every 5 litre of water for one application.

3.1.4.4.4 Neem (*Azadirachta indica*)

Diseases free, tender, green leaf were collected.3 kg laef were kept in the plastic bucket for fermentation along with 100 gm yeast powder, 1.5 litres coconut water, 12 number banana and 1 kg jiggery. Fermented leaf extract containing azadirachtin, nimbolinin,nimbim, nimbidin, nimbidol, slannin and quercetin an important toxic principle to pathogen. We Staired the mixture twice a day for the next 20 days. On the 20th day, the neem mixture was ready for use.

Doses of neem

For spraying; 3% of solution in water i.e 180ml of neem was mixed to every 6 litre of water for one application.

3.1.4.4.5 Asuro (*Adhatoda vasica*)

Diseases free, tender, green leaf were collected.3 kg laef were kept in the plastic bucket for fermentation along with 100 gm yeast powder, 1.5 litres coconut water, 12 number banana and 1 kg jiggery. Fermented leaf extract containing constitue vasicine acetate and other chemical an important toxic principle to pathogen. We Staired the mixture twice a day for the next 20 days. On the 20th day, the asuro mixture was ready for use.

Doses of asuro

For spraying; 16.6% of solution in water i.e 1 litre of asuro was mixed to every 5 litre of water for one application.

3.1.4.4.6 Timur (*Zanthoxylum alatum*)

Diseases free, tender, green leaf were collected.3 kg laef were kept in the plastic bucket for fermentation along with 100 gm yeast powder, 1.5 litres coconut water, 12 number banana and 1 kg jiggery. Fermented leaf extract containing constitute essential oil and linalool, 2-decanone, sabine an important toxic principle to pathogen. We Staired the mixture twice a day for the next 20 days. On the 20th day, the timore mixture was ready for use.

Doses of timore

For spraying; 16.6% of solution in water i.e 1 litre of timore was mixed to every 5 litre of water for one application.

3.1.4.4.7 Copper colloide

Copper ion was separated from the copper rod in distill water through the passing of current from battery of 1.5 volt ( 6 battery were used ). In 24 hours, 25ppm ion was separated, producing slightly blue color in distill water.

Doses of copper colloid

For spraying 5 litre of solution which have 25 ppm copper ion concentration relevant for one time use.

3.1.4.4.8 Control factor

Pure distill water was used for the maintaining the similar environment as other treatments and removed biasness.

3.1.4.5 Fertilizer application

Plant nutrient in the form of N.P2O5.K2O @ of 11:7:5 kg/ropani respectively (Krishi Diary), through urea, di-ammonium phosphate and muriate of potash were applied on the ridge demarcated just prior to planting. Farm yard manure @ 1.017 ton/ropani was also applied on plot before planting at the time of field preparation.

3.1.4.6 Weeding

We performed two hand weeding and earthing up as necessary to remove the weed and provide support to potato plant. 1st weeding was done at 16 Magh 2073 and 2nd weeding at 3 Falgun 2073.

3.1.4.7 Irrigation

Two flood irrigation at 30 and 40 days after plantin were given. For maintaining of moisture and creating suitable environment for diseases sprinkler irrigation was also provided.

3.1.4.8 Harvesting

The tuber from the net plot area was harvested manually with the help of sickles. Harvested tuber were left in shaded area for a night.

3.1.5 Observation recorded in potato field

3.1.5.1. Diseases assessment

3.1.5.1.1 Diseases scoring

Diseases scoring was started when late blight was seen on magh 15 2073 in the field, and the data was recorded 3 times at interval of 7 days respectively by using 0-5 Scale by using Horsfall-Barratt scale formerly used at the international Potato center to estimate severity of potato late blight.

Disease scoring was assessed visually as foliage damage percent in all the observations.

0 = No disease
1 = Less than 10% leaves of the plants infected with small Lesions.
2 = 10-25% of the plants infected with large lesions
3 = 26-50% leaves of the plants infected with large lesions and slight infection on the stem (less than 10%)
4 = 51-75% leaves of the plants infected with large lesions and more infection on the stem (11-50%)
5 = More than 75% of the plants leaf infected with large lesions, stem infection more than 50% plants, plants going to die.

3.1.5.2 Diseases severity
Ten plants were randomly selected to record disease severity from each experimental unit. Percentage disease severity was then calculated using the following formula:

\[
\text{Disease severity (\%)} = \frac{\text{Sum of all numerical rating}}{\text{No. of plants observed} \times \text{maximum rating}} \times 100
\]

3.1.5.3 Area under disease progress curve (AUDPC)

The area under disease progress curve is used to summarize the progress of disease severity. The area under the disease progress curve was estimated using the following formula (Campbell, 1990; Madden and Hughes, 1995).

\[
\text{AUDPC} = \sum_{i=1}^{n-1} \left( Y_{i+1} + Y_i \right) 0.5 \left( T_{i+1} - T_i \right)
\]

Where

- \( Y_i \) = late blight disease severity % on the \( i^{th} \) date
- \( T_i \) = date on which the disease was scored
- \( n \) = numbers of dates on which disease was scored

3.1.6 Yield attributing character of potato

3.1.6.1 Hundred tuber weight

3.1.6.2 Economic yield

Tuber were collected from the randomly selected plant and weighted with the help of portable weighing machine.

3.1.7 Statistical analysis

Recorded data on above-stated parameters were tabulated treatment wise under 3 replications. The data recorded during the study were processed to fit into RSTAT software for analysis, Microsoft excel program was used for data tabulation, and Duncan’s Multiple Range Test (DMRT) was carried out at 5 % level of significance. The data entry was done to develop ANOVA table. DMRT, a mean separation technique was applied to identify most effective treatment. Correlation and regression analysis were done for group comparison and to test the main and interaction effects (Gomez and Gomez, 1984).

3.1.8 Meteorological features

The meteorological mean data such as temperature (maximum, minimum) and total rainfall during cropping period (January to April 2017) were obtained from the regional meteorological station Dipayal. Summary of the major weather variables has been presented in Figure 4.

III. RESULTS AND DISCUSSIONS

4.1 Diseases severity at different date of scoring

Analysis of variance (ANOVA) reveled highly significant relationship between the first diseases severity and treatments (Appendix 3). Mean value of first scoring severity was 28.16. For the management of late blight diseases different non-chemical pesticides were used for three times. Lowest first disease severity was observed in the control factor (20.00) followed by timur (22.66) and Sisnu (26.66) respectively. Highest value of diseases severity was observed in Panchagavya (36.00) followed by Neem (34.66) which is higher than the mean value (table 4).

Analysis of variance (ANOVA) reveled highly significant relationship between the second diseases severity and treatments (Appendix 3). Mean value of second scoring severity was 22.83. Lowest second diseases severity was observed in the copper colloide (22.66) followed by Bakino, Neem, Sisnu (25.33) and timore, panchagavya (28.00) respectively. Highest
value of diseases severity was observed in control factor (30.66) followed by Asuro (29.33) which is higher than the mean value (table 4).

Analysis of variance (ANOVA) revealed highly significant relationship between the third diseases severity and treatments (Appendix 3). Mean value of third scoring severity was 19.66. Lowest third diseases severity was observed in the panchagavya (6.66) followed by copper collide (10.66) and neem (14.66) respectively. Highest value of diseases severity was observed in control factor (44.00) followed by Asuro (25.33) which is higher than the mean value (table 4).

Management of late blight of potato is greatly related with the application of non-chemical pesticides. Among several factor for management of late blight, use of Panchagavya, neem, bakino, asuro, timore, sisnu and copper collide has been found effective to a great extent (Lawless, 1995). Diseases severity decreases with the increase in the dose of copper collide and Panchagavya and increases diseases severity with the increase in the dose of asuro and control factor Table 4 Diseases severity at different date of scoring at GAASC, Baitadi 2017

<table>
<thead>
<tr>
<th>Treatments</th>
<th>35DAS</th>
<th>42DAS</th>
<th>49DAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asuro</td>
<td>28.00 ab</td>
<td>29.33 a</td>
<td>25.33 b</td>
</tr>
<tr>
<td>Bakaino</td>
<td>29.33 ab</td>
<td>25.33 a</td>
<td>20.33 bc</td>
</tr>
<tr>
<td>Control</td>
<td>20.00 b</td>
<td>30.66 a</td>
<td>44.00 a</td>
</tr>
<tr>
<td>Copper collide</td>
<td>28.00 ab</td>
<td>22.66 a</td>
<td>10.66 de</td>
</tr>
<tr>
<td>Neem</td>
<td>34.66 a</td>
<td>25.33 a</td>
<td>14.66 cd</td>
</tr>
<tr>
<td>Panchakabaya</td>
<td>36.00 a</td>
<td>28.00 a</td>
<td>6.66 e</td>
</tr>
<tr>
<td>Sisnu</td>
<td>26.66 ab</td>
<td>25.33 a</td>
<td>17.33 cd</td>
</tr>
<tr>
<td>Timore</td>
<td>22.66 b</td>
<td>28.00 a</td>
<td>18.66 bc</td>
</tr>
<tr>
<td>Mean</td>
<td>28.16</td>
<td>22.83</td>
<td>19.66</td>
</tr>
<tr>
<td>CV</td>
<td>21.49</td>
<td>19.07</td>
<td>22.68</td>
</tr>
<tr>
<td>Sem</td>
<td>3.49</td>
<td>2.95</td>
<td>2.57</td>
</tr>
<tr>
<td>LSD</td>
<td>10.60</td>
<td>8.96</td>
<td>7.81</td>
</tr>
</tbody>
</table>

DAS: Days after sowing. CV: Coefficient of variation, LSD: Least significant difference, SEM: Standard error of mean. Treatment means are separated by Duncan’s Multiple range Test (DMRT) and the columns represented by the same letter (s) are not significantly different among each other at 5%.

4.2 Effect of different treatment on AUDPC

Analysis of variance (ANOVA) revealed highly significant relationship between first date AUDPC and treatments (Appendix 4). Mean first AUDPC was 96.25. For the management of late blight of potato we applied different non-chemical pesticides. Lowest first AUDPC was observed in timore, copper collide and control factor (88.66) followed by Sisnu (91.00) and bakino (95.66) , and asuro with the value of (100.33) , followed by neem (105), and Panchagavya (112) which is higher than the mean value (table 5).

Higher the application of asuro (291.66) resulted to higher disease pressure which shows the ineffectiveness of asuro in management of diseases (Chopra, R. N., S. L. Nayr, and I. C. Chopra., 1995). Higher diseases was seen during third times application of asuro. Lower diseases severity noticed in higher use of copper collide (205.33) which reported that severity of late blight decreases with increasing use of copper collide. The findings also agreed with the results of project IR-4 which shows the higher use of copper collide resulted in decreases attack of late blight decreased in total AUDPC (The Ohio State University 2016).
Table 5. 1st AUDPC, 2nd AUDPC and total AUDPC of different treatments at GAASC, Baitadi 2017.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>AUDPC1</th>
<th>AUDPCII</th>
<th>Total AUDPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asuro</td>
<td>100.33 a</td>
<td>191.33 b</td>
<td>291.66 ab</td>
</tr>
<tr>
<td>Bakino</td>
<td>95.66 a</td>
<td>158.66 bcd</td>
<td>254.33 bc</td>
</tr>
<tr>
<td>Control</td>
<td>88.66 a</td>
<td>261.33 a</td>
<td>350.00 a</td>
</tr>
<tr>
<td>Copper colloide</td>
<td>88.66 a</td>
<td>116.66 e</td>
<td>205.33 c</td>
</tr>
<tr>
<td>Neem</td>
<td>105 a</td>
<td>140.00 cde</td>
<td>245.00 bc</td>
</tr>
<tr>
<td>Panchakabia</td>
<td>112 a</td>
<td>121.33 de</td>
<td>233.33 bc</td>
</tr>
<tr>
<td>Sisnu</td>
<td>91 a</td>
<td>149.33 cde</td>
<td>240.33 bc</td>
</tr>
<tr>
<td>Timore</td>
<td>88.66 a</td>
<td>163.33 bc</td>
<td>252.00 bc</td>
</tr>
<tr>
<td>Mean</td>
<td>96.25</td>
<td>162.75</td>
<td>259</td>
</tr>
<tr>
<td>CV</td>
<td>18.47</td>
<td>14.47</td>
<td>14.98</td>
</tr>
<tr>
<td>SEm(±)</td>
<td>10.26</td>
<td>13.60</td>
<td>22.40</td>
</tr>
<tr>
<td>LSD</td>
<td>31.13</td>
<td>41.26</td>
<td>67.96</td>
</tr>
</tbody>
</table>

DAS: Days after sowing, CV: Coefficient of variation, LSD: Least significant difference, SEm: Standard error of mean. Treatment means are separated by Duncan’s Multiple range Test (DMRT) and the columns represented by the same letter (s) are not significantly different among each other at 5%.

4.3 Effect of different treatments on test weight and economical yield

Analysis of variance (ANOVA) revealed highly significant relationship between test weight (kg) and treatments (Appendix 5). Mean value of test weight was 2.87. For the management of late blight of potato we applied different non-chemical pesticides. Lowest test weight was observed in no application of non-chemical pesticides (1.41) followed by asuro (2.38) and timore (2.66) respectively. Higher value of test weight was observed in Sisnu (2.88), bakino (3.01), neem (3.28), copper colloide (3.46) and Panchagavya (3.86) which is higher than the mean value (table6). This results coincided with (Agricultural University, Udhagamandalan-643 001), which reported that test weight of potato tuber increased with the increase of use of panchagavya that provides all the macro and micro nutrient, other growth promoting factors.

Analysis of variance (ANOVA) revealed highly significant relationship between economical yield (ton/ha) and treatments (Appendix 5). Mean value of economical yield was 10.88. For the management of late blight of potato we applied different non-chemical pesticides. Lowest value of economical yield was observed in no application of non-chemical pesticides (6.00) followed by asuro (9.13) and timore (10.15) respectively. Higher value of economical yield was observed in Sisnu (11.03), bakino (11.42), neem (12.26), copper colloide (12.78) and Panchagavya (14.23) which is higher than the mean value (table6). This results coincided with (Selvaraj, N., B. Anitha, B. Anusha and M. Guru Saraswathi. 2007) which reported that per unit production of potato was increased with the use of panchagavya because panchagavya acts as ramban (growth factor, diseases management, diseases tolerance power etc) without any side effect.

Table 6. Test weight and economical yield of different treatments at GAASC, Baitadi, 2017.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Test weight(kg)</th>
<th>Economical yield(t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panchakabia</td>
<td>3.86 a</td>
<td>14.23 a</td>
</tr>
<tr>
<td>Copper colloide</td>
<td>3.46 ab</td>
<td>12.78 ab</td>
</tr>
<tr>
<td>Neem</td>
<td>3.28 bc</td>
<td>12.26 b</td>
</tr>
<tr>
<td>Bakaino</td>
<td>3.01 bcd</td>
<td>11.42 bc</td>
</tr>
<tr>
<td>Sisnu</td>
<td>2.88 cde</td>
<td>11.03 bcd</td>
</tr>
<tr>
<td>Timore</td>
<td>2.66 de</td>
<td>10.18 cd</td>
</tr>
<tr>
<td>Asuro</td>
<td>2.38 e</td>
<td>9.13 d</td>
</tr>
<tr>
<td>Control</td>
<td>1.41 f</td>
<td>6.00 e</td>
</tr>
<tr>
<td>Mean</td>
<td>2.87</td>
<td>10.88</td>
</tr>
<tr>
<td>CV</td>
<td>10.60</td>
<td>10.26</td>
</tr>
</tbody>
</table>
DAS: Days after sowing. CV: Coefficient of variation, LSD: Least significant difference, SEM: Standard error of mean. Treatment means are separated by Duncan’s Multiple range Test (DMRT) and the columns represented by the same letter (s) are not significantly different among each other at 5%.

4.4 Regression study

The correlation between test weight (dependent variable) with mean AUDPC (independent variable) was studied. There was highly significant negative correlation between mean AUDPC and test weight. Contribution of mean AUDPC for reduction in test weight was 65% (Figure 5).

Table 5. Correlation between disease severity, mean AUDPC, Economic yield (t/ha) and 100 tuber weight.

<table>
<thead>
<tr>
<th></th>
<th>DS10-22</th>
<th>DS10-29</th>
<th>DS11-07</th>
<th>MeanAUDPC</th>
<th>EY t/ha</th>
<th>TKW</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS10-22</td>
<td>1</td>
<td>.213</td>
<td>-.476**</td>
<td>-.027</td>
<td>.429</td>
<td>.430*</td>
</tr>
<tr>
<td>DS10-29</td>
<td></td>
<td>1</td>
<td>.323</td>
<td>.783**</td>
<td>-.373</td>
<td>-.408*</td>
</tr>
<tr>
<td>DS11-07</td>
<td></td>
<td></td>
<td>1</td>
<td>.814**</td>
<td>-.934**</td>
<td>-.929**</td>
</tr>
<tr>
<td>MeanAUDPC</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>-.799**</td>
<td>-.812**</td>
</tr>
<tr>
<td>EY t/ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>.995**</td>
</tr>
<tr>
<td>TKW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**Figure 5. Correlation between mean AUDPC and test weight.**

The correlation between economical yield (dependent variable) with mean AUDPC (independent variable) was studied. There was highly significant negative correlation between mean AUDPC and economical yield. Contribution of mean AUDPC for reduction in economical yield was 63% (Figure 6).
Table 5 show the correlation between the different date of disease severity, mean AUDPC, EY t/ha and TKW, First date of disease severity and second disease severity relation was positive but non significant. Relation between first disease severity and third disease severity negative but significant, relation between first disease severity and mean AUDPC was negative but non significant. Table also show the relation between first disease severity and EY that was positive and significant, similarly, relation was seen in TKW. Disease severity second show the relation to the third disease severity that was positive and non significant, relation between second disease severity and mean AUDPC was positive and highly significant. Relation between second disease severity and economic yield was negative and non significant. Relation between second disease severity and 100 test weight was negative and highly significant.

Correlation between third disease severity and mean AUDPC was positive and highly significant. Relation between third disease severity and economic yield was negative and highly significant, similar result was found with TKW. Correlation between mean AUDPC and economic yield was negative and highly significant, similar result was found with TKW. Correlation between economic yield and TKW was positive and highly significant.

IV. SUGGESTIONS

Hence, from our research result, we can suggest the farmers of Gokuleshwar for:

- Panchagavya can be made in easy way with low cost technology by every potato growing which is safe and sustainable for late blight management.
- The optimum dose of Panchagavya and Copper colloide can be alternate option for the management of late blight for nearby farmers of Gokuleshwar

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Microcontroller-Based Temperature Control for Traditional Medicine Production

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Abstract- Temperature is one of the most important parameter to be controlled in almost all industrial plant, since it directly affects on product quality. The main objective of this paper is to study and construct 8051 based temperature control system. In this control system AT89S51 microcontroller is used. To sense the temperature, IC temperature sensor, LM 35DZ is used and its sensing range is up to 150°C. This paper aims to apply for heating process in traditional medicine production. The required temperature of heating process is under 110°C. When the temperature is greater than the required temperature, the product quality will be low and if the temperature is less than power and time consumption will be large. So this process requires temperature regulation. LM 35 is precision integrated-circuit temperature sensor, whose output voltage is linearly proportional to the Celsius temperature. Its accuracy, low cost and temperature range are desirable for this heating process.

In this control system, temperature is controlled within the temperature range 100°C to 110°C. The goal of this paper is to get development in traditional medicine production and good quality products.

Index Terms- 8051 microcontroller, LM 35DZ temperature sensor, ADC 0808 analogue to digital converter, Relay, seven segment display.

I. INTRODUCTION

Temperature is the measurement of the hotness or coldness of an object or substance. This can be accomplished to a degree by touching the object. Heat added to a material causes such changes as melting, boiling, expansion, etc. When these changes are compared with scale (any scale), we use the word “temperature”. This is just a convenience way of communicating the hotness or coldness of an object. Heat and temperature are very different things. Temperature is probably the most widely measured and frequently controlled in many industrial processes. Temperature control system has two parts; measurement and control.

A measurement system is used for making measurements. In general, measurement system may be classified into three categories:

1. Sensor
2. Signal conditioner
3. Display

Temperature cannot be measured directly but must be measured by observing the effect that temperature variation causes on the measuring device. A control system is a combination sub-system that to maintain output suitably related to input. Automatic control system is used for temperature control.

Microcontrollers make storage, programmability and on-line decision to use in temperature measurement and control applications. Microcontroller based temperature controllers are economically available to control the temperature of industrial processes. Microcontroller is an inexpensive single-chip computer and the entire computer system lies within the confines of the
integrated circuit chip. Most 8051 microcontrollers contain a CPU (Central Processing Unit), RAM (Random Access Memory), ROM (Read Only Memory), Input/output ports, timer and other built-in peripherals. RAM is used for temporary storage of data and Special Function Registers (SFRs) are special elements of RAM. Each register controls an I/O port; each of pins can be designated as input or output. For the control system, program counter is also important. It is the engine to start the program and point to the memory address of the instruction to be executed. In this research, AT89S51 microcontroller is used to control the heating system at the required range.

II. Operation Principle

The block diagram of 8051 based temperature control system is shown in Figure 1. In this diagram, the temperature is measured by using the temperature sensor. When the sensor measures the input temperature, it converts its temperature measurement to an equivalent signal. This signal is sent to the microcontroller and the programs in it instruct and command to the power switching device to cut out the heating coil if it is required.

![Figure 1: Block Diagram of Temperature Controller](image-url)

When the drying process for the traditional medicine starts in the drying room, the heating coils get electricity through the relay. And then the room temperature is increasing steadily. The temperature sensor senses the drying room temperature continuously and converts the temperature to the voltage as its output. If the room temperature is higher, the output voltage of temperature sensor will be greater. This output voltage is sent to input pin of the analogue to digital converter (A/D converter). The input channel can be chosen by selecting bit for ADD A, ADD B, ADD C. In this paper, pin 26 is selected as the input pin of A/D converter. The analogue to digital converter converts into the equivalent digital signal to understand the 8051 microcontroller. The output pins of A/D converter for eight bit digital word are connected to the port 1 of 8051 microcontroller. On the microcontroller, port 0 is used as the output port to display the temperature in the drying room. When the temperature in the drying room reaches 100°C, the program in the microcontroller sends the signal to the relay to cut off the AC power line of heater coils. By this way, the temperature will not exceed 110°C and it will be remain around 100°C.
Figure 4: Complete Circuit Diagram of 8051 Based Temperature Control System
III. Hardware and Software Implementation

All electronic components require a steady dc power supply. Thus a regulated dc power supply unit was built for this temperature control system. That regulated power supply is constructed with stepdown transformer, rectifier diodes, filter capacitor and voltage regulator IC as shown in figure 5.

The LM 35 DZ is precision integrated-circuit temperature sensors. It converts the temperature to the equivalent output voltage. The output voltage is linearly proportional to the Celsius temperature because of scale factor is +10 mV/°C. When the temperature increases the output voltage will increase. The typical accuracies of LM 35 are ±1/4 °C at room temperature, 0.5°C accuracy at 25 °C and ±3/4 °C over a full -55°C to +150 °C temperature range. Its cost is very low. The analogue to digital converter (ADC0808) is used to convert the output voltage of analog temperature sensor, LM 35DZ. In this paper, pin 26 is selected as the input pin of A/D converter. The output pins of A/D converter for eight bit digital word are connected to the port 1 of 8051 microcontroller. It is constructed as shown in figure 6.
The temperature in the heating process is displayed by the 4 seven-segment displays and when the temperature reaches 100°C, the microcontroller will command the relay to be cut-off the AC power line of heater coils. The following figure 7 shows the implementation of display and cut-off relay.

Figure 7: Temperature Display and Cut-off Relay

For the software implementation, the program is type in the notepad and saves as “temperature.c” in drive C. And then compile the program. In case of syntax error in program code, program will not be compiled and HEX file will not be generated. The figure 8 shows error free and HEX file is ready for the microcontroller.

Figure 8: Converted to HEX file

IV. Test and Result

The test was done by powering the system. When powered, the present room temperature 30°C is displayed and the heating coil starts the heating for the purpose of the traditional medicine drying process. To ascertain the workability of the system, the temperature sensor LM35 is placed near the heating coil. The temperature increased rapidly to the 90°C in a few seconds. In a few minute the seven segments displayed 100°C. At that time the relay coil cutoff the AC power line of heating coil. Although cutting off the AC power, the temperature still increased slowly. After a few minute the temperature decreased less than 95°C and at that time the relay connected AC power supply with the heating coil. By this way, the temperature will not exceed 110°C and it will be remain around 100°C.
V. Conclusion

A very important process in many industrial fields is temperature regulation. An automatic temperature regulator has its application in various industries where constant temperature is required to be maintained. In all closed-loop temperature control system, temperature of system is constantly compared with the desired temperature and then controlled temperature of system. This system needs temperature measuring device. There are several temperature sensors. According to the system requirement, the sensor was chosen. There are many factors to choose sensor: They are-

1. Low or high temperature range
2. Linearity or non-linearity
3. Accuracy
4. Output scale factor
5. Response time and
6. Cost

In this paper, LM 35 DZ is used to measure the temperature. The features of LM 35 are good accuracy, linearity, low cost, low self-heating and calibrated directly in degree Celsius. The heart of this control system is 8051 microcontroller. The temperature is controlled by the program in the microcontroller. In AT 89S51, there are not included analog-to-digital converters. As the output of LM 35 is analog, it requires to convert digital format which inputs the microcontroller. So AT 89S51 microcontroller is linked to the A/D converter of an external peripheral device. The sensing temperature is displayed by seven segment display. The temperature is controlled by cutting off the AC power line to the heater coils. If we want more accuracy and low cost update control system, we will need very good instruments, to measure, i.e. digital sensor DS 1620. It can covert temperature to digital word in 750 ms. By replacing this sensor, no need to use analog-to-digital converter. So the system cost will effectively low. TIL 311 hexadecimal displays can be used as seven segment display. By using these displays, the outputs of microcontroller are not need to convert the decimal number because of its internal structure has 4-bit latch and decoder. Its display screen has 4×7 light-emitting diode (LED), and left and right hand decimals LED. By replacing these two components, the control circuit will be very small, compact and fast response.

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Environmental Support and Students’ Involvement in Improving Soft Skills of Secondary School Students

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Abstract- This study aims to identify the environmental support and students’ involvement in improving the students' soft skills based on the types of schools. Environmental support refers to teacher support, peer support and parental support. Students’ involvement is examined in terms of learning in the classroom, social interaction in the school environment and co-curricular activities. Environmental support and students’ involvement lead to soft skills that are higher order thinking skills, social and interpersonal skills, leadership skills and problem-solving skills.

A survey is conducted by using questionnaire to collect data. The sample was chosen randomly, involving a total of 1600 form four students. It is divided into four zones of schools named North Zone, South Zone, East Zone and Central Zone of Peninsular Malaysia. Data analysis involves descriptive statistics and inferential statistics. It was analysed by using Statistical Packages for the Social Sciences (SPSS) Version 24. The descriptive analysis is used to obtain the frequency, percentage, mean and standard deviation. Cronbach Alpha coefficient value is between 0.896 and 0.965. The results show that environmental support, students’ involvement and soft skills are at moderate level. Pearson correlation analysis portrays significant relationship between environmental support and soft skills towards the students’ involvement. Research implications show that environmental support and student engagement are at a satisfactory level in improving student's soft skills. Hence, various efforts, activities and programs need to be tailored to the needs of the students to enhance the soft skills among students.

Index Terms- Environmental support, Students’ involvement, Soft skills.

I. INTRODUCTION

Environmental support is a catalyst in mobilizing the spirit of students to participate in learning activities as well as school adaptation. Teacher support, parents and peers give influence to the construction of student involvement. The choice of teachers on the subject matter, classroom activities and the application of soft skills also affects the involvement of students whether they can appreciate and develop what has been learned in school. Parents who are concerned about their children's desires and aspirations will always support, motivate and stimulate what they aspire to and help in improving the student's soft skills (Anisa Saleha, 2015 & Haslina Md Yunus, 2015).

Soft skills should be encouraged in self-development of students. Students must be equipped with creative and critical thinking skills, problem solving skills, communication skills, initiative, ethical and cultured lifelong learning (Marlina et. al., 2011). In secondary education, students are required to apply soft skills in order to acquire it for future endeavours. In other word, students' learning aspects need to be addressed so that the circumstances of academic and moral disability among students can be overcome. As a result, it will enhance the soft skills and the academic achievement of students (Supian Hashim, 2010).

This paper discusses about environmental support and student involvement in improving students' soft skills. The soft skills cover four components, namely higher order thinking skills, social skills and interpersonal skills, leadership skills and problem-solving skills as illustrated in the following diagram:

Figure 1.1: Conceptual Framework

**Problem Statement**

The level of student engagement in school linked to the support of student environments named as teacher support, peers and parents. A good construction of learning environment and clear expectations will enhance student's engagement and soft skills (Anisa Saleha, 2015 & Haslina Md Yunus, 2015). In contrast, weak environment support creates various problems affecting student behaviour such as emotional changes which draw the feelings of inferiority, loneliness, and boredom characteristics within students. As a result, the students will possess inferior personality characteristics and become silent, easily offended, low motivated hence leading to unfavourable academic achievements (Habibah Elias et al., 2010; Mohd Asran, 2011; Tan Swee Chen et al., 2013). In a word, the schools need to be proactive in addressing this phenomenon.

An active involvement of students in co-curricular also affects students' soft skills. In the meantime, there are less contributions of schools into the improvement of soft skills during student enrolment (Wilhelm et al., 2002). Soft skills need to be integrated in the curriculum and co-curriculum. A competent student need to acquire the basic skills in order to synchronize the soft skills (Martinez, 2005). Therefore, a constructive plan by the school in addition to the significance of stakeholders’ view are important to highlight the soft skills applied to earlier enrolment.

**Objectives of the study**

The specific objectives are to:

1. Determine the environment support level in terms of teacher support, peer support and parental support.
2. Determine the degree of students’ involvement in learning in classroom, social interaction in school environment and co-curricular activities.
3. Determine the level of soft skills from the aspects of higher order thinking skills, social and interpersonal skills, leadership skills and problem-solving skills.
4. Identify the relationship between environmental support and students’ involvement.
5. Identify the relationship between students’ involvement and soft skills.

**II. MATERIALS AND METHODS**

**Study design and Sampling**

A survey is conducted by using a complete questionnaire to collect data. In this study, a stratified random sampling technique is used to select the sample of the study. The population of the study is comprised of 1600 students of Form 4 students. The sample is divided into four zones of schools named North Zone, South Zone, East Zone and Central Zone of Peninsular Malaysia. In this study, stratified random sampling technique is used due the scattered population in each district.

**Data Collection Tools**

The questionnaire used was developed according to the study needs. Respondents will be given five choices based on Likert scale (1–5); Strongly Disagree (1), Disagree (2), Less Agree (3) Agree (4) and Strongly Agree (5). Pilot study was conducted to determine the validity and reliability of the research instrument. Cronbach Alpha coefficient value is between 0.896 and 0.965.

**Data Analysis Methods**

Data analysis involves two types of statistics; descriptive statistics and inferential statistics. It was analysed by using Statistical Packages for the Social Sciences (SPSS) Version 24. The descriptive analysis was used to obtain the frequency, percentage, mean and standard deviation used to describe the overall level of environmental support, students’ involvement and student's soft skills. Pearson correlation analysis was used to identify the relationship between environmental support and soft skills towards the students’ involvement. The significant level is 0.05.

**III. RESEARCH DISCUSSION AND RESULTS**

*a) Environmental Support*

<table>
<thead>
<tr>
<th>No</th>
<th>Environmental Support</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Teacher support</td>
<td>3.645</td>
<td>0.519</td>
<td>medium high</td>
</tr>
<tr>
<td>2</td>
<td>Peer support</td>
<td>3.595</td>
<td>0.580</td>
<td>medium high</td>
</tr>
<tr>
<td>3</td>
<td>Parental support</td>
<td>3.569</td>
<td>0.538</td>
<td>medium high</td>
</tr>
<tr>
<td>4</td>
<td>Overall score</td>
<td>3.603</td>
<td>0.437</td>
<td>medium high</td>
</tr>
</tbody>
</table>

In general, Table 1 shows the level of environmental support from the aspect of teacher support with the highest mean value (M = 3.645 and SD = 0.519). It is followed by peer support (M = 3.595 and SD = 0.580) and parental support (M = 3.569 and SD = 0.538) each have a mean value at moderate high level. In summary, the teacher support has the highest level compared to peer support and parental support. The level of environmental support among respondents is at moderate high (M = 3.603 and SD = 0.437).
Table 2 Level of Student Involvement

<table>
<thead>
<tr>
<th>No</th>
<th>Student Involvement</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Learning in the classroom</td>
<td>3.641</td>
<td>0.571</td>
<td>medium high</td>
</tr>
<tr>
<td>2</td>
<td>Social interaction in the school environment</td>
<td>3.568</td>
<td>0.515</td>
<td>medium high</td>
</tr>
<tr>
<td>3</td>
<td>Co-curricular activities</td>
<td>3.472</td>
<td>0.532</td>
<td>medium high</td>
</tr>
<tr>
<td></td>
<td>Overall score</td>
<td>3.560</td>
<td>0.539</td>
<td>medium high</td>
</tr>
</tbody>
</table>

Students’ involvement is measured based on learning in the classroom, social interaction in the school environment and co-curricular activities. It shows that the level of students’ involvement score is at moderate high (M = 3.560 and SD = 0.539). According to the Table 2, the dimension of learning in the classroom at moderate high (M = 3.641 and SD = 0.571). While, the dimension of social interaction in the school environment is at moderate high (M = 3.568 and SD = 0.515). Finally, co-curricular activities dimension is also at moderate high (M = 3.472 and SD = 0.532). To conclude, the dimension of learning in the classroom hold the highest level compared to social interaction in the school environment and co-curricular activities.

Table 3 Level of Students' Soft Skills

<table>
<thead>
<tr>
<th>No</th>
<th>Students' Soft Skills</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Higher Order Thinking Skills</td>
<td>3.560</td>
<td>0.619</td>
<td>medium high</td>
</tr>
<tr>
<td>2</td>
<td>Social and Interpersonal Skills</td>
<td>3.716</td>
<td>0.601</td>
<td>medium high</td>
</tr>
<tr>
<td>3</td>
<td>Leadership Skills</td>
<td>3.553</td>
<td>0.586</td>
<td>medium high</td>
</tr>
<tr>
<td>4</td>
<td>Problem-solving skills</td>
<td>3.558</td>
<td>0.595</td>
<td>medium high</td>
</tr>
<tr>
<td></td>
<td>Overall score</td>
<td>3.597</td>
<td>0.518</td>
<td>medium high</td>
</tr>
</tbody>
</table>

In this study, the level of students' soft skills is measured based on higher order thinking skills, social and interpersonal skills, lead skills and problem-solving skills. In general, the students' soft skills (M = 3.597 and SD = 0.518) is at moderate high level. Based on the Table 3, students' soft skills in social and interpersonal skills has the highest mean value (M = 3.716 and SD = 0.611). It is followed by higher order thinking skills (M = 3.560 and SD = 0.619), problem-solving skills (M = 3.558 and SD = 0.595) and leadership skills (M = 3.553 and SD = 0.586) respectively.

Table 4 Pearson correlation coefficients between environmental support and students’ involvement

<table>
<thead>
<tr>
<th>Domain</th>
<th>Students’ Involvement R</th>
<th>Sig.</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental support</td>
<td>0.701</td>
<td>0.000</td>
<td>Strong</td>
</tr>
</tbody>
</table>

** p <0.01

According to the Table 4, Pearson correlation analysis reported that there is a significant relationship between environmental support and the students’ involvement with the value (r = 0.701) and sig = 0.000 (p <0.01). The strength of the relationship is strongly positive. In a word, it showed that there is a significant relationship between environmental support and the students’ involvement. Hence, the hypothesis is rejected.

Table 5 Pearson correlation coefficients between students’ involvement and soft skills

<table>
<thead>
<tr>
<th>Domain</th>
<th>Students’ Involvement R</th>
<th>Sig.</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft skill</td>
<td>0.723</td>
<td>0.000</td>
<td>Strong</td>
</tr>
</tbody>
</table>

** p <0.01

Pearson correlation analysis as shown in Table 5 shows that there is a significant correlation between students’ involvement and soft skills of high school student with value (r = 0.723) and sig = 0.000 (p <0.05). The strength of the relationship is strongly positive. In overall, there is a significant relationship between the students’ involvement and the students’ soft skills. Hence, the hypothesis is rejected.

IV. CONCLUSION

Environmental support affects the students’ involvement in various activities in the school to enhance students' soft skills. Schools should always create a competent and holistic human capital internationally. Such skills need to be developed and nurtured throughout the schooling process and integrated into classroom activities. The Ministry of Education's wishes through the Malaysia Education Blueprint 2013–2025 emphasizes on empowerment of the soft skills among students. The System Aspiration targets the effort to empower the students’ academic achievement as outlined in the National Education Philosophy.
Therefore, without fails, all parties should provide supports and opportunities for students to engage in various activities in a way to enhance the students’ soft skills.

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Constraints to Profitable Participation in Agri-food Value Chains: A Case of Small-scale Banana Farmers in Meru County, Kenya

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Abstract- Constraints in agri-food value chains tend to heighten the vulnerability of small-scale farmers in Sub-Saharan Africa. This study evaluates the constraints limiting small-scale banana farmers in Meru County, Kenya, from profitably participation in the crop’s value chain, producers’ efforts in- and suggestions to- overcoming them. Results of this study reveal that banana farmers face several interdependent constraints such as inadequate know-how on banana management, high cost plantlets, and pests and diseases that amplify one another but efforts to overcome them have been partial. It is therefore, necessary to have several measures implemented concurrently to address the constraints. Thus, future interventions should have concerted efforts from governments and non-governmental organizations.

Index Terms- Agri-food, bananas, constraints, Kenya, small-scale farmers, value chain.

I. INTRODUCTION

Constraints in agri-food value chains tend to heighten the vulnerability of small-scale farmers in Sub-Saharan Africa (SSA). For producers who entirely derive their livelihood from farming, constraints in agri-food chains are life-threatening. Typically, small-scale farmers are disadvantaged even when opportunities such as increase in food demand either domestically or internationally arise because of constraints such as lack of information on prices and export opportunities, a strong presence of middlemen, inaccessibility to credit, poor transport services, and stringent safety measures requirements (Ashraf, Ginè and Karlan 2009; Asfaw, Mithöfer and Waibel 2010, Schaffnit-Chatterjee, 2014). Yet, constraints in agrifood value chains are expected to be compounded in future as more people move to urban areas as well as change their consumption habits. Research reveals that with increased urbanization world over, consumers are reducing their food demand of staples and are diversifying to high quality, processed and pre-cooked animal products, vegetables and fruits (Neven, Reardon, Chege and Wang, 2006; Hazell and Wood, 2008; Satterthwaite, McGonahan and Tacoli, 2010; Ngigi, Okello, Lagerkvist, Karanja and Mburu, 2011; Maertens and Swinnen, 2012). This calls for efforts by farmers to align their production and marketing activities in ways that will enable them benefit from the emerging food demands. An understanding of the existing value chains is, therefore, useful in diagnosing the constraints and fashioning strategies of promoting producers’ profitable participation in their commodities’ value chain.

Banana farming is an activity that can improve the livelihood of small-scale farmers in SSA in general, and in Kenya, in particular, by broadening their income sources. Banana constitutes one of the most important tropical food staples after rice, wheat and maize in terms of gross value production, and most of its production (98%) is in the developing countries (Pillay, Tenkouano and Ortiz, 2012). In Kenya, banana is one of the important fruits with a market share of 35.6% followed by pineapples (20%), mangoes (17%), avocados (6%), paw paws (6%), passion fruits (3.6%), oranges (3%), water melons (3%), and tangerines (2%) (Horticultural Validated Report, 2014). It is the most popular fruit in the country (Neven et al., 2006; Nzioka, 2009). Bananas are a source of vitamins A, B, and C, potassium, magnesium, fibre, are low in fat and sodium, and are cholesterol-free (Fruit Production Technical Handbook, 2011; Pillay et al., 2012; Horticultural Validated Report, 2014). Due to their nutritional features, bananas appeal to health conscious consumers (Pillay et al., 2012). Farmers in Kenya are taking up banana as a cash crop, catching up with conventional ones such as coffee (Mwangi and Mbaka, 2010; Murithi, 2011; Miriti, Wamue, Masiga and Murithi, 2013; Republic of Kenya, 2013). Despite their nutritional and economic importance, banana value chains are described as ‘lumbering giants with feet of clay’ (Domaingue, Lewicki, This, Bakry, Horny, Braconnier, Pot and Trouche, 2017: 143).

A number of studies on banana farming constraints focus either on production or marketing (Karembu, 2002; Kiiza, Abele and Kalyebara, 2004; Biruma et al., 2007; Mbaka, Mwangi and Mwangi, 2008; Mwangi and Mbaka, 2010; Mbaka, Nakato, Auma and Odero, 2009; Miriti et al., 2013). For example, tissue culture technology adoption (Karembu, 2002), spread of pests and diseases (Biruma et al., 2007; Mbaka et al., 2009), restoring banana production (Mwangi and Mbaka, 2010), and marketing (Kiiza, 2004). While such studies are important in prompting and
guiding interventions by the government and non-government firms, the efforts are mainly segmented and thus hardly successful (Jogo, Karamura, Kubiriba, Tinzaara, Rietveld, Onyango and Odongo, 2011; Muchui, Gatambia, Kamau, Thuramira, Miruka, Wasilwa, Gitau, and Gitau, 2013). This is partly because such interventions fall short of linking production and marketing as important components of agri-food value chain that should be developed concurrently. This study attempts to link production and marketing by adopting a value-chain perspective in examining constraints facing small-scale banana farmers in Meru County, Kenya. Thus, the current study provides information that may guide policy makers in formulating more comprehensive and sustainable interventions measures.

II. MATERIALS AND METHODS

This study on constraints in banana value chain included primary data collection from April 2015 to July 2015. The required information was collected from 384 farmers and 384 banana traders in Meru County using semi-structured questionnaires. The questionnaire for farmers covered the types of seedlings planted, sources of seedlings, farm sizes, amount of banana stools on farm, distance between farms and markets, methods of selling, selling prices of bananas, constraints faced, strategies used by farmers in addressing the identified constraints, and suggested solutions to the constraints. The 384 farmers were randomly selected from four sub-counties of Meru County in Kenya namely; Imenti South, Imenti Central, Imenti North and Igembe South. These sub-counties were purposively picked because they produced 283,373 tons of the total banana production of 323,363 tons in the entire County in the year 2013 (Ministry of Agriculture, Livestock and Fisheries, 2015 [MOALF]). Besides the high banana production, Igembe South is one of the sub counties that prior to the ban by United Kingdom relied on Khat exports (Riak, 2014). Imenti South, Imenti North and Imenti Central are relatively located closer to Meru-Nairobi tarmac road which potentially enhances access to the key banana markets in Kenya. In addition, Imenti South and Imenti Central are privileged with well-established water projects (Miriti, 2011; J. Mwangi, Personal communication, April 27, 2015). Through the guidance of the sub-counties’ horticulture, agribusiness and extension offices, 96 farmers from each sub county participated in the study.

The questionnaire for traders covered sources of bananas, methods of buying, selling destinations, the constraints faced, strategies used to overcome such constraints, and suggestions on how to address the constraints. The 384 traders were randomly selected from 10 banana markets namely; Tiira, Maau, Kanuni, Kariene, Kanyakine, Gakoromone, Mirirriiri, Mitungu, Mujwa, Kamachege, Nharere, and Mwichiune. The number of traders interviewed in these markets were; 6, 16, 8, 38, 30, 70, 30, 18, 30, 30, 70, 38 for Tiira, Maau, Kanuni, Kariene, Kanyakine, Gakoromone, Mirirriiri, Mitungu, Mujwa, Kamachege, Nharere, and Mwichiune, respectively. To arrive at the number of banana traders interviewed from each market, two conditions were observed; the size of banana markets approximated by the number of banana traders present and the co-operation of traders. In addition to the data collected from the farmers, information was also sought from the Key Informants. Further information was collected through Focus Group Discussions (FGDs). The key informants included; Imenti North sub-county agricultural officer, Imenti South and Imenti Central sub-county horticulture officers, Igembe South sub-county agribusiness officer, Kaguru Training Institute crops’ officer, Nkuene Ward agricultural extension officer, Meru Green Horticulture (MGH Ltd) marketing officer, and Meru Banana Farmers’ Cooperative (MBFC) manager. Two FGDs were conducted. One of the focus group discussions comprised of five female and two male banana farmers. The other consisted of four female and one male banana farmers cum traders and three male banana carriers. The key informants interviews and focus group discussions solicited for in-depth information on constraints of banana farming in Meru County.

One way analysis of variance (ANOVA) was used to determine the statistical differences in the average distances between banana farms and markets, and banana stools on farms in different locations of Meru County. The statistical differences in prices fetched by farmers at the farm-gate and the various open-air markets in Meru County were determined using the Student’s t test.

III. FINDINGS AND DISCUSSIONS

Opportunities

Results of this study revealed that there was a demand at local and national levels for bananas produced in Meru County. At a local level, bananas were sold in Igembe North, Igembe Central, Tigania East, and Tigania West sub counties of Meru County that had low production (Table 1). An agribusiness officer in Igembe South, expressed the dire need for bananas in Igembe North, Igembe Central, Tigania East, and Tigania West, ‘our bananas are not sufficient to feed our very own’ (D. Mburugu, personal communication, 16 July 2015). Igembe North, Igembe Central, Tigania East, and Tigania West have for years relied on Khat as their main cash crop (Carrier, 2005; Anderson and Carrier, 2009; Riak, 2014). The dependency on Khat is, however, threatened by recent bans by importing nations such as the United Kingdom (Klein, 2013; Riak, 2014). This implies that banana farming is potentially an economic worthy venture for Khat farmers in Meru County.

Table 1: Banana Production Statistics of Meru County, 2011 - 2013

<table>
<thead>
<tr>
<th>Sub-County</th>
<th>Area (ha)</th>
<th>Production (tons)</th>
<th>Area (ha)</th>
<th>Production (tons)</th>
<th>Area (ha)</th>
<th>Production (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2011</td>
<td>2012</td>
<td>2013</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imenti North</td>
<td>1,075</td>
<td>52,625</td>
<td>892</td>
<td>43,708</td>
<td>1,03</td>
<td>41,400</td>
</tr>
<tr>
<td>Meru Central</td>
<td>1,279</td>
<td>76,740</td>
<td>1,299</td>
<td>75,342</td>
<td>1,80</td>
<td>108,000</td>
</tr>
<tr>
<td>Igembe North</td>
<td>455</td>
<td>13,650</td>
<td>457</td>
<td>15,995</td>
<td>225</td>
<td>6,750</td>
</tr>
<tr>
<td>Igembe Central</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>545</td>
<td>16,350</td>
</tr>
<tr>
<td>Imenti South</td>
<td>1,653</td>
<td>94,050</td>
<td>1,650</td>
<td>94,050</td>
<td>1,78</td>
<td>101,973</td>
</tr>
<tr>
<td>Tigania west</td>
<td>252</td>
<td>2,016</td>
<td>264</td>
<td>13,200</td>
<td>300</td>
<td>15,000</td>
</tr>
</tbody>
</table>

http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7912
www.ijsrp.org
Besides the demand for bananas at the local level, the results of this study revealed that there was a national and potential international demand. Bananas from Meru County were sold in at least 12 of the 47 counties in Kenya. The counties include; Laikipia, Mombasa, Nyandarua, Nairobi, Nakuru, Isiolo, TharakaNithi, Kirinyaga, Nyeri, Embu, Muranga, and Kiambu. Meru County had the highest (60.7%) number of operations. This observation may be partly because some traders doubled as banana farmers who exploited their close proximity to local markets. On one hand, bananas originating from Meru County were sold in counties where banana farming had not thrived (for example, Laikipia, Mombasa, Nyandarua, Nairobi, Nakuru, Isiolo). These counties were banana deficient and therefore provided a ready market. Apart from being banana deficient, Nairobi’s population of over 4 million provided a big market. On the other hand, Meru bananas were also sold in counties where production was flourishing (for example, TharakaNithi, Kirinyaga). This observation implied that the demand even in regions where banana farming was thriving outweighed the supply. The national demand is expected to continue rising given that 26.7 percent of the population live in urban areas and urbanisation has sustained a steady 2.12 percent average annual growth rate since 1968 when it was 9.5 percent (World Population Prospects, 2017). Moreover, the urban population in Kenya is projected to ‘exceed 36% by 2030–2040’ (Hope, 2012: 5).

Farmers in Meru County through the MBFC had in 2014 supplied an exporting horticulture company based at Embakasi in Nairobi with ripe sweet bananas. An interview with the MBFC’s manager, however, revealed that the cooperative had the contract cancelled on March 2015 as a result of failing to supply on time (S. Gikokunda, personal communication, 21 April 2015). This finding attests the results of previous studies on export and / or high value domestic outlets that small-scale producers must produce consistently, large volumes or quantities, quality products and supply on time (Neven et al., 2006, Ashraf 2009, Keleman, Ranó, and Hellin, 2009, Asfaw et al., 2010). Keleman et al. (2009) noted that small-scale maize farmers in Mexico needed to produce in large quantities and get information in order to compete in global markets with large-scale producers. Neven et al. (2006) observed that small-scale fresh fruits and vegetables producers in Kenya targeting to sell to supermarkets outlets faced challenges of producing consistently, volume and quality.

This research revealed that there was meagre value addition on bananas in Meru County. A few of the farmers (0.5%) and 41.7 percent of the traders ripened bananas. All the respondents who ripened bananas used the traditional method. The traditional method involved wrapping bananas plus a few avocados or passion fruits in a polythene paper for three or four days. At the end of these days, the polythene paper was removed and bananas were put on a dry place to ripen completely. Well ripened medium banana finger retailed at Ksh 5 or $ 0.05 compared to Ksh 10 or $ 0.1 for three unripe ones.

Banana processing into products such as snacks and juices was on small scale and in the early years of establishment. Both banana snack and juice processing involved five similar preliminary or preparation steps (Figure 1). Upon harvesting, bananas were sorted to eliminate those of poor quality. After sorting, bananas were washed in clean water, dried and ripened. On ripening, the bananas were peeled and the main processing of juice and solar dried snacks proceeded. The main steps in solar dried banana snacks processing includes slicing, sun-drying and packaging ready for consumption markets (Figure 1).

![Figure 1. Banana Juice and Snack Processing](image)

Figure 1. Banana Juice and Snack Processing

Source: Mbuthia (2018)

Banana solar dried snack processing was conducted by a banana solar processing firm at a local trading centre (Mitunguu). The firm was established in January 2015 by a group of five banana farmers. These proprietors supplied bananas from their farms. By May 2015, the solar processing firm had its initial solar dried snacks in the market. The proprietors engaged themselves in marketing the snacks too. The take-up of processing and marketing activities by farmers or vertical integration is important in managing price risks for the producers. The shortening of the value chain means that the actors sharing the profit earned are reduced to the benefits of farmers. A study by Ouma and Jagwe (2010) found out that banana beer processing cottage industries in Central Africa were operated by traders. These traders acquired their bananas from wholesalers bulking from farmers.

As Figure 1 shows banana juice processing involved four main steps (homogenizing, digestion and de-aerating, filtration, and packaging in bottles). The juice processing was being undertaken by MBFC. An interview with the MBFC manager revealed that the cooperative began operating in the year 2014. Upon its establishment, the cooperative engaged itself in selling bananas on behalf of farmers either in raw form or after ripening. By the time of data collection for this study, the MBFC staff processed banana juice and were searching for a market. Moreover, in April 2015, the Meru Banana Farmers’ Cooperative management board members were trained on banana value addition (such as jam, purée, crisps) by experts from Jomo Kenyatta University of
Agriculture Technology (JNUAT). The banana value addition could prolong the shelf life of bananas, create more jobs in the sector and enhance domestic and international marketing. Lack of well-established banana value addition activities along the chain has been reported in other banana studies in Africa (for example, Kiiza et al. 2004; Mwangi and Mbaka, 2010; Ouma and Jagwe, 2010). Mwangi and Mbaka (2010) recommended that maximising banana value through improving packaging and labelling to differentiate products would promote competition. Ouma and Jagwe (2010) noted that banana beer processing in Central Africa – Rwanda, Burundi, and eastern Democratic Republic of Congo – was done using rudimentary techniques in cottage industries. Nevertheless 4 percent of the banana beer was exported to the regional markets.Kiiza et al. (2004) noted that whereas about 200 banana products such as juice, wine (tonjo), gin (waragi), banana pulp based bakery (kabalagala) among others exist in Uganda, only a few (for example, gin) were fully developed and industrialized. The other products were processed locally, in small scale and often in poor quality.

**Constraints**

The results of this study showed that banana farmers in Meru County face at least 17 constraints in their crop’s value chain (Table 2). Most of the constraints (12) concern production. Pests (nematodes and weevils) and diseases (ura - a bacteria wilt and sigatoka) was the most reported constraint (Table 2). The importance of pests and diseases is intertwined with infected conventional suckers and expensive tissue cultured (TC) plantlets (Ksh 120 or $ 1.2 per seedling). Plantlets were costly due to their scarcity in the study area following the back off by the government institutions such as JNUAT and Kenya Agricultural Research Institute (KARI) in the late 2000s from distributing seedlings in the County (Karembo, 2002; Muchui et al., 2013). The high prices of plantlets partly contributed to the high (96.4%) use of potentially infected suckers acquired from the farmer’s older banana stools or friends and neighbours. While all pests and diseases reduced the quality and quantity of bananas compromising the prices fetched, ura infected maize and beans too. The disease posed a threat to food sources for the households given that maize and beans are important food crops in the County.

<table>
<thead>
<tr>
<th>Constraints Faced by Banana Farmers, the Applied and Suggested Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constraints</td>
</tr>
<tr>
<td>Pests and diseases a</td>
</tr>
<tr>
<td>Inadequate water for irrigation b</td>
</tr>
<tr>
<td>Poor roads a, b</td>
</tr>
<tr>
<td>Low selling prices b</td>
</tr>
</tbody>
</table>

**Note.** - represents no action, a production-related constraints, b marketing-related constraints

Source: Mbuthia (2018)

As shown in Table 3, the average number of banana stools on each farm were 177. The number of stools however, varied from one sub-county to another. A statistical significance test of the observed variations was found to be significant, $F = 5.249, p = .001$ at .05 level. This difference in banana stools in the four sub counties may be partly due to availability of irrigation water. In Imenti North and Igembe South where water shortage was prevalent, 42.7% and 60.4% of the farms had less than 80 stools on their farms, respectively (Table 3). This meant that banana production in the two sub counties was low and did not break even in line with Qaim (1999).Qaim (1999) had observed that with 80 banana stools, a farmer could reap profits from banana farming. The finding on low banana production in parts of Meru County concurs with findings of earlier studies in Kenya (Karembo, 2002; Qaim, 1999).

<table>
<thead>
<tr>
<th>Table 3: Number of Banana Stools on Farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>County</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Number of Banana Stools</td>
</tr>
</tbody>
</table>

Majority of the farmers (94.5%) did not adhere to the recommended planting spacing of 4 x 4 m, 4 x 3 m, and 3 x 3 m for tall, medium and short varieties, respectively (Fruit Production Technical Handbook, 2011). Failure to observe the recommended spacing may be explained with respect to inadequate know-how on banana management and the limited extension services in Meru County as 83.6 percent of the farmers had not received any services from extension officers on banana farming. This observation concurs with findings by Miriti (2011) that majority (64%) of banana farmers in Imenti South had not received extension services for a period of one year.

Banana toppling was reported by 2.4 percent of the farmers (Table 2). Tall banana variety required stays upon fruition. Without the support, this variety was prone to tumble before maturing or harvesting. Toppled bananas acquired broken and bruised fingers. This meant that a farmer could not sell the banana or fetched low prices because of the defacement. Crop toppling, therefore, reduced the quality bananas, a problem reported by 0.8 percent of the traders. Apart from buying low quality bananas at low prices, such products were disqualified from high level domestic and international markets. The challenge of meeting quality demands has been reported in other agricultural studies (Keleman et al. 2009; Zamil and Cadilhon, 2009; Bolo, Lorika and K’Obonyo, 2011). Bolo et al., (2011) found out that dairy farmers in Kenya either used poor milk jars that easily got contaminated with bacteria or sold through brokers who diluted milk leading to failure to deliver quality milk to cooperatives. This observation may be explained by the farmers’ lack of knowhow on dairy farming. Keleman et al. (2009) established that buyers of criollo maize variety required that it should have 12 percent moisture, white- or cream-coloured, no insects, mould, or other signs of rot.

The requirement that maize be either white or cream coloured meant that farmers could not sell criollo of other colours though such varieties were readily produced. Zamil and Cadilhon (2009) noted that Mr. Abdul Kadir, the owner of Konika Mushroom Ltd, based in Mymensingh in Bangladesh demanded that mushrooms supplied to his company be fresh and clean, packaged in polyethylene bags bearing the label, ‘This mushroom is a product of the FAO-supported group Jhinuk Mushroom producer Group and marketed by Abdul Kadir of Konika Mushroom, Mymensingh’ and a date of packaging (Zamil and Cadilhon, 2009: 929). At times farmers harvested mushroom that were not fresh and Mr. Kadir advised them to dry for dry-mushroom market. Failure to meet the requirement for fresh mushroom costs the farmers a lot. For instance, a farmer needed ‘10 kilograms of fresh mushroom to make 1 kilogram of dry ones’ as well as repackage to sell to Konika Mushroom Ltd (Zamil and Cadilhon, 2009: 926).

This study revealed that more than a quarter of the farmers (33.1%) did not search for price information. Having farmers ignorant on the prevailing prices in banana markets denied them a baseline for determining prices. Thus, farmers were likely to be taken advantage of by traders as they would accept whatever prices offered for their crop. Such a scenario meant that as main actors along banana value chain, farmers were not reaping benefits for their activities. This finding agrees with other agricultural studies in developing nations (for example, Piper, 2007; Jaeger, 2010; Jeckonia, Mdoe and Nombo, 2013). Jeckonia et al. (2013) found out that onion farmers in Tanzania lacked reliable information on prices and availability of onions creating a chance to be exploited by brokers and middlemen. Piper (2007) and Jaeger (2010) note that farmers in developing nations lacked adequate knowledge on market information.

Of the farmers interviewed for this study, 66.9% sought price information. These farmers got information from different sources including; banana traders (35.7%), fellow farmers (19%), both traders and fellow farmers (7.3%),agribusiness officers (1%) and previous market prices (0.1%) among others. Whereas traders reportedly shared information on the prevailing market price at the national level with the farmers, the information given could not be authenticated since traders are largely after profit making. Contacting fellow farmers was likely to provide valid information on the market prices. The downside of this would be that such information would be limited to the local area. Apart from being a time-intensive process, information acquired during market visits was confined to local markets. This meant that such farmers were guided by narrow (local) rather than broad (national and international) sources of information in determining selling prices for bunches. Similar methods of acquiring market information have been documented in other studies (for example, Muendo, Tschirley and Weber, 2004; Onumah, Davis, Kleih, and Proctor, 2007; Mwitiwira, 2010). Muendo et al. (2004) established that market information around the boader markets in Kenya was mainly (92%) by word of mouth from friends, relatives and fellow business people. Mwitiwira (2010) noted that 60 percent and 71 percent of traders in Meru South and Mbeere, respectively relied on other traders.

The findings of this study revealed that low selling priceof banana was a concern for both farmers (10%) and traders (4%). An interview with the MBFC’s manager revealed that banana prices dropped to Ksh 150 or $ 1.5 from Ksh 500 or $ 5 between April and May, and November and February because avocados and mangoes are in season (S. Gikokunda, personal communication, 21 April 2015). Farmers and traders indicated that prices dipped more when buyers were few and a lot of bananas were available in the markets. Low selling prices deter farmers and traders from devoting themselves to banana farming and trading. Furthermore, use of infected suckers, presence of pests and diseases, inadequate know-how on crop management, toppling, limited price information, limited value addition, lack of a standard grading system and sales unit, lack of bargaining power, few buyers, long value chains, and competition with
alternative fruits (avocados and mangoes) work synergistically to make banana prices low.

There was no standard grading system and sale unit of bananas in Meru County. Majority of the farmers (70%) sold their bananas using bunch or *githukio* method. The bunch method involved an arbitrary determination of banana buying or selling price by either the buyer or farmer by merely considering the size of the bunch, the quantity of bananas in the market, number of buyers in the market, and the bargaining capability of the transacting parties. The subjectivity driving the bunch selling compounded; found out that majoritiy of male and female (73% and 53%, respectively) maize traders used dry weather roads which became impassable during rainy seasons. He further reported that other roads were dilapidated and poorly maintained. Mbuthia (2003) found out that muddy routes were highest rated (89%) constraint by rice farmers in Mwea Irrigation Scheme.

A few traders (4.6%) reported the problem of high transport costs. Traders particularly, those who bought bananas in large volumes reported that the means of transport from the Meru County to the selling destinations were not readily available. The traders pointed out that the transport providers were either unavailable or available but demanding high pay for the service. Transport charges depended on distances covered, means of transport used and the load size carried. In an attempt to overcome the challenge of lack of means of transport, several traders teamed up and approached the available transport providers and then negotiated for the service. Otherwise, the traders would have to wait, sometimes overnight until a transport provider was available.

Farmers and traders reported that the traditional method of ripening bananas did not achieve a homogenous ripening of all bananas and that some started rotting at the finger tips. Nevertheless, the continued to use the same method. The problem of rotting was more pronounced during cold months of July and August. Rotting lowered the quality of bananas and consequently the prices they attracted in the markets.

Use of poor methods of ripening bananas is not unique to Meru farmers and traders. Berhe, Puskur, Teka, Hoekstra and Tegegne (2008) noted that farmers in Metema District in Ethiopia used a trial and error method in ripening bananas. Initially, farmers put bananas in open wooden boxes leading to change of colour to black that put off consumers. To overcome the setback, farmers dug holes where they placed banana hands arranged in layers separated with green grass to cushion and hasten ripening for five days. Although better than the first method, bananas remained green in colour. To attain the yellow colour upon ripening, farmers applied a third method where bananas were kept above the ground in sacks and crates under shade. The sacks and crates were covered with hay, dry banana leaves and sometimes plastic sheeting for five to six days.

**Solutions to constraints**

The findings show that farmers applied a number of strategies to overcome various constraints (Table 2). Strategies such as application of ash and of elevating scare crows indicated that farmers use indigenous knowledge in an effort to improve banana production. While some of the strategies (for example, establishment of plantlet hardening nurseries on their farms – see Figure 2 and shoring up banana plants) used enhanced profits, others were detrimental (for example, planting of short and medium varieties and farm-gate selling). Planting of short and medium varieties, for instance disadvantaged farmers in bunch selling as the sizes of bunches they harvested were smaller than the tall varieties. Farm-gate selling on average fetched (Ksh
157 or $ 1.57) compared to (Ksh 223 or $ 2.23) the market sales. A statistical significant $t$ test yielded a significant difference in prices with $t = 29.135$ and $p < .000$ at .05 level. Thus, the hypothesis that there is no significant difference in prices fetched at the farm-gate and the market by farmers in Meru County was rejected in favour of the alternative.

Several of the strategies of overcoming constraints used by farmers such as hiring of workers and guards, increased production cost of bananas. Other solutions, for instance, selling bananas at farm-gate, exposed farmers to exploitation by buyers. The position of farmers was further complicated by methods used by traders to overcome the challenges they encountered. For example, to overcome rotting losses, 9.9 percent of traders who ripened bananas reduced the quantity they bought during cold seasons while 1.1 percent lowered the selling prices to attract buyers. These strategies by traders eventually affected the farmers’ activities in that they could not sell all their supplies and the selling price declined.

In dealing with the high transport costs, traders used two methods aimed at reducing banana volume. One of the methods involved wrapping together of two to three bunches (Figure 3). Whereas the transport charges for an average bunch from Meru to Nairobi was Ksh 40 or $ 0.4, transporting two or three bunches wrapped together cost Ksh 70 or $ 0.7. The other method necessitated the cutting of bunches into hands and packaging them in sacks, locally referred to as mutumba (Figure 4). One sack comprised of seven to nine medium sized banana bunches and was charged Ksh 80 or $ 0.8 on average to transport from Meru to Nairobi. These methods were however, not recommended for transporting bananas as they compromised the quality (Muchui et al., 2013).

Conclusion

Banana farming has enormous potential to benefit not only producers but other actors along the chain as well. However, several interdependent constraints that amplify each other, inherent in the chain, hinder the realization of the benefits. The constraints include; pests and diseases, small farms, high plantlet costs, inadequate irrigation water, inadequate know-how on banana management, low production, limited price information, limited value addition, lack of standard grading system and sales unit, low selling prices, poor and congested market facilities. It is therefore important that interventions be they from government and non-government bodies should cut across the chain and be implemented simultaneously to comprehensively address the constraints.

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Renovation and Performance Study of SPV Power Plant

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Abstract - The performance of a photovoltaic array implemented in the Block A Rooftop Solar Plant at National Institute of Solar Energy (NISE) which installed last 20 years ago is analyzed. This plant consists of 80 monocrystalline PV modules with a MPP power of 35 W under STC. This plant is divided into 4 parallel strings with each of 20 modules connected in series as string. The mismatch losses on different array configurations are analyzed firstly using measured IV characteristics for each module using a solar analyzer device, and secondly using MATLAB SIMULINK model. Infrared (IR) thermography testing is used for hot-spot detection, cell line checking is used for interconnect integrity and electroluminescence (EL) testing is used for detecting degradation of some modules.

Index Terms - PV module, Mismatch, MATLAB SIMULINK, NISE

I. INTRODUCTION

Mismatch losses (MML) are a very serious problem in photovoltaic modules and arrays because it causes the lower output power so the system efficiency and performance become lower. In photovoltaic module the mismatch losses occur when the configuration and parameters of one solar cell are different from the other cells. The impact of power loss due to mismatch depends on circuit configuration, operating point and parameter which are different from the remaining of the solar cells. There are two mismatch losses occur through series that are open circuit voltage and short circuit current. The mismatch effect occurs in short circuit current of series connected cells are relatively minor as compare to open circuit voltage [1]. The mismatch is related to the power losses of a solar cell, module, or plant operating under adverse conditions.

Different configurations of PV system modules connections are Total Cross-Tied (TCT), Series-Parallel (SP), Honey Comb (HB) and Bridge-Linked (BL). In TCT configuration, the row PV modules are firstly connected in parallel, and then connected in series forming the PV array. In SP configuration, to get PV strings, the modules are connected in series, and then these strings groups are connected in form of parallel forming the PV array. In the traditional TCT and SP configurations the interconnection operation of the PV modules normally is fixed [5]. The array configuration of SP and TCT are shown in Figure 1.

Series parallel and total cross tied configurations are investigated. Differences in simulated and measured module, string and array parameters are compared. The physical degradation of the PV modules is investigated using infrared thermography to detect hot spots; electroluminescence to detect micro-cracks, and interconnect integrity is checked using cell line checking. Measured and simulated mismatch losses for SP and TCT configuration are presented.

II. ANALYSIS OF ROOFTOP SOLAR PLANT

A. Analysis of using AMPROBE Solar Analyzer

The performance of PV modules was measured with AMPROBE Solar Analyzer, Solar-4000 measurement equipment. The characteristic curve measured by the SOLAR-4000 will be extrapolated to standard test conditions by using of the measured values of the sensor and then displayed.

Figure 1: SP and TCT array configurations [5]

Figure 2: AMPROBE Solar Analyzer [7]
In addition, the manufacturer’s STC ideal characteristic curve can be displayed as well using the integrated module database. The wireless sensor measures the cell temperature without direct contact, as well as the inclination angle and the irradiation in the solar module level. The measurement values are transmitted directly to the main device by radio signal. To measure the irradiation, the device switches the reference cell automatically from a monocrystalline to a polycrystalline cell. This equipment generates the curves corresponding to standard conditions of measurement STC (irradiance of 1000 W/m² and temperature of 25°C) in order to compare that results with other ones.

Every module was measured independently and then the whole system was measured, getting I-V and power curves with $V_{oc}$, $I_{sc}$, $P_m$, Fill Factor, Irradiance, and Module temperature, respectively. Figure 3 shows the measurement data of one module with AMPROBE solar analyzer and data extract in Excel.

![Figure 3: Extract measured data in Excel](image)

For the past 20 years each module has similar rated power with 35W for 80 modules. For the current retested measuring the average maximum power is around 30W, their maximum voltage ranges from 18.5 V to 21.42 V whereas current varies between 1.35 A and 2.5 A. Figure 4 shows the IV characteristics curve for each string by measuring AMPROBE solar analyzer. From these measuring: efficiency, series resistance $R_s$ and shunt resistance $R_{sh}$ of each module were calculated. The efficiency is calculated by

$$\eta = \frac{I_{max} \times V_{max}}{\text{Incident solar radiation} \times \text{Area of solar cell}}$$

$$= \frac{V_{oc} \times I_{sc} \times FF}{G \times A}$$

Eq (1)

By calculation which module is still best, good or low efficiency can be found. Figure 5 shows the total modules efficiency. From analyzing, the highest efficiency is 12.86 and the lowest efficiency is 4.0.

![Figure 5: Total module efficiency of each module](image)

B. Analysis of MATLAB SIMULINK Model

MATLAB SIMULINK model is used to compare the result of simulation and actual measurement data. Each string consists of 20 modules with series connection and 4 strings are connected to parallel connection. The results are shown with IV, PV curves and workspace. Figure 6 shows the MATLAB SIMULINK model for 80 modules simulation.

![Figure 6: SIMULINK Model for 20 modules x 4 strings](image)

C. Comparison of Actual and Simulation Measurements

Figure 7 shows the comparison of the actual measurement and simulation result of each string. In comparison of $P_{mp}$, string 1, 2 and 3 are not too much error but string 4 is a big error. And then, the comparison of $I_{sc}$, $I_{mp}$, $R_s$ and $R_{sh}$ of string 4 are also problems.
As in string 4, some module efficiencies are very low. String 1, 2, 3 and 4 are series connection of 20 modules. So the mismatch losses are mainly related with series PV modules connection. In total string, four strings are connected in parallel so the mismatch losses are less than series connection. Table 1 and 2 show the difference of simulation and actual measurement for 20 modules of string 1 and total four strings.

Table 1: String 1 compared result

<table>
<thead>
<tr>
<th>String 1</th>
<th>Amprobe Measurement</th>
<th>Simulation</th>
<th>Difference</th>
<th>% error</th>
</tr>
</thead>
<tbody>
<tr>
<td>I&lt;sub&gt;sc&lt;/sub&gt;</td>
<td>2.09</td>
<td>1.97</td>
<td>-0.12</td>
<td>-6.09</td>
</tr>
<tr>
<td>V&lt;sub&gt;oc&lt;/sub&gt;</td>
<td>411.76</td>
<td>415.00</td>
<td>+3.24</td>
<td>+0.78</td>
</tr>
</tbody>
</table>

Table 2: Total compared results (%)

<table>
<thead>
<tr>
<th>String 1 (%)</th>
<th>String 2 (%)</th>
<th>String 3 (%)</th>
<th>String 4 (%)</th>
<th>Total String</th>
</tr>
</thead>
<tbody>
<tr>
<td>I&lt;sub&gt;sc&lt;/sub&gt;</td>
<td>-6.09</td>
<td>+0.46</td>
<td>-4.78</td>
<td>+40.55</td>
</tr>
<tr>
<td>V&lt;sub&gt;oc&lt;/sub&gt;</td>
<td>+0.78</td>
<td>+7.87</td>
<td>+1.87</td>
<td>+4.74</td>
</tr>
<tr>
<td>I&lt;sub&gt;mp&lt;/sub&gt;</td>
<td>+2.30</td>
<td>+1.43</td>
<td>-2.55</td>
<td>+30.10</td>
</tr>
<tr>
<td>V&lt;sub&gt;mp&lt;/sub&gt;</td>
<td>-3.86</td>
<td>+7.81</td>
<td>+2.06</td>
<td>+22.91</td>
</tr>
<tr>
<td>R&lt;sub&gt;s&lt;/sub&gt;</td>
<td>+20.73</td>
<td>+17.66</td>
<td>+8.31</td>
<td>-414.75</td>
</tr>
<tr>
<td>R&lt;sub&gt;sh&lt;/sub&gt;</td>
<td>-35.75</td>
<td>-41.38</td>
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<td>-368.54</td>
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<tr>
<td>P&lt;sub&gt;mp&lt;/sub&gt;</td>
<td>-1.31</td>
<td>+9.13</td>
<td>-0.43</td>
<td>+46.11</td>
</tr>
</tbody>
</table>

D. Analysis of using Cell Line checker

In this analysis, to check the cell interconnection of the module cell line checker is used. “Cell Line Checker” is a tool based on non-contact method to identify and locate electrical failures in PV modules and systems. When a bad electrical connection is detected, the beeping sound stops and LEDs cease to flash. This corresponds to the location of failure. Figure 8 shows the checking of PV module by using cell line checker.

![Cell line checking of PV module](image)

E. Analysis of using EL and IR

To find the defects of PV modules, Infrared (IR) Thermography and Electroluminescence (EL) testing are used. EL imaging is very effective in detecting defects in module such as cracks, broken fingers and broken cell. EL is also a useful tool in identifying damaged or cracked cells which are responsible for cell mismatch in a module. So, some modules are measured in EL testing lab at NISE. Figure 9 shows EL image for some modules testing.

Figure 10 shows a typical IR image and its temperature histogram. Modules were also characterized using infra-red (IR) thermography, which shows the temperature distribution over the
module, and is particularly useful for identifying hot spots in the module, which can cause significant long-term degradation.

F. New Installation 18x4 strings
After checking with EL, IR and cell line checker, 8 modules have many defects. So these 8 modules are removed. And then the remaining modules are rearranged by current and new installation is step up and analyzed again. This new plant has 72 modules, 18 modules connect series per string and parallel these 4 strings. In this analysis, two interconnections of PV array configuration: serial-parallel (SP) and total-crossed tied (TCT) are modified. In Figure 11, SP connection are set up and compared with actual measurement and simulation results of each string. Table 3 shows the result data.

Table 3: Amprobe and simulation measurements data for SP Configuration

<table>
<thead>
<tr>
<th></th>
<th>I_{sc} (%)</th>
<th>V_{oc} (%)</th>
<th>I_{mp} (%)</th>
<th>P_{mp} (%)</th>
<th>R_s (%)</th>
<th>R_{sh} (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>string 1</td>
<td>3.77</td>
<td>0.76</td>
<td>3.06</td>
<td>4.82</td>
<td>-11.14</td>
<td>-76.01</td>
</tr>
<tr>
<td>string 2</td>
<td>2.68</td>
<td>1.43</td>
<td>6.53</td>
<td>7.26</td>
<td>0.13</td>
<td>55.28</td>
</tr>
<tr>
<td>string 3</td>
<td>4.23</td>
<td>0.86</td>
<td>3.31</td>
<td>3.67</td>
<td>12.91</td>
<td>-8.20</td>
</tr>
<tr>
<td>string 4</td>
<td>5.67</td>
<td>0.65</td>
<td>2.84</td>
<td>4.09</td>
<td>37.99</td>
<td>-71.99</td>
</tr>
<tr>
<td>Total</td>
<td>3.68</td>
<td>1.97</td>
<td>4.31</td>
<td>8.31</td>
<td>13.69</td>
<td>-11.54</td>
</tr>
</tbody>
</table>

III. DISCUSSION
When average maximum power of 30W PV modules are used to get the maximum power 2.4 kW for 20 x 4 array and 2.16 kW for 18 x 4 array at STC condition. This analysis is based on 20 years used PV modules. Mismatch losses of the array are then calculated by equation (2).

Table 5: Mismatch losses of the array

<table>
<thead>
<tr>
<th></th>
<th>20x4 SP</th>
<th>18x 4 SP</th>
<th>18x 4 TCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amprobe measurement MML (%)</td>
<td>13.94</td>
<td>11.41</td>
<td>7.8</td>
</tr>
<tr>
<td>Simulation MML (%)</td>
<td>11.15</td>
<td>3.39</td>
<td>2.92</td>
</tr>
</tbody>
</table>
Table 5 shows the MML for each configuration. Measured mismatch losses are reduced from 11.41% in series-parallel configuration to 7.8% in total cross tied. By this result, reinstallation of TCT configuration is better performance.

\[ \text{MML} = 1 - \frac{\sum_{i=1}^{N} P_{\text{maxi}}}{N \cdot P_{\text{max} \text{-array}}} \]  
Eq (2)

![Mismatch Losses](image)

Figure 13: Mismatch losses for old and new installations

<table>
<thead>
<tr>
<th>Parameter</th>
<th>New value</th>
<th>Average Current value</th>
<th>% Change</th>
<th>Degradation rate (%/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P_{\text{max}} ) (W)</td>
<td>35</td>
<td>30</td>
<td>-14.29</td>
<td>-0.71</td>
</tr>
<tr>
<td>( V_{\text{oc}} ) (V)</td>
<td>21.6</td>
<td>20.7</td>
<td>-4.17</td>
<td>-0.42</td>
</tr>
<tr>
<td>( I_{\text{sc}} ) (A)</td>
<td>2.4</td>
<td>2.17</td>
<td>-10.6</td>
<td>-0.53</td>
</tr>
<tr>
<td>( V_{\text{mp}} ) (V)</td>
<td>16.4</td>
<td>15.7</td>
<td>-4.27</td>
<td>-0.21</td>
</tr>
<tr>
<td>( I_{\text{mp}} ) (A)</td>
<td>2.1</td>
<td>1.9</td>
<td>-9.52</td>
<td>-0.48</td>
</tr>
</tbody>
</table>

Mismatch losses are reduced in TCT configuration but method involves greater cost and greater complexity. Infrared (IR) thermography testing is useful for identifying hot spot of the modules, which cause significant long term degradation. EL testing images detect micro-cracks of the modules. That causes power degradation.

**ACKNOWLEDGEMENTS**

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[8] www.toami-elec.co.jp

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Duct Design of Assembly Hall at Mandalay Technological University

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Abstract- It is intended to air-condition the internal space of the Assembly Hall at Mandalay Technological University (MTU). The main objective of air conditioning is for human comfort and the preservation of equipment. The unit thus consists of refrigeration system, the control system, electrical protection system, air circulation system and ventilation (fresh air damper) exhaust system. The most important function to install an air-conditioning system is to calculate the cooling load and duct design of the Assembly Hall at MTU. But this paper analyses duct design for required air distribution of designed space. After a series of calculation and designing the outcome was a possible solution for an optimum ducting system for our hall. The proposed design is compatible only for Assembly Hall at MTU, but the same design procedures are applicable to large ducting systems in skyscrapers and factories.

Index Terms- Air-condition, Assembly Hall, Duct design, Friction losses, Latent Heat, Sensible Heat.

I. INTRODUCTION

People appreciate the relief from discomfort afforded by a modern air conditioning system. Air conditioning, by its very name, means treating or conditioning of air to alter its temperature and moisture content to suit specific requirements [1]. Besides using in summer, it may use an air conditioning in winter for heating.

Air conditioning is used for maintaining conditions:
1) Suitable for human comfort or
2) Required by a product or process [2].

Air conditioning of office buildings, auditoriums, homes, classrooms, automobile, railway coaches, etc. is meant for maintaining comfort conditions for the occupants. In addition to the control of temperature and relative humidity, it is necessary to maintain proper air circulation and a low dust level in the conditioned space. Other typical applications of air conditioning include industrial purposes such as, watch assembly shops, telephone manufacturing, chemical industry, tool rooms, jig boring machine rooms, pharmaceutical industry, telephone exchanges, computer rooms, laboratories [3].

This paper relates the dry bulb, wet bulb and dew point temperature of air with its sensible, latent and total heats, and presents a theory of adiabatic saturation. Ducts are used in heating, ventilation, and air conditioning (HVAC) to deliver and remove air. These needed airflows include, for example, supply air, return air, and exhaust air. Ducts also deliver, most commonly as part of the supply air, ventilation air. As such, air ducts are one method of ensuring acceptable indoor air quality as well as thermal comfort [4].

In summer, the weather is very hot in Myanmar. In this condition, the students, guests and staffs are not comfortable being in the Assembly Hall. So it is required a comfort condition in the Assembly Hall at Mandalay Technological University.

II. DESIGN CONDITION OF ASSEMBLY HALL

Outside condition
- Dry bulb temperature = 43 °C
- Wet bulb temperature = 28 °C
- Relative humidity = 30%
- Specific humidity, = 0.0175 kg/kg dry air

Inside condition
- Dry bulb temperature = 25 °C
- Relative humidity = 50%
- Specific humidity, = 0.01 kg/kg dry air
Location: 22° N Latitude and 96° 32’ E Longitude
Side of space: 36.5760 m × 12.1920 m × 7.9248 m
Daily range: 30 °C to 43 °C = 13 °C
Occupancy: 400
Electric fluorescent: 16 × 80W and 4 × 40W (factor = 1.5)
Electric halogen light: 4 × 1000 W (factor = 1)
Plaster on inside wall: 1.5 cm
Outside wall construction: 20 cm concrete block
Floor construction: 60 cm concrete
Roof construction: 0.3 cm zinc
Ceiling construction: 0.5 cm plywood
Density: Brick: 2000 kg/m³
Concrete: 1900 kg/m³
Plaster: 1885 kg/m³
Asbestos board: 520 kg/m³
Glass: Single glass
Doors; South: 2 × (1.4478 m × 2.0754 m)
East: 0.8 m × 2.0754 m
West: 0.8 m × 2.0754 m
Bypass factor of cooling coil: 0.15 (assume)

III. HEAT GAIN SOURCES

The interior of the building gains from a number of several of sources. If the temperature and humidity of air in rooms are to be maintained at a comfortable level, heat must be extracted to offset these heat gains. The net amount of heat that is removed, is called cooling load. [2]

The components contribute to room heat gain consist of the following items.

<table>
<thead>
<tr>
<th>Items</th>
<th>Sensible heat, Q_S</th>
<th>Latent heat, Q_L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat gain through exterior structure</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Transmission gain through interior structure</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Infiltration and outside air</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Internal gain</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Miscellaneous gain</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Outside air through apparatus</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Grand total heat = 229948.4369 W = 65.4006 TR
Effective sensible heat factor = ERSHG/ERTHG = 127525.2550/159290.9969 = 0.8

From psychometric chart,

Apparatus dew point temperature = 11˚C
Assuming; BF = 0.2

Supply (CMM)_{min} = \frac{ERSHG (kW)}{0.0204(t_i - t_{ADP})} = \frac{127.5253}{0.0204(25-11)} = 446.5172 CMM \approx 447 CMM

Supply temperature, t_s = \frac{ERSHG}{0.0204 (CMM)} = \frac{127.5253}{0.0204(447)} = 13.9˚C

CMM supply = \frac{ERSHG (kW)}{0.0204(t_i - t_s)} = \frac{127.5253}{0.0204(25-11)} = 563.1748 CMM \approx 564 CMM

Resulting entering and leaving conditions at apparatus;

Entering temperature, t_1 = t_i + \frac{CMM_{sa}}{CMM_{ta}} (t_o - t_i) = 25 + \frac{112}{564} (43 - 25) = 28.6˚C
Leaving temperature, \( t_2 = t_{ADP} + BF (t_1- t_{ADP}) = 11 + 0.2(28.6-11) = 14.52^\circ C \)

IV. DUCT DESIGN RESULTS FOR HALL

Figure 1. Duct design plan for hall

For Supply Duct,
Supply CMM = 564 CMM
Number of diffuser = 22
Capacity for each diffuser = 564/22
≈ 26 CMM

By Equal Friction Method
Example: Fan to A
Supply air = 564 CMM
From Table,
Velocity = 390 m/min [5]
Duct area = \( \frac{564}{390} = 1.4462 \) m²

From Table, choose a duct size (150 cm × 100 cm) for area 1.4415 m².[5]
Equivalent round duct diameter = 133.3 cm
Aspect ratio = \( \frac{150}{100} = 1.5:1 \)

Duct sizes and lengths for the supply ducts are shown in Table 2 and 3.

### Table 2. Duct Sizing Calculation Results Form for Supply Duct

<table>
<thead>
<tr>
<th>Duct section</th>
<th>Air quantity CMM</th>
<th>CMM Capacity (%)</th>
<th>Duct area (%)</th>
<th>Duct area (sq.m)</th>
<th>Equivalent round duct dia. (cm)</th>
<th>Rectangular duct (cm × cm)</th>
<th>Aspect ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan to A</td>
<td>564</td>
<td>100</td>
<td>100</td>
<td>1.4462</td>
<td>133.3</td>
<td>150 × 100</td>
<td>1.5:1</td>
</tr>
<tr>
<td>A to B</td>
<td>512</td>
<td>91</td>
<td>40.5</td>
<td>0.5857</td>
<td>87</td>
<td>85 × 75</td>
<td>1.13:1</td>
</tr>
<tr>
<td>B to C</td>
<td>460</td>
<td>82</td>
<td>36</td>
<td>0.5206</td>
<td>82</td>
<td>75 × 75</td>
<td>1:1</td>
</tr>
<tr>
<td>C to D</td>
<td>408</td>
<td>72</td>
<td>33</td>
<td>0.4772</td>
<td>79</td>
<td>75 × 70</td>
<td>1.1:1</td>
</tr>
<tr>
<td>D to E</td>
<td>356</td>
<td>63</td>
<td>30</td>
<td>0.4339</td>
<td>76.5</td>
<td>70 × 70</td>
<td>1:1</td>
</tr>
<tr>
<td>E to F</td>
<td>304</td>
<td>54</td>
<td>26</td>
<td>0.3760</td>
<td>71</td>
<td>65 × 65</td>
<td>1:1</td>
</tr>
<tr>
<td>F to G</td>
<td>252</td>
<td>45</td>
<td>22.5</td>
<td>0.3254</td>
<td>65.5</td>
<td>60 × 60</td>
<td>1:1</td>
</tr>
<tr>
<td>G to H</td>
<td>200</td>
<td>36</td>
<td>19</td>
<td>0.2748</td>
<td>60.3</td>
<td>55 × 55</td>
<td>1:1</td>
</tr>
<tr>
<td>H to I</td>
<td>148</td>
<td>26</td>
<td>15</td>
<td>0.2169</td>
<td>54.8</td>
<td>50 × 50</td>
<td>1:1</td>
</tr>
<tr>
<td>I to J</td>
<td>96</td>
<td>17</td>
<td>10.5</td>
<td>0.1519</td>
<td>43.8</td>
<td>40 × 40</td>
<td>1:1</td>
</tr>
<tr>
<td>J to K</td>
<td>44</td>
<td>8</td>
<td>4.5</td>
<td>0.0651</td>
<td>32.8</td>
<td>30 × 30</td>
<td>1:1</td>
</tr>
<tr>
<td>K to L</td>
<td>26</td>
<td>5</td>
<td>3</td>
<td>0.0434</td>
<td>24.5</td>
<td>25 × 20</td>
<td>1.25:1</td>
</tr>
</tbody>
</table>
Table 3. Equivalent Length Calculation Form for Supply Duct

<table>
<thead>
<tr>
<th>Duct section</th>
<th>Item</th>
<th>Length (m)</th>
<th>Additional equivalent length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan to A</td>
<td>Duct</td>
<td>3.576</td>
<td></td>
</tr>
<tr>
<td>A to B</td>
<td>Duct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>B to C</td>
<td>Duct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>C to D</td>
<td>Duct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>D to E</td>
<td>Duct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>E to F</td>
<td>Duct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>F to G</td>
<td>Duct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>G to H</td>
<td>Duct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>H to I</td>
<td>Duct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>I to J</td>
<td>Duct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>J to K</td>
<td>Duct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>K to L</td>
<td>Elbow</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diffuser</td>
<td>3.5</td>
<td>4.5</td>
</tr>
</tbody>
</table>

For Return Duct,

Supply CMM = 447 CMM

Number of diffuser = 27

Capacity for each diffuser = \( \frac{447}{27} = 16.556 \text{ CMM} \approx 17 \text{ CMM} \)

By Equal Friction Method

Fan to 1

Supply air = 447 CMM

CMM capacity percent = 100%

Velocity = 330 m/min [5]

Duct area = \( \frac{447}{330} = 1.3545 \text{ m}^2 \)

From Table, choose a duct size (145 cm × 100 cm) for area 1.3950 m².[5]

Equivalent round duct diameter = 131 cm

Aspect ratio = \( \frac{145}{100} = 1.45 : 1 \)

Table 4 and 5 illustrate designed data for the Return Duct.

Table 4. Equivalent Length Calculation Form for Return Duct

<table>
<thead>
<tr>
<th>Duct section</th>
<th>Item</th>
<th>Length (m)</th>
<th>Additional equivalent length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5. Duct Sizing Calculation Results Form for Return Duct

<table>
<thead>
<tr>
<th>Duct section</th>
<th>Air quantity CMM</th>
<th>CMM Capacity (%)</th>
<th>Duct area (%)</th>
<th>Duct area (sq.m)</th>
<th>Equivalent round duct dia: (cm)</th>
<th>Rectangular duct (cm × cm)</th>
<th>Aspect ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan to 1</td>
<td>447</td>
<td>100</td>
<td>100</td>
<td>1.3545</td>
<td>131</td>
<td>145 × 100</td>
<td>1.45 : 1</td>
</tr>
<tr>
<td>1 to 2</td>
<td>430</td>
<td>96</td>
<td>42</td>
<td>0.5689</td>
<td>84.5</td>
<td>80 × 75</td>
<td>1.07 : 1</td>
</tr>
<tr>
<td>2 to 3</td>
<td>413</td>
<td>92</td>
<td>40.5</td>
<td>0.5486</td>
<td>84.5</td>
<td>80 × 34</td>
<td>1.07 : 1</td>
</tr>
<tr>
<td>3 to 4</td>
<td>396</td>
<td>89</td>
<td>39</td>
<td>0.5283</td>
<td>82</td>
<td>75 × 75</td>
<td>1 : 1</td>
</tr>
<tr>
<td>4 to 5</td>
<td>379</td>
<td>85</td>
<td>37.5</td>
<td>0.5079</td>
<td>79</td>
<td>75 × 70</td>
<td>1.07 : 1</td>
</tr>
<tr>
<td>5 to 6</td>
<td>362</td>
<td>81</td>
<td>36</td>
<td>0.4876</td>
<td>79</td>
<td>70 × 70</td>
<td>1 : 1</td>
</tr>
<tr>
<td>6 to 7</td>
<td>345</td>
<td>77</td>
<td>35</td>
<td>0.4741</td>
<td>76.5</td>
<td>70 × 65</td>
<td>1.08 : 1</td>
</tr>
<tr>
<td>7 to 8</td>
<td>328</td>
<td>74</td>
<td>33.5</td>
<td>0.4538</td>
<td>76.5</td>
<td>70 × 65</td>
<td>1 : 1</td>
</tr>
<tr>
<td>8 to 9</td>
<td>311</td>
<td>70</td>
<td>32</td>
<td>0.4334</td>
<td>73.8</td>
<td>70 × 65</td>
<td>1.08 : 1</td>
</tr>
<tr>
<td>9 to 10</td>
<td>294</td>
<td>66</td>
<td>30.5</td>
<td>0.4131</td>
<td>73.8</td>
<td>70 × 65</td>
<td>1.08 : 1</td>
</tr>
<tr>
<td>10 to 11</td>
<td>277</td>
<td>62</td>
<td>29.5</td>
<td>0.3996</td>
<td>71</td>
<td>65 × 65</td>
<td>1 : 1</td>
</tr>
<tr>
<td>11 to 12</td>
<td>260</td>
<td>58</td>
<td>27.5</td>
<td>0.3725</td>
<td>68</td>
<td>65 × 60</td>
<td>1.08 : 1</td>
</tr>
<tr>
<td>12 to 13</td>
<td>243</td>
<td>54</td>
<td>26.5</td>
<td>0.3589</td>
<td>68</td>
<td>65 × 60</td>
<td>1.08 : 1</td>
</tr>
<tr>
<td>13 to 14</td>
<td>226</td>
<td>51</td>
<td>25</td>
<td>0.3386</td>
<td>65.5</td>
<td>60 × 60</td>
<td>1 : 1</td>
</tr>
<tr>
<td>14 to 15</td>
<td>209</td>
<td>47</td>
<td>23.5</td>
<td>0.3183</td>
<td>62.8</td>
<td>60 × 55</td>
<td>1.09 : 1</td>
</tr>
<tr>
<td>15 to 16</td>
<td>192</td>
<td>43</td>
<td>22</td>
<td>0.2980</td>
<td>62.8</td>
<td>60 × 55</td>
<td>1.09 : 1</td>
</tr>
<tr>
<td>16 to 17</td>
<td>175</td>
<td>39</td>
<td>20.5</td>
<td>0.2777</td>
<td>60.3</td>
<td>55 × 55</td>
<td>1 : 1</td>
</tr>
<tr>
<td>17 to 18</td>
<td>158</td>
<td>35</td>
<td>19</td>
<td>0.2573</td>
<td>57.3</td>
<td>55 × 50</td>
<td>1.1 : 1</td>
</tr>
<tr>
<td>18 to 19</td>
<td>141</td>
<td>32</td>
<td>17.5</td>
<td>0.2370</td>
<td>54.8</td>
<td>50 × 50</td>
<td>1 : 1</td>
</tr>
<tr>
<td>19 to 20</td>
<td>124</td>
<td>28</td>
<td>15</td>
<td>0.2032</td>
<td>51.8</td>
<td>50 × 45</td>
<td>1.1 : 1</td>
</tr>
<tr>
<td>20 to 21</td>
<td>107</td>
<td>24</td>
<td>14</td>
<td>0.1896</td>
<td>49.3</td>
<td>45 × 45</td>
<td>1 : 1</td>
</tr>
<tr>
<td>21 to 22</td>
<td>90</td>
<td>20</td>
<td>12</td>
<td>0.1625</td>
<td>46.3</td>
<td>45 × 40</td>
<td>1.12 : 1</td>
</tr>
<tr>
<td>22 to 23</td>
<td>73</td>
<td>16</td>
<td>10.5</td>
<td>0.1422</td>
<td>43.8</td>
<td>40 × 40</td>
<td>1 : 1</td>
</tr>
<tr>
<td>23 to 24</td>
<td>56</td>
<td>13</td>
<td>8</td>
<td>0.1084</td>
<td>38.3</td>
<td>35 × 35</td>
<td>1 : 1</td>
</tr>
<tr>
<td>24 to 25</td>
<td>39</td>
<td>9</td>
<td>6</td>
<td>0.0813</td>
<td>32.8</td>
<td>30 × 30</td>
<td>1 : 1</td>
</tr>
<tr>
<td>25 to 26</td>
<td>22</td>
<td>5</td>
<td>3</td>
<td>0.0406</td>
<td>24.5</td>
<td>25 × 20</td>
<td>1.25 : 1</td>
</tr>
<tr>
<td>26 to 27</td>
<td>17</td>
<td>4</td>
<td>2.5</td>
<td>0.0339</td>
<td>24.5</td>
<td>25 × 20</td>
<td>1.25 : 1</td>
</tr>
</tbody>
</table>

V. CONCLUSION

Design of duct for Assembly Hall at MTU was presented in this paper. Cooling load capacity of this hall was found to be 65 tons, supply air 564 CMM, entering temperature was 28.6˚C, and leaving temperature was 14.52˚C. For duct design, equal friction method was used for supply duct design and return duct design. The supply air for each duct section and duct layout was calculated. To achieve adequate supply air distribution, the supply air CMM for outlet was divided by area proportions method. The reduction of duct section should be carefully designed. In this particular design, return duct was necessary because the fan was not located adjacent
to the space to be cooled and doors are closed throughout. In conclusion, this duct design can be applied in the implementation of air-conditioning system in MTU’s Assembly Hall.
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Second Author – Tin Min Soe, Lecturer, Technological University (Kyaukse) and tinminsoe77@gmail.com
Impeller Design of Centrifugal Blower for 40 kW Wood Chips Gasifier

Tin Min Soe, Lwin Myo

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Abstract- Impeller design plays an important role in manufacturing centrifugal blowers because, without proper design, the blowers cannot function effectively. This paper presents design of the 12-blade backward-curved impeller to be used in the centrifugal blower for 40 kW wood chips gasifier. Design is mainly focused for the single-stage impeller. Required design parameters (such as impeller dimensions, blade shape, vane angle, number of blades for centrifugal blower) of the proposed impeller are calculated and the results are shown in this paper.

Index Terms- Blade, Blower, Gasifier, Impeller

I. INTRODUCTION

The application and use of centrifugal pumps and blowers today are universal. Nowadays, local made centrifugal pumps and blowers are widely used in factories, farm machinery, gasifiers and other buildings in Myanmar. Gas-pumping turbomachinery is composed at a wide variety of machines such as fans, blowers, and compressors. All of them are gas compressed and moved by dynamic action of rotating vanes of impellers which impact velocity and pressure to flow gas.

The majority of all pumps, blowers and compressors may be classified as reciprocating rotary or centrifugal. Reciprocating and rotary blowers or pumps do not permit free flow of fluid through the blower except for leakage past close-fitting parts, and are called “positive-displacement” blowers [1].

A centrifugal pump or blower consists essential of one or more impeller equipped with vanes, mounted on a rotating shaft and enclosed by a casing. Fluid enters the impeller axially near the shaft and has energy, both kinetic and potential, imparted to it by the vanes. As the fluid leaves the impeller at a relatively high velocity, it is collected in a volute or series of diffusing passages which transforms the kinetic energy into pressure. This is, of course, accompanied decrease in the velocity. After the conversion is accomplished the fluid is discharged from the machine.

Centrifugal pumps and blowers are fundamentally high speed machines (compared with the reciprocating, rotary, or displacement type) [2]. The recent advances in steam turbine, electric motor, and high speed gearing design have greatly increased their use and application. As the centrifugal machines have been developed, they have had to complete with the already established reciprocating units.

II. TYPES OF BLOWER

The term blower generally used for high pressure fans or low pressure compressor. The great variety of blowers built for various applications may be reduced to a few basic hydraulic types. Every blower consists of two principal parts. The first principal is an impeller or lobed rotors, which force the gas into rotary motion by impelling action of the vanes. The second principal is casing, which directs the gas to the impeller and leads it away at a higher pressure. Before the gas leaves the casing its velocity is reduced and partially converted into pressure by diffuser action. These are several methods of converting the velocity of gas issuing from the impeller.

In general, blowers can be separated into two types:

1) Turbo type machines  
2) Positive-displacement type machines [3].

Turbo type machines that transfer energy from rotor to fluid via dynamic action, acceleration, deceleration, and motion in radial force field includes radial flow blowers sometimes called centrifugal blowers and axial flow blowers.

Positive-displacement machines type that fluid is drawn or forced into a finite space bounded by mechanical parts and is then sealed in it by some mechanical means consist of only roots blowers (lobed impeller).

III. BASIC THEORY OF BLOWER

The path and velocity of a fluid particle flowing through the impeller would appear to be quite different to an observer standing on the ground, than it would to one station inside the rotating impeller, if that were possible. The velocity of the particle relative to the
ground is called absolute; the velocity relative to the impeller is called relative [4]. It is important to understand thoroughly these two types of velocities and the relationships between them.

For a fluid flowing through a rotating impeller, \(u\) is the velocity of a point on the impeller relative to the ground, \(V\) is the absolute velocity of a fluid particle flowing through the impeller relative to the ground, and \(v\) is the velocity of a fluid particle relative to the impeller.

Assuming that the flow takes place in a plane, i.e., that it is two-dimensional, and that the fluid follows the impeller vanes exactly, the inlet and outlet triangles of velocities for an impeller having backward curved vanes are shown in Figure 1.

![Figure 1: Inlet and Outlet Velocity Diagrams of an Impeller Having Backward-Curved Vanes [1]](image)

The angle between \(V\) and \(u\) is called \(\alpha\); the angle between \(v\) and \(u\) extended (negative \(u\)) is \(\beta\) and it is the angle made by tangent to the impeller vane and a line in the direction of motion of the vane. These angles are shown on the Figure 2, as well as \(V_r\) which is the radial component of the absolute velocity \(V\). The simplified inlet and outlet diagrams of these velocities for the impeller are shown in Figure 3.2. Note that \(V_u\) is the tangential component of \(V\) and equals \(V \cos \alpha\).

![Figure 2. Virtual Inlet and Outlet Velocity Diagrams of the Impeller [1]](image)

IV. DESIGN CALCULATION OF THE PROPOSED IMPELLER

The centrifugal blower for gasifier is to run at 2500 r.p.m. and handle 882.75 c.f.m. (25 m³/min) of gas i.e. 14.7125 c.f.s. at 26°C (78.8°F) i.e. 538.8° R and 14.7 psi absolute with a discharge pressure of 0.3317 psi (250 mmH₂O).

Overall pressure ratio: \(\epsilon_p = \frac{14.7 + 0.3317}{14.7} = 1.0226\)

\(\epsilon_p = 0.283 - 1 = 6.3348 \times 10^{-3}\)

Total adiabatic head: \(H_{ad} = \frac{RT_a}{0.283} \left(\frac{0.283}{\epsilon_p} - 1\right) = \frac{55.23 \times 538.8}{0.283} \times 6.3348 \times 10^{-3} = 666.11\) ft (203.03 m)

where carbon monoxide gas constant: \(R = 55.23\) ft lb/ lbm°R

Specific weight of gas: \(\gamma = \frac{P_a}{RT_a} = \frac{144 \times 14.7}{55.23 \times 538.8} = 0.0711\) lb/ft³

Weight flow: \(W = \frac{Q\gamma}{60} = \frac{882.75 \times 0.0711}{60} = 1.0466\) lb/sec

Adiabatic horsepower: \(hp = \frac{wH_{ad}}{550} = \frac{1.0466 \times 666.11}{550} = 1.27\) hp
A. Impeller Inlet Dimensions and Vane Angle

Assume a velocity through the impeller eye \( V_0 \) of 65 ft/sec.

Velocity head:

\[
V_0^2 = \frac{65^2}{2 \times 32.2} = 65.61 \text{ ft}
\]

\[
\frac{0.283}{\eta_p} - 1 = \frac{0.283 \times H}{RT_a} = \frac{0.283 \times 65.61}{55.23 \times 538.8} = 6.2396 \times 10^{-4}
\]

\[
\frac{0.283}{\eta_p} = 1.0006; \quad \eta_p = 1.0022
\]

\[
P_0 = \frac{14.7}{\eta_p} = 14.7 \times 1.0022 = 14.67 \text{ lb/in}^2
\]

\[
T_0 = \frac{T_a}{0.283} = \frac{538.8}{1.0006} = 538.5^\circ \text{ R}
\]

The specific weight of the gas in the impeller eye:

\[
\gamma_0 = \frac{P_0}{RT_0} = \frac{144 \times 14.67}{55.23 \times 538.8} = 0.0710 \text{ lb/ft}^3
\]

Volume flow through impeller eye:

\[
Q_0 = \frac{w}{\gamma_0} = \frac{1.0466}{0.0710} = 14.74 \text{ ft}^3/\text{sec}
\]

The shaft diameter \( D_s \) is based upon the critical speed and deflection. The shaft diameter \( D_s \) is made 1.5 inches. The hub diameter \( D_H \) may then be taken as 3 inches.

The impeller eye diameter:

\[
D_0 = \frac{4 \times 144 \times Q_0}{\pi V_0} + D_H^2 \quad = \quad \frac{4 \times 144 \times 14.74}{65} + 3^2 = 7.11 \text{ in.}
\]

So \( D_0 = 7 \text{ in.} \) may be used.

The vane inlet diameter \( D_1 \) may be made slightly greater than the eye diameter, so \( D_1 \) is taken as 7.5 inches.

Inlet tip speed:

\[
u_1 = \frac{\pi D_1 N}{720} = \frac{\pi \times 7.5 \times 2500}{720} = 81.81 \text{ ft/sec}
\]

The inlet velocity is assumed to be radial; i.e., \( V_1 = V_{sl} \), and is made slightly greater than \( V_0 \), so \( V_1 \) is 70 ft/sec.

The tangent of the inlet angle:

\[
\tan \beta_1 = \frac{V_1}{u_1} = \frac{70}{81.81} = 0.8556
\]

This should be increased by about 3 percent to care for the contraction of the steam at the inlet: 1.03 \times 0.8556 = 0.8813. Then

\[
\beta_1 = \tan^{-1} (0.8813) = 41.39^\circ \quad (41^\circ \ 23')
\]

Relative inlet velocity:

\[
v_1 = \sqrt{u_1^2 + V_1^2} = \sqrt{81.81^2 + 70^2} = 107.67 \text{ ft/sec}
\]

In calculating the impeller areas, the flow must be increased about 10 percent because of leakage past the impeller.

Impeller inlet area:

\[
A_1 = \frac{1.1 \times Q_0 \times 144}{V_1} = \frac{1.1 \times 14.74 \times 144}{70} = 33.35 \text{ in}^2
\]

Assuming the vane thickness factor \( \varepsilon_1 \) of 0.9 and the impeller inlet width is

\[
b_1 = \frac{A_1}{\pi D_1 \varepsilon_1} = \frac{33.35}{\pi \times 7.5 \times 0.9} = 1.6 \text{ in}
\]
B. Impeller Outlet Dimensions and Vane Angle

The outside diameter of the impeller is found from Equation after assuming the value of K’. The overall pressure coefficient K’ may be between 0.5 and 0.65. Take the value of K’ = 0.575.

Outside diameter of impeller: 
\[ D_2 = \frac{1300 \times \sqrt{H}}{N \sqrt{K}} = \frac{1300 \times \sqrt{666.11}}{2500 \times \sqrt{0.575}} = 17.7 \text{ in} \]

Therefore, \( D_2 \) is taken as 18 in.

The outlet vane angle, \( \beta_2 \) of 55° is assumed.

The number of blade:

\[ Z = 6.5 \times \frac{D_2 + D_1}{D_2 - D_1} \times \sin \frac{\beta_1 + \beta_2}{2} = 6.5 \times \frac{18 + 7.5}{18 - 7.5} \times \sin \frac{41.39 + 55}{2} = 11.77 \]

So the number of blade may be used 12 vanes.

The radial outlet velocity \( V_{r2} \) is made less than the inlet velocity \( V_1 \) and may be taken as 45 ft/sec.

The impeller tip speed:
\[ u_2 = \frac{\pi D_2 N}{720} = \frac{\pi \times 18 \times 2500}{720} = 196.35 \text{ ft/sec} \]

\[ V_{u2} = u_2 - \frac{V_{z2}}{\tan \beta_2} = 196.35 - \frac{45}{\tan 55} = 164.84 \text{ ft/sec} \]

\[ W_z = u_2 \times \frac{\pi \times \sin \beta_2}{12} = 196.35 \times \frac{\pi \times \sin 55}{12} = 42.11 \text{ ft/sec} \]

\[ V_{u2} = V_{u2} - W_z = 164.84 - 42.11 = 122.73 \text{ ft/sec} \]

\[ V_2 = \sqrt{V_{u2}^2 - V_{z2}^2} = \sqrt{45^2 + 164.84^2} = 170.87 \text{ ft/sec} \]

\[ V_2' = \sqrt{V_{u2}^2 - V_{z2}^2} = \sqrt{45^2 + 122.73^2} = 130.72 \text{ ft/sec} \]

\[ v_2 = V_{z2}^2 + (u_2 - V_{z2})^2 = \sqrt{45^2 + (196.35 - 164.84)^2} = 54.94 \text{ ft/sec} \]

\[ \tan \alpha'_z = \frac{V_2'}{V_{u2}} = \frac{45}{122.73} = 0.3607; \quad \alpha'_z = 20.14^\circ (20^\circ 8') \]

\[ W_{z2} = 42.11 \]

\[ v_{2z} = 170.37 \]

\[ V_{2z} = 130.37 \]

\[ V_{u2} = 122.73 \]

\[ V_{z2} = 45 \]

\[ u_2 = 196.55 \]

\[ \alpha_z = 20.14 \]

\[ \beta_z = 55 \]

\[ \beta_2 = 55 \]

\[ \gamma_2 = 122.73 \]

\[ \gamma_{2z} = 170.37 \]

\[ \gamma_{z2} = 54.94 \]

Figure 3: Outlet Velocity Diagram

The outlet velocity diagram for impeller is shown in Figure 3.

The virtual pressure head developed in the impeller is:

\[ H_{vir,z,p} = \frac{1}{2g} \left( u_2^2 - u_1^2 + v_1^2 - v_2^2 \right) = \frac{1}{2 \times 32.2} \times \left( 196.35^2 - 81.81^2 + 107.67^2 - 54.94^2 \right) = 627.87 \text{ ft} \]

It may be assumed that, owing to the circulatory flow, friction, and turbulence in the impeller, 10 percent of this head is lost. Hence the effective head is

\[ H_{eff} = 0.9 \times 627.87 \; \text{= 565.08 ft} \]

\[ \varepsilon_p \frac{0.283}{-1} = \frac{0.283 \times H_{eff}}{RT_0} \; \text{= 0.283 \times 565.08 = 5.377 \times 10^{-3} \; ; \; \varepsilon_p \; = 1.0191} \]

Impeller outlet pressure:

\[ P_2 = \varepsilon_p \times P_0 \; \text{= 1.0191 \times 14.67 \; = 14.95 lb/in^2} \]

The friction and turbulence losses will be transformed into heat which raises the temperature of the gas. The outlet temperature may be based upon the adiabatic head in the impeller neglecting losses.
\[ \varepsilon_p = 0.283^{1-0.283} = 0.283 \times 627.87 = 5.9744 \times 10^{-3} \]

The outlet temperature: 
\[ T_2 = T_0 \times \varepsilon_p = 538.5 \times 1.0060 = 541.72^\circ R \]

The outlet specific weight: 
\[ \gamma_2 = \frac{P_2}{RT_2} = 144 \times 14.95 = 0.0720 \text{ lb/ft}^3 \]

The flow leaving the impeller: 
\[ Q_2 = \left( \frac{1.1 \times w}{\gamma_2} \right) = 15.99 \text{ ft}^3/\text{sec} \]

The net impeller outlet area: 
\[ A_2 = \frac{144 \times Q_2}{V_{r2}} = 51.17 \text{ in}^2 \]

Assuming the vane thickness be 1/8 inches, the outlet vane thickness factor:
\[ \varepsilon_2 = \frac{\pi D_2 - \frac{Zt}{\sin \beta_2}}{2 \pi D_2} = \frac{\pi \times 18 - 12 \times 0.125}{\sin 55 \times \pi} = 0.968 \]

The impeller outlet width: 
\[ b_2 = \frac{A_2}{\pi D_2 \varepsilon_2} = \frac{51.17}{\pi \times 18 \times 0.968} = 0.935 \text{ in} \]

The vane thickness factor at the inlet: 
\[ \varepsilon_1 = \frac{75 \times \pi - 12 \times 0.125}{\sin 41.39 \times 7.5 \times \pi} = 0.9 \]

The vane thickness factor at the inlet \( \varepsilon_1 \) is nearly equal to the previous assumed value.

So, the impeller inlet width: 
\[ b_1 = \frac{A_1}{\pi D_1 \varepsilon_1} = \frac{33.35}{\pi \times 7.5 \times 0.9} = 1.6 \text{ in} \]

Summary of calculated data for the designed impeller is stated in Table I and calculated data for blade shape is described in Table II. Then Figure 4 illustrates the complete vane design in polar coordinates. And Figure 5 depicts detail drawing of 12 blades backward-curve impeller.

<table>
<thead>
<tr>
<th>Data</th>
<th>Units</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft diameter (D_s)</td>
<td>in.</td>
<td>1.5</td>
</tr>
<tr>
<td>Hub diameter (D_H)</td>
<td>in.</td>
<td>3</td>
</tr>
<tr>
<td>Eye diameter (D_0)</td>
<td>in.</td>
<td>7</td>
</tr>
<tr>
<td>Eye velocity (V_0)</td>
<td>ft/sec</td>
<td>65</td>
</tr>
<tr>
<td>Flow through eye (Q_0)</td>
<td>ft^3/sec</td>
<td>14.74</td>
</tr>
<tr>
<td>Vane inlet diameter (D_i)</td>
<td>in.</td>
<td>7</td>
</tr>
<tr>
<td>Velocity at vane inlet (V_1)</td>
<td>ft/sec</td>
<td>70</td>
</tr>
<tr>
<td>Impeller inlet width (b_1)</td>
<td>in.</td>
<td>1.6</td>
</tr>
<tr>
<td>Inlet vane angle (\beta_1)</td>
<td>degree</td>
<td>41.39</td>
</tr>
<tr>
<td>Inlet vane thickness factor (\varepsilon_1)</td>
<td></td>
<td>0.9</td>
</tr>
<tr>
<td>Number of vanes</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>Inlet tip speed (u_1)</td>
<td>ft/sec</td>
<td>81.81</td>
</tr>
<tr>
<td>Outlet diameter of impeller (D_2)</td>
<td>in.</td>
<td>18</td>
</tr>
<tr>
<td>Radial outlet velocity (V_r2)</td>
<td>ft/sec</td>
<td>45</td>
</tr>
<tr>
<td>Impeller outlet width (b_2)</td>
<td>in.</td>
<td>0.94</td>
</tr>
</tbody>
</table>
Outlet vane thickness factor ($e_1$) | - | 0.97
---|---|---
Impeller outlet tip speed ($u_2$) | ft/sec | 196.35
Vane outlet angle ($\beta_2$) | degree | 55
Absolute outlet velocity ($V_2$) | ft/sec | 130.72
Flow from impeller outlet ($Q_2$) | ft$^3$/sec | 15.99

Table II. Data for Blade Shape

<table>
<thead>
<tr>
<th>Ring</th>
<th>R</th>
<th>$\beta$</th>
<th>$\tan \beta$</th>
<th>$\frac{1}{R \tan \beta}$</th>
<th>$\frac{1}{R \tan \beta}$</th>
<th>$\Delta R$</th>
<th>$\frac{\Delta R}{R \tan \beta}$</th>
<th>$\Delta \theta^0$</th>
<th>$\theta^0$</th>
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<tbody>
<tr>
<td>1</td>
<td>3.75</td>
<td>41.00°</td>
<td>0.8693</td>
<td>0.307</td>
<td></td>
<td>0.255</td>
<td>1.5</td>
<td>0.3825</td>
<td>21.92</td>
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<tr>
<td>b</td>
<td>5.25</td>
<td>43.25°</td>
<td>0.9407</td>
<td>0.202</td>
<td></td>
<td>0.169</td>
<td>1.75</td>
<td>0.2958</td>
<td>16.95</td>
</tr>
<tr>
<td>c</td>
<td>7.00</td>
<td>46.50°</td>
<td>1.0538</td>
<td>0.136</td>
<td></td>
<td>0.119</td>
<td>1.25</td>
<td>0.1488</td>
<td>8.53</td>
</tr>
<tr>
<td>d</td>
<td>8.25</td>
<td>50.25°</td>
<td>1.2024</td>
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<td>0.090</td>
<td>0.75</td>
<td>0.0675</td>
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<tr>
<td>2</td>
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<td>55.00°</td>
<td>1.4281</td>
<td>0.078</td>
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</tbody>
</table>

Figure 4: Vane Design Using Polar Coordinate

Figure 5: 12 Blades Backward-curved Impeller
V. CONCLUSION

In this paper, the single-stage impeller was designed for the centrifugal blower used in 40 kW wood-chips gasifier. The calculation of impeller consisted of the determinations of overall dimensions, such as inlet and outlet diameter, vane angle, and number of blades and blade shape. Finally, the designed impeller was a 12-blade backward-curved one. This impeller design was considered for centrifugal blowers which run at 2500 rpm. In conclusion, this impeller can be applied in the centrifugal blower for 40 kW wood-chips gasifier.

REFERENCES

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The Role and Functions of Civil Society in Countries Affected by Armed Conflict

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PhD candidate

Abstract- Nowadays there are different definitions of civil war, or there are attempts to separate it from some other phenomena such as terrorism or armed conflicts of low intensity. They are often linked to a particular ideology, as well as the political consequences that an armed conflict would have if it was characterized as a civil war. International law requires that the conditions under which certain phenomena can be called a civil war arise from the Geneva Convention. Such wars are one of the reasons why humanity today suffers, and especially the countries of the third world, primarily because of mutual knowledge of the warring parties and hatred. All this causes thousands of victims, thousands of missing persons, rape of women, large migrations, and the destruction of civilian and cultural sights and historical monuments, which was the case in civil wars from South Sudan, through Somalia to Angola. Civil society and its engagement are important actors in peace building processes. As such, it is fundamentally focused on building and strengthening civil society, especially in countries experiencing armed conflicts. In such environments, civil society plays an important role in reducing violence and easing the conditions necessary for building a sustainable peace. However, despite the increasing emphasis on the role of civil society in peace building, little systematic research has been undertaken to empirically support this assumption. Some studies have shown the relevance of the seven functions of civil society that differ in different phases of the conflict. Although there has been a significant increase in peace building initiatives with the strengthening of civil society, these initiatives have not been followed by systematic research programs. As a result, we know little about the role of civil society in peace building, including its potential contribution to reducing violence, ending armed conflicts, and building sustainable peace thereafter. The effectiveness of civil society varies considerably from function to function. When implemented, civil society functions such as protection, monitoring, advocacy and relief were often very effective. In contrast, efforts aimed at socialization and social cohesion have generally had a very low level of efficiency in terms of reducing violence, contributing to agreements and maintaining peace. This is due to the way in which most of the initiatives within these functions have been implemented, as well as the way in which certain factors influenced them. Solving various conflicting lines within societies is a matter of preventing violence. The fact that armed conflict drastically changes the lives of all people, at all levels, with individual changes in attitudes and behavior (for example, questions of trust and mistrust), causes economic and social changes, with the final changes in the power relations in communities, regions and society as a whole.

Index Terms- civil war, civil society, armed conflict

I. INTRODUCTION

The civil society and its stakeholders have become important in development cooperation, at least since the mid-1980s. This change started with increased participation of voluntary agencies or non-governmental organizations (NGOs) within the framework of development cooperation. This can be attributed mainly to the neoliberal model of development (Debiel and Sticht, 2005) in the 1980s, which prompted a very skeptical attitude towards state and favored the privatization of state goods and infrastructure services. Civil society and its engagement are important actors in peace-building processes. As such, it is fundamentally focused on building and strengthening civil society, especially in countries experiencing armed conflicts. In such environments, civil society plays an important role in reducing violence and easing the conditions necessary for building a sustainable peace (Glassius, 2004). However, despite this growing emphasis on the role of civil society in peace building, little systematic research has been undertaken to empirically support this assumption. Some studies have shown the relevance of the seven functions of civil society that differ in different phases of the conflict. With the proliferation of armed conflicts in the 1990s, and the increasingly complex peace-building efforts facing the international community, peace-building is increasingly focused on the potential role of civil society. Although there has been a significant increase in peace-building initiatives with the strengthening of civil society, these initiatives have not been followed by systematic research programs. As a result, we know little about the role of civil society in peace-building, including its potential contribution to reducing violence, ending armed conflicts, and building sustainable peace thereafter (Abiw and Keating, 2004). Citizens' participation in political decision-making is the basic concept of functional democracies. Civil society therefore has an extremely important role in democratic societies. This is equally reflected in the discourse of international cooperation. Armed conflict constitutes a fundamental obstacle to the development of every society. During and after the conflict, high expectations are placed on the de-escalating power of civil society and its contribution to sustainable peace. From this perspective, citizens, communities and civil society organizations are perceived as key
actors in overcoming the existing lines of conflict, and organized violence. With the spread of the conflict in the 1990s and increasing the complexity of peace-building efforts to deal with the international community, including significant failures such as those done on Somalia and Rwanda, the peace-building discussion has increasingly focused on the potential role of civil society. This led to a massive increase in peace-building initiatives in civil society, but, interestingly, did not fit researchers and debates about the nexus between civil society and peace building. To date, there has been little systematic analysis of the specific role of civil engagement and civil society in the context of armed conflicts, and even less in terms of its potential, constraints and critical factors.

II. THE RELATIONSHIP WITH THE INTERNATIONAL COMMUNITY TOWARDS CIVILIANS DURING ARMED CONFLICTS

Throughout history, the battles led to large, remote settlements the poles where the armies measured their strengths. So, the term is a battlefield in that time was geographically limited, while the destruction was limited by range then the weapon. The civilians in the occupied area also had time to recover escape the enemy, even though they were not spared the plunder the invasion of the hostile army. Somewhat paradoxically, but with the development of new technologies and the type of weapons, the methods of warfare change, and civilians are increasingly “involved” in the events of the war and more and more directly affected by the hostilities. The fact that armed conflict drastically changes the lives of all people, at all levels, with individual changes in attitudes and behavior (for example, questions of trust and mistrust), causes economic and social changes, with the final changes in the power relations in communities, regions and society as a whole. The relationship that exists with the international community towards civilians and their facilities during armed conflicts taking place in the territory where these facilities are located and where those civilians live is viewed from the legal point of view. The above issues are multifaceted in a socially relevant and significant manner. The role of the international organization of the protection of civilians and their facilities is a sensitive political issue, due to the different views of the parties involved in armed conflicts, the one in power and the one who wants the government to take over. Therefore, both sides are referring to the regularity of their attitudes, and additional influence is created by states that do not participate in the conflicts. The regularity or irregularity of warring parties in the civil war is not in the scope of our research, but it shows the degree of protection of the rights of civilians and their property within the Geneva Convention. Therefore, the rights of civilians in this situation are mainly related to the interest of the politicization of another state, as there are examples throughout history. The United Nations has adopted a charter in which Article 4, paragraph 2 states that it does not propagate the application of armed conflicts among states. However, this regulation did not define armed conflicts within the country itself. Therefore, such conflicts within the country are led by groups of people who carry out various activities such as protests, armed rebellions against the state, provoking disorder within the state, plundering property, which in the end can result in a civil war, all of which significantly weakens the state in all fields, endangering social peace and stability. The emergence of armed conflicts in the country itself is mainly of interest that can be apparent or covert, and in which different elements such as religion, tribal affiliation, different political attitudes, economic interests, ethnic conflicts, etc. are used as a cause. Nowadays there are different definitions of civil war, or there are attempts to separate it from some other phenomena such as terrorism or armed conflicts of low intensity. They are very often related to a certain ideology, as well as the political consequences that a particular armed conflict would have if it was characterized as a civil war. International law requires that the conditions under which certain phenomena can be called a civil war arise from the Geneva Convention. Such wars are one of the reasons why humanity today suffers, and especially the countries of the third world, primarily because of mutual knowledge of the warring parties, mutual hatred, all of which causes thousands of victims, thousands of missing persons, rape of women, large migrations, demolition of civilian and cultural sights and historical monuments, which was the case in civil wars from South Sudan, via Somalia to Angola and Libya. Civil war does not leave any less consequence than the war between the two countries, because in the civil war, the number of dead civilians is high. Although cruelty is almost always present in wars, it cannot be denied that old civilizations such as China, India and some African people, and then adhered to certain humane principles during armed conflicts, and religion had a powerful impact on the application of human principles in armed conflicts, such as changing and providing care to opponents, eating and accommodation of these soldiers, and so on (Schmidt, 2000). French thinker Jean Jacques Rousseau in his book emphasizes that it is necessary to make a distinction between civilians and warriors, which is the main thesis of Human International Law. In practice, countless times it has been confirmed that the war is not affecting only the warring fighters, but also civilians and their facilities. However, although there are similarities in the position of civilians and their facilities in various armed conflicts between countries, international law has not seriously taken into account the position of civilians in the event of a civil war. International conflicts have been in the focus of international law since the 19th century, which is not the case with a civil war, where it took a lot of time, victims, and suffering to take this type of war conflict into serious consideration. The main reason for the long period of undefined civil war relations under international law is that they cannot clearly distinguish warriors from insurgents, because the countries are sovereign, and every other country has a different opinion on a country affected by the civil war. The organization that played a key role in these wars is the Red Cross, with its founder of Swiss origin Henry Donan, who propagated aid to the victims of each war. At the very beginning, the Red Cross organization had narrow-minded activities, but despite numerous problems and risks, it remained consistent with its parole, which puts human victims at risk in front of every risk. On August 12, 1949, the fourth Geneva Convention was signed, which represented a revolution in the field of humanitarian international law. Then, for the first time, a special article on armed conflicts...
within the state was adopted, the third joint member, but developments in the world and the emergence of new technologies have shown that there are many shortcomings in the laws that were adopted at that time. Due to the process of globalization and transition, the Red Cross played a significant role in the preparation of two additional protocols for the Fourth Geneva Convention, 10. juna1977. years. The first protocol relates to armed conflicts between countries, and puts other emphasis on internal conflicts, ie war. We are especially interested in another protocol because it sets two parallel systems of international protection for people. The first system is applied in the events of a civil war emphasizing the conditions for the third common member to apply. The most important thing is that citizens and their facilities are maximally protected in these armed conflicts. The international community's contribution to the protection of civil rights in armed conflicts was modest, but it should be emphasized that a positive impact on civilisation was achieved, however, since many countries adopted these laws, and in addition to the conflict-affected sides, they took all into account the protection of civilians and their facilities. In order for the implementation of the Convention to be widely and widely accepted by all countries, it is necessary to create an environment that guarantees the enforcement of all the laws in force.

III. CONCLUSION

The complexity and dynamics of political, economic and social processes in the modern world require governments to be and state institutions quickly adapt to change and react readily in different (crisis) situations. Inclusion of citizens and their associations in the process of formulating and implementing (practical) policies to which the country responds to different challenges is one of the prerequisites for this. The effectiveness of representative democracy, news on the principles of the division of power, free elections and multi-party system, is increased by the introduction the principle of participatory democracy. Participatory democracy implies the permanent involvement of citizens in the processes of managing public affairs, and not just at the time of the election, when their participation is reduced to selecting the holders of power at different levels. This type of democracy implies that citizens have at their disposal different mechanisms that allow them to express their needs or attitudes on certain topics. These attitudes are then translated into practical policies. Citizens, therefore, have the right to ask, know and be informed about all decisions and processes affecting their lives. It should also be borne in mind that citizens are those who pay state administration, and that it has an obligation to act in accordance with the guidelines and priorities established by them. With the spread of the conflict in the 1990s and the increasing efforts to build the peace of the international community, stakeholders and peace-building discourse were increasingly focusing on the potential role of civil society. This has led to a massive increase in peace-building initiatives in civil society. There is a systematic analysis of the specific role of civil engagement and civil society in the context of an armed conflict, but less in terms of its potential, constraints and critical factors. Our work provides an overview of the notion of civil society and understanding in different contexts. He creates an analytical framework of the functions of civil society arising from the theory of democracy, discourse on development and knowledge of the case study, which in turn applies to the context of peace building. The theory and practice of peace-building is analyzed in terms of the functions of civil society and their importance, scope and content. The results show that the very existence and support of civil society does not automatically lead to peace-building.

A good understanding of the role of civil society and peace-building potential is needed. It is also important to recognize that certain roles and functions of civil society vary depending on the conflict phases and may not all be equally relevant and effective at all stages of the conflict. Nevertheless, civil society plays an important role in building peace. Based on the analysis of the functions of civil society, this paper concludes that civil society can make a significant contribution to peace-building in the short term, but also in the medium term and in the long run. Democracy research shows that civil society played a key role in democratic transition in Eastern Europe. The most visible result of peace-building in civil society shows a direct correlation between the involvement of civil society in peace negotiations and the sustainability of the agreement, the greater the participation of civil society, it is more likely that the peace agreement will be sustainable. It seems that the most important role of civil society in peacebuilding is advocacy, especially in terms of safeguarding civil society's votes and bringing important peace-building questions. Other civil society roles are also important for peace-building, in particular monitoring respect for human rights as it contributes to the protection of civil society and through joint activities that can build ties between divided societies.

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Specific Design Considerations for Cloud Accounting Mobile Apps

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Abstract- In the era of rapid application development which emphasizes heavily the rapid prototyping and iterative delivery, it is imperative that software developers take the time to properly plan the software development phases. With the emergence of cloud computing and mobile cloud computing software developers are tempted to jump in and write code without planning. This practice can lead to resource waste, thus making the use of software development methodologies an imperative. This paper proposes five UML diagram models for a cloud accounting app.

Index Terms- cloud computing, SOA, QoS, IaaS, PaaS, SaaS, MDE, DSML

I. INTRODUCTION

Considered by authors such as Huang et al. (2013), a consequence of virtualization development and software oriented architecture (SOA), cloud computing revolutionized the IT industry by facilitating access to infrastructure and software based on a subscription (Garg et al., 2012). As a result, more and more IT companies have begun to offer cloud services to their customers. The difficulty consumers face when choosing a cloud computing service provider is amplified, on the one hand, by the multitude of existing providers on the market, and on the other by the lack of a framework that allows them to evaluate different vendors based on type of service offered and its quality (Quality of Service - QoS).

As early as 2011, cloud computing technology has confirmed its promising platform status for providing the following services: service-based infrastructure (IaaS), PaaS and SaaS, cloud serving centers state-of-the-art data with a virtual service network architecture (hardware, database, interface, applications) so developers have the ability to deploy and access applications globally at competitive prices correlated with user requirements specified in QoS (Ferry et al., 2013).

II. SOFTWARE DEVELOPMENT METHODOLOGIES COMPATIBLE WITH CLOUD COMPUTING TECHNOLOGY

Service-Oriented Software Architecture (SOA) is a design and implementation model based on discrete software features that provide application functionality as services to other applications. SOA is independent of any vendor, product, or technology.

SOA and cloud computing share some similar features, both focusing on the concept of service. The basic element of SOA is a service-oriented software, cloud computing being an extension of the IT infrastructure for the SOA concept. Because it has all the computing resources (including hardware and software), cloud computing is a much more efficient and economical choice than the SOA architecture. SOA is much more strategic and abstraction, while cloud computing is more tactical and specific. Cloud features enrich and extend content based on cloud computing resource and service sharing.

On the other hand, SOA and cloud computing are complementary. Cloud computing provides remote cloud services that are available for SOA, and SOA provides the way for composing cloud services that are required for business applications. At the same time, points of interest are different. SOA focuses on designing the system that adopts service architecture, focusing on how services are being processed, reuse, agility, while cloud computing focuses on providing and using services, focusing on how services are delivered and virtualized, on their dynamic prolongation on demand, on resources and services.

Because the current context of cloud computing includes a multitude of cloud providers as well as several IaaS and PaaS solutions, Ferry et al. (2013) support the idea that cloud infrastructure is exposed to application developers through software packages located in layers of SaaS and PaaS designed to support the creation and deployment of applications.

To serve this purpose, the development of scalable architectures and application development environments for creating, accessing, managing, deploying, and maintaining cloud applications in a way that is as accessible to developers has become critical because of the ability to run and manage multi-cloud lets you exploit the specificity of each cloud solution and therefore optimize the performance, availability and cost of applications.
Cloud computing technology is attractive, especially for small and medium sized businesses, because it allows them to focus on the consumption or service delivery on the top of the cloud infrastructure. At a high level, cloud computing does not seem radically different from the other existing paradigms: WorldWideWeb, grid computing, service computing and cluster computing. However, the key differentiators of cloud computing are its technical features, such as on demand-shared or fast elasticity, self-service, almost infinite scalability, end-to-end virtualization support, and robust support for resource monetization and billing used. In addition, non-technical differentiators include the services that are offered in the pay-as-you-go model, service level agreement (SLA), rapid implementation, lower pre-cost, low maintenance and reduced environmental impact.

The following limitations are usually encountered when programming apps for a cloud computing environment:

- Knowledge of different types of cloud resources is required and this usually relies on procedural programming or scripting languages;
- Interaction with cloud resources is primarily accomplished through low-level APIs and command line interfaces;
- SaaS deployment depends on the programming environments supported by IaaS and PaaS providers;
- Lack of flexibility and efficiency to support generic applications that can run simultaneously on multiple cloud infrastructures. Therefore, it is clear that the development of system architecture and application development environments that can simplify and improve the cloud programming task are essential to harnessing their capacity.

Cloud software distribution is subject to security breaches, privacy abuses, and access control violations. Illegal copying, malware manipulation and other violations of cloud-based services, applications, and data are examples of security threats, intimacy, and trust.

To address access control issues, Yu et al. (2011) in the paper titled „A Novel Watermarking Method for Software Protection in the Cloud”, identifies an internal access control threat that is not completely eliminated by common encryption techniques, cryptographic signatures, and access control labels. The authors address this threat by using the software watermarking. Ensuring privacy is essential and has become one of the most relevant issues because in the absence of this, users may eventually lose confidence and passion for implementing virtualized cloud-based applications (CPUs, storage, databases, etc.).

However, cloud-based IT solutions are usually deployed on heterogeneous clouds and the features offered are often incompatible. This diversity prevents proper exploitation of the full potential of cloud computing as it hinders interoperability and promotes provider lock-in, and increases the complexity of developing and managing multi-cloud systems. Applying techniques and techniques based on advanced engineering models (MDEs) would be appropriate to tamper with this complexity.

MDE (Model-Driven Engineering) is a software engineering branch that aims to improve the productivity, quality and cost-effectiveness of software development by switching from the code-based paradigm to the model-based modeling. This approach, which is usually summed up by the expression "model once, generates from anywhere," is particularly relevant to reduce the complexity of the development methodology of complex systems such as multi-cloud systems. Models and modeling languages as the main artifacts of the development process allow developers to work at a high level of abstraction, focusing on cloud issues rather than on implementation details. Transforming the model as a primary technique to wholly or partly generate software discourages developers from repetitive and error-prone tasks.

Domain-specific modeling languages (DSMLs) provide abstractions and notations that allow for straightforward and understandable expression of domain concepts instead of encoding them in a lower-level programming language.

Unified Modeling Language (UML) is a family of graphical notation supported by a single meta-model that helps in the design of information systems, especially systems using object oriented programming languages. UML's usefulness in the development of information systems is that it is independent of any programming language.

III. DESIGNING A CLOUD ACCOUNTING APP USING UML

According to Wikipedia, UML is “a general-purpose, developmental, modeling language in the field of software engineering, that is intended to provide a standard way to visualize the design of a system”. Its creation was initially motivated by the desire to standardize notation systems and various software design approaches.

UML is not a development method by itself, but it was however designed to be comparable with OMT, the Booch method and RUP. UML has two major categories of diagrams. The first category represents structural information while the other category represents behavior and interactions.

This paper’s focus will be the presentation of the behavior and structure diagrams, with examples for a cloud computing app.

A. USE CASE DIAGRAM

A use case diagram shows a collection of usage cases and actors that:

- provides a general description of how the system will be used
- provides an overview of the functionality that the system wants to offer
- shows how it interacts with the system with one or more actors
When designing a cloud accounting app, the development team should take into consideration two different end user perspectives. The two end user perspectives the author is referring to are the app manager and the day-to-day user.

As can be observed in Figure 1, from the cloud-based application manager's perspective, the use case diagram can be represented as follows:

![Use case diagram from app admin perspective](image)

**Figure 1: Use case diagram from app admin perspective**

The client interacts with the app admin when sending requests and when receiving the contract. The app admin is the actor that receives all client requests, evaluates them and then approves or rejects them. Also, he is the one that can add new users and create their account once the contract proposal has been accepted and signed by the client.

In the case of a cloud accounting app, the “client” that the author referred to above becomes the “accountant”. The “accountant” actor is the one that interacts with the partners, which can be internal – such as employees – or external – such as suppliers and customers. The accountant’s role is to receive documents from the partners, verify them, return them if they do not meet all validity criteria or initiate the creation of all applicable accounting operations. The “accountant” actor is the one that adds all the new partners, the one that updates the chart of accounts, the one that creates accounting operations which will represent the basis for the monthly reports and financial statements. The management can fundament the decisional process after consulting the financial statements.

From the user's perspective, the use case diagram can be presented as follows in Figure 2:
B. CLASS DIAGRAM

The class diagram describes the static structure of the information system by presenting the classes of the system, its attributes, methods and relations between objects.

Figure 3 presents the class diagram for the accounting operations. The classes are represented by boxes which contain three compartments, as follows:

- the top section contains the name of the class
- the middle section contains the attributes of the class
- the bottom section contains the operations that can be executed by the class

The “AccountingOperation” and “Operation” classes are associated. The same applies for the “Document” and “Operation” classes and for the “Account” and “Initial balance” classes. The “Ledger” class cannot exist without the “Operation” class, the relationship between those two classes is known as “Composition”. The same applies for the “Credit” and “Operation” classes and for the “Debit” and “Operation” classes.
C. ACTIVITY DIAGRAM

The activity diagram describes the sequence of operational activities of the components of a system.

Figure 4 presents the activity diagram for the entire app. The rounded rectangles represent the actions, the diamonds represent the decisions, the bars represent the start or the end of concurrent activities. The black circle at the start represents the initial node of the workflow and the encircled black dot represents the final node of the workflow. In this case, the workflow starts when documents are received. The next action is to verify the documents. This step is followed by a decision: if the document does not meet the standards, it must be returned and if the document does meet the standards the system can proceed to register the operation.
Figure 5 presents the activity diagram for the “SumOfCredit” operation. After the initial node, the app faces a decision. If the SumOfCredit is greater or equal than SumOfDebit, then the next activity is to calculate the CreditBalance which will be equal to the difference between SumOfCredit and SumOfDebit. If SumOfCredit is however lesser than SumOfDebit, then the CreditBalance is zero. After the app computes the CreditBalance value it also reaches the final node.
IV. CONCLUSION

All reliable software solutions require a solid and thorough foundation of planning and clear, precise communication among the team members and the final users during all stages of the product’s development. The main point of this paper is to highlight the importance of using UML diagrams to better visualize user interactions, processes and the system’s structure when designing apps that will run in a cloud environment.

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Abstract- This paper describes the design and construction of low power audio amplifier. In the construction of this amplifier, microphone preamplifier, tone preamplifier and output power amplifier. The output power amplifier is constructed by using class AB push pull amplifier. The input can come directly from the microphone or similar device and typical 4Ω/5W speakers are output. The signal output is clean with no distortion up to certain audio levels, but some distortion occurs at higher levels. The Multisim Software is used for the construction of audio amplifier.

Index Terms- audio amplifier, class A, class AB push pull amplifier, Multisim Software

I. INTRODUCTION

The push pull amplifier drives the current using with two identical BJTs or MOSFETs. One is used as a source and the other is used as a sink and then through the load. The signal is amplified into 180° out of phase by preamplifier. The advantages of push pull amplifier are low distortion, cancellation of power supply ripples and absence of magnetic saturation in the coupling transformer core [3].

In this paper, BJTs Class AB push pull amplifier is used. This amplifier has an efficiency rating between that of Class A and Class B but poorer signal reproduction than Class A amplifiers. BJT is controlled by the input base current. The cost and the losses of the BJT is much lower cost than FET. BJT can give low current and low voltage supply. BJT is good in amplification. But when FET is used, it can give high current and high voltage supply. FET is not good in amplification. To get the high power, FET can be used [1].

II. OPERATION PRINCIPLE

The circuit is constructed of four distinct components: the power supply, the volume control, preamplifier Stage and tone preamplifier stage which functions to amplify the voltage signal, a Class AB Power Amplifier Stage which increases the current output stage. See figure1 for a block diagram.

Microphone Preamplifier is to pre amplifies the audio signals from the microphone device. Tone Preamplifier is to lift and cut the low frequency and high frequency of the signal. Output Amplifier is to get the better sound force to the output power amplifier from the audio signals. Output Power Amplifier is to amplify the audio signals and to produce the necessary amount of watts. Sound signal Indicator is to indicate the volume of sounds. Three BC 547 transistors Q6, Q1 and Q2 are wired as preamplifier and Q4TIP 41C and Q3TIP 42C together for driving the speaker.

The pre-amplifier section of this circuit is based around transistor Q6, Q1 and Q2 which forms a class A amplifier reduces the noise performance of the circuit is improved. A complementary class AB push pull stage is built around the Q3 and Q4 speaker. Diodes D1 and D2 bias the complementary pair and ensure the proper operation of Q2 drives the push pull pair and its base is directly coupled to the collector of transistor. Other essential features include the use of two diodes to provide thermal stability, and some bias adjustments to give minimum distortion. The advantages of Class AB amplifier are no cross over distortion, high fidelity and low harmonic distortion. These amplifiers are most suitable for low power applications.

Transistor Q6, Q1 and Q2 driver transistor is a class A voltage amplifier fed with a variable amplitude audio signal from the input via the volume control VR1. Bias for Q1 is provided via the potential divider R4, Vr1 & R11 from the transistor of Q3 and Q4 emitters, which will be at half of the supply voltage.
III. System Design

A. Preamplifier Stage

In preamplifier stage, we select BC547 transistor. The required bias resistors are needed to select. So the calculation steps are follows.

When \( V_{cc} = 12 \, V \), \( V_c = V_{cc}/2 = 6V \)
From BC547 datasheet, \( I_c = 2 \, mA \), \( h_{FE} = 110 \),

\[
R_3 = \frac{V_{cc}-V_c}{I_c}, \quad 4.7k\Omega \quad \text{Eq (1)}
\]

\[
V_E = V_c - V_{CE}, \quad 1V \quad \text{Eq (2)}
\]

\[
I_B = \frac{I_c}{h_{FE}}, \quad 0.018mA \quad \text{Eq (3)}
\]

\[
R_6 = \frac{V_E}{IB+IC}, \quad 330 \, \Omega \quad \text{Eq (4)}
\]

\[
R_9 = \frac{V_B}{nIB}, \quad 10k \, \Omega \quad \text{Eq (5)}
\]

\[
V_B = \frac{R9}{R2+R9} \times V_{CC}, \quad R_2 = 60k \, \Omega \quad \text{Eq (6)}
\]

B. Tone Preamplifier Stage

In tone preamplifier stage, we select BC547 transistor. The required bias resistors are needed to select. So the calculation steps are follows.

When \( V_{cc} = 12 \, V \), \( V_c = V_{cc}/2 = 6V \)
From BC547 datasheet, \( I_c = 2 \, mA \), \( h_{FE} = 110 \),

\[
R_7 = \frac{V_{cc}-V_c}{Ic}, \quad 4.7k\Omega
\]

\[
V_E = V_c - V_{CE}, \quad 1V
\]

\[
I_B = \frac{I_c}{h_{FE}}, \quad 0.018mA
\]

\[
R_{14} = \frac{VE}{IB+IC}, \quad 330 \, \Omega
\]

\[
R_{13} = \frac{VB}{nIB}, \quad 11k \, \Omega
\]

\[
V_B = \frac{R9}{R2+R9} \times V_{CC}
\]

\[
R_8 = 100k \, \Omega
\]

C. Output Power Amplifier

In power amplifier stage, we select TIP41C and TIP42C transistors. So the calculation of output voltage and current are follows.

\[
V_{Out} (peak) = \frac{V_{cc}}{2}, \quad 6V \quad \text{Eq (7)}
\]

\[
I_{out(peak)} = \frac{V_{out(peak)}}{R_L}, \quad 1.5A \quad \text{Eq (8)}
\]

\[
P_{out (max)} = 0.5 \times V_{out(peak)} \times I_{out(peak)} \quad \text{Eq (9)}
\]

\[
P_{out (max)} = 5W
\]

The efficiency of class AB push pull power amplifier is follows:

\[
\eta = \frac{P_{out}}{P_{DC}}, \quad \text{Eq(10)}
\]

\[
P_{DC} = \frac{P_{out} \times V_{CC}}{\pi}, \quad 5.7V
\]
\[ \eta = \frac{5}{5.7}, \ 87\% \]

IV. TEST AND RESULT OF LOW POWER AUDIO AMPLIFIER

In this section, the testing results of step by step are shown. In Figure 6, the simulation and hardware results of preamplifier stage input and output waveforms are 180 degree out of phase. In Figure 7, the input and output waveforms are also 180 degree out of phase.

In Figure 7, the simulation and hardware results of tone preamplifier stage input and output waveforms are 180 degree out of phase.

In this circuit, volume control VR1 functions is gain control for varying its gain.

In Figure 8, the simulation and hardware results of output power stage input and output waveforms are 180 degree in phase.
The circuit materials are correctly setup on Universal Card. The power supply is giving by 12V single supply to get the output power 5W. After the circuits are correctly setup, the output signal is needed to be check at the output.

Figure 10: Test Output of Power amplifier and Power Supply Generator on Universal Card

Figure 11: Testing Power Amplifier

Figure 12: Constructed the Power Amplifier

V. CONCLUSION

This paper of all circuit is designed according to the circuit diagram of class AB push pull amplifier. Then the elements are added to counter the distortion effect. A load is also connected at junction of class A across which output voltage is measured and its corresponding waveform is also drawn. Therefore we can design and analyze the hardware implementation of a high performance class AB push pull amplifier. All though a class AB power amplifier was build and functioned well, more improvements can be made to the circuit to make it better. Use heat sinks with wider surface area to increase the power dissipation. If use of PCB is tidy the circuit path and less noise. Power amplifiers with higher output power could be built by connecting more output power transistors in parallel.

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Planting Density Influenced the Fruit Mass and Yield of ‘Sensuous’ Pineapple

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ABSTRACT

One of the approaches to attain better yield especially in newly developed fruit crop varieties is through planting density optimization. Hence, this study was conceptualized to 1) determine the effects of varying planting densities on the vegetative growth of ‘Sensuous’ pineapple, 2) evaluate the effects of planting density on the fruit mass and yield of ‘Sensuous’ pineapple and 3) compare the fruit chemical properties of ‘Sensuous’ pineapple at varying planting densities. Treatments include 45,000, 55,000, 65,000 and 75,000 planting density hectare⁻¹, respectively. The experiment was laid-out in a randomized complete block design (RCBD) with four replications. Results revealed that growth of ‘Sensuous’ pineapple was comparable in all planting densities. The lower planting densities hectare⁻¹ (45,000 and 55,000) resulted to heavier fruit mass. On the other hand, yield hectare⁻¹ was directly proportional with planting density. Nonetheless, fruit chemical properties were not affected by planting density. Results indicate that fruit mass and yield of ‘Sensuous’ pineapple can be improved through appropriate planting density.

Keywords: novel pineapple, planting density, pineapple fruit, fruit mass, pineapple yield

INTRODUCTION

Pineapple, scientifically known as *Ananas comosus*, is found in almost all tropical and subtropical areas of the world, and it ranks third in production of tropical fruits, next to banana and citrus (Paull and Duarte, 2011). In the Philippines, pineapple production in January-March 2016 reached 591.25 thousand metric tons (Philippine Statistics Authority, 2016) of which majority of the produced are being exported to other countries.

Pineapple export industry in the Philippines is concerted in the province of Bukidnon. Among the commercial varieties grown are MD-2, Dole Cayenne and Del Monte Cayenne. New varieties such as “Sensuous”, “Ulam Pine” and “PACO” were developed by local plant breeders and already registered in the Plant Variety Protection Office (PVPO) of the Bureau of Plant Industry. ‘Sensuous’ pineapple was developed by Dr. Juan C. Acosta (T.S. Castro, personal communication, September 11, 2009), a Filipino plant breeder. The variety has high total soluble solids (Valleser and Castro, 2018) content compared to ‘MD-2’ pineapple and other local varieties. The commercialization of ‘Sensuous’ pineapple takes place in Mt. Kitanglad Agricultural Corporation (MKADC) at Valencia City, Bukidnon, Philippines. Since this novel pineapple variety was just recently introduced, cultural management practices need to be established specifically planting density hectare⁻¹.

Studies have been conducted using varying planting densities hectare⁻¹ in PR-1 67 (Ramirez and Gandia, 1980), Chinese Smooth Cayenne (Hung et al., 2011) and MD-2 (Genefol et al., 2017) pineapple cultivars. Pineapple planting densities vary according
to the cultivar, product destination, level of mechanization, use of irrigation and other factors (Malézieux et al., 2003). High planting densities favour greater productivity, lower densities generally permit the production of a higher percentage of large fruits, which get higher prices in the market for fresh fruits (Malézieux et al., 2003). Hence, this study was conducted to 1) determine the effects of varying planting densities on the vegetative growth of ‘Sensuous’ pineapple, 2) assess the effects of planting density on the fruit mass and yield of ‘Sensuous’ pineapple and 3) evaluate the fruit chemical properties of ‘Sensuous’ pineapple at varying planting densities.

MATERIALS AND METHODS

The experiment was conducted at the Pineapple Research Station of Mt. Kitanglad Agricultural Development Corporation, Valencia City, Bukidnon, Philippines on November 2010 to January 2013.

Healthy suckers (250-300 grams) used in the experiment were collected from ‘Sensuous’ pineapple planting material production field at MKADC Research station. Collected suckers were cured and treated with recommended fungicide and insecticide following the standard practice of MKADC commercial pineapple farm.

The experiment site was prepared following the recommended practice of MKADC commercial pineapple farm. Varying planting densities (Table 1) served as treatments. The experiment was then laid-out in a randomized complete block design (RCBD) with four replications resulting to 16 plots. Each plot measured 26.94 m² with four seedbeds. The two inner seedbeds served as the data rows, whereas the two outer seedbeds as the border rows. An alley of 0.5 meter separated each treatment plot within a replication or block.

Experiment plants received similar intercultural management practices except planting density which served as treatment. Recommended flower-induction treatment solution (1.5% calcium carbide) was applied when ‘Sensuous’ pineapple plants were 11.5 months old after planting.

<table>
<thead>
<tr>
<th>PLANTING DENSITY (HECTARE)</th>
<th>ROWS BED</th>
<th>DISTANCE BETWEEN HILLS (cm)</th>
<th>CENTER OF SEEDBEDS DISTANCE (m)</th>
<th>WALK SPACE (m)</th>
<th>BLOCK WIDTH (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>45,000</td>
<td>2</td>
<td>33.00</td>
<td>1.347</td>
<td>0.838</td>
<td>33.53</td>
</tr>
<tr>
<td>55,000</td>
<td>2</td>
<td>26.90</td>
<td>1.347</td>
<td>0.838</td>
<td>33.53</td>
</tr>
<tr>
<td>65,000</td>
<td>2</td>
<td>22.90</td>
<td>1.347</td>
<td>0.838</td>
<td>33.53</td>
</tr>
<tr>
<td>75,000</td>
<td>2</td>
<td>19.80</td>
<td>1.347</td>
<td>0.838</td>
<td>33.53</td>
</tr>
</tbody>
</table>

Data Gathered

1. Plant Biomass- this was taken at 11.5 months after planting (MAP) or at flower-induction treatment. Three randomly selected plants from the border rows were uprooted and weighed using a pre-calibrated weighing scale. Mean plant biomass was computed using the formula:

\[
\text{Plant biomass (kg)} = \frac{\sum \text{Plant biomass (kg)}}{\text{No. of plant samples}}
\]

2. D-leaf Mass- D-leaf is the longest leaf of a pineapple plants. 10 D-leaf samples were pulled-out from 10 plant samples in the border rows. D-leaf samples were weighed using a pre-calibrated weighing scale. Mean D-leaf mass was computed using the formula:
D-leaf mass (g) = \frac{\sum \text{D-leaf mass (g)}}{\text{No. of D-leaf samples}}

3. Fruit Mass- fruits in the data rows were harvested manually when 30-40% of the peel exhibits yellow color. All harvested fruits were weighed using a pre-calibrated weighing scale. Mean fruit mass was computed using the formula:

\text{Fruit mass (kg)} = \frac{\sum \text{Fruit mass (kg)}}{\text{No. of harvested fruits}}

4. Yield- The formula was used to compute the yield (kg hectare\(^{-1}\)) of ‘Sensuous’ pineapple:

\text{Yield} = \frac{\text{Mean fruit mass x percent plant survival x planting density x 10,000 m}^2}{\text{Number of data plants x 13.47 m}^2}

Yield computed was then converted to tons hectare\(^{-1}\).

5. Total Soluble Solids (TSS)- five randomly selected fruits (1.50-1.75 kg) in each plot were utilized for this data. Pineapple fruit juice was collected per fruit sample and TSS was determined based on the recognized standard procedure (https://archive-resources.coleparmer.com/Manual_pdfs/Sku8115008.pdf) using a refractometer.

6. Titratable Acidity (TA)- 10 mL of pineapple juice was placed inside a beaker, and 2 mL of phenolphthalein solution was added. Titration then followed by adding a basic solution (0.1 N NaOH) to the fruit juice until the color turned to light red. The equation was used to determine the TA:

\text{TA} = \frac{\text{mL NaOH added x 0.1 (NaOH concentration) x 0.064 x 100}}{\text{volume of juice}}

7. TSS/TA- this was computed using the formula:

\text{TSS/TA} = \frac{TSS}{TA}

RESULTS AND DISCUSSION

Plant Biomass

The biomass (fresh mass basis) of ‘Sensuous’ pineapple plants at flower-induction treatment ranged from 3.36-3.53 kg (Table 2) and did not vary significantly in response to the different planting densities used. Data indicates that ‘Sensuous’ pineapple plants in all planting densities are mature enough and inevitably will produce better fruit mass. T.S. Castro (personal communication, July 8, 2006) stated that in order to attain higher recovery of marketable fruits in ‘MD-2’ pineapple, plant biomass must be ≥2.50 kg. Py et al. (1987) reported that average plant mass of most crops decreases with increasing plant population density due to interplant competition for light, but no data illustrating this effect on pineapple were found. Results revealed that the planting densities used in this study did not influenced the biomass of pineapple.

D-Leaf Mass

Malézieux et al. (2003) reported that specific leaf mass of pineapple significantly decreased when planting density was more than 6 plants m\(^{-2}\). A D-leaf is the youngest among the adult leaves of pineapple as well as the most physiologically active. Its mass is reflective of the readiness of pineapple for flower-induction treatment and basis in forecasting fruit mass at harvest.

<table>
<thead>
<tr>
<th>PLANTING DENSITY HECTARE(^{-1})</th>
<th>PLANT BIOMASS (kg)</th>
<th>D-LEAF MASS (grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>45000</td>
<td>3.36</td>
<td>115.12</td>
</tr>
<tr>
<td>55000</td>
<td>3.53</td>
<td>113.88</td>
</tr>
</tbody>
</table>

According to Fornier et al. (2006), in pineapple “Flhoran 41”, a D-leaf of 70 g is sufficient to get exportable fruits, whereas 80 g is the standard for “MD2” and “Smooth Cayenne”. In “Perola”, it was recommended that the plant can be induced to flower when D-leaf has a minimum fresh mass of 80 g and a minimum length of 1.0 m in order to get fruits weighing more than 1.5 kg (Reinhardt et al, 1987). However, in this study ‘Sensuous’ pineapple showed comparable ‘D’ leaf mass when at varying planting densities.

Fruit Mass

‘Sensuous’ pineapple showed an increasing fruit mass with decreasing planting density (Figure 1). Heaviest fruit mass (1.77 kg) was obtained in 45,000 planting density and was comparable to 55,000 planting density with fruit mass of 1.68 kg. On the other hand, lightest fruit mass (1.54 kg) was obtained in highest (75,000) planting density per hectare. Result indicates that planting density has a significant influenced on fruit mass of ‘Sensuous’ pineapple. Experiments on the effect of density on average fruit mass have shown quite predictable results. Average fruit mass decreases linearly with increasing density, but the effect is variety and site-specific (Hepton, 2003). For ‘Smooth Cayenne’ in Hawaii, fruit mass decreases by 2.4% per 1000 increase in plants per acre over a wide range of densities (Hepton, 2003).

Yield

Yield of ‘Sensuous’ pineapple was found directly proportional with planting density (Figure 2). Highest yield (101 tons hectare⁻¹) was recorded in highest (75,000) planting density, whereas lowest planting density (45,000) resulted to lowest yield (59 tons hectare⁻¹). Results imply that it is still possible to produce higher yield using ≥75,000 planting densities per hectare. According to Hepton (2003), total yield per unit land area generally increases curvilinearly with increasing density. However, studies also show that at densities higher or lower than 74,000 plants per hectare, the percentage of fruit recovered as well as the quantity and quality of fruit declines (Malézieux et al, 2003). For ‘Smooth Cayenne’, typical planting density (Hepton, 2003) range from about 60,000 to 80,000 plants ha⁻¹. Hepton (2003) suggests further that the optimum density for a given farm or region and variety must be determined by the available technology, environmental resources and market requirements.
Fruit Chemical Properties

Total soluble solids (TSS), titratable acidity (TA) and TSS/TA of ‘Sensuous’ pineapple fruits were comparable in all planting densities used. TSS (19.82 to 20.17), TA (0.59 to 0.69) and TSS/TA (30.47 to 34.82) values surpassed the market standard which
requires only a TSS value of 13, TA value of 0.5-0.7 and TSS/TA value of 20-40 ("Fresh fruit varieties", 2006). At densities above or below 74,000 planting density per hectare, fruit recovery percentage as well as the quantity and quality of fruits declines (Malézieux et al., 2003).

<table>
<thead>
<tr>
<th>PLANTING DENSITY HECTARE(^1)</th>
<th>TOTAL SOLUBLE SOLIDS (TSS)</th>
<th>TITRATABLE ACIDITY (TA)</th>
<th>TSS/TA</th>
</tr>
</thead>
<tbody>
<tr>
<td>45000</td>
<td>20.09</td>
<td>0.66</td>
<td>31.65</td>
</tr>
<tr>
<td>55000</td>
<td>20.14</td>
<td>0.63</td>
<td>32.80</td>
</tr>
<tr>
<td>65000</td>
<td>19.82</td>
<td>0.69</td>
<td>30.47</td>
</tr>
<tr>
<td>75000</td>
<td>20.17</td>
<td>0.59</td>
<td>34.82</td>
</tr>
<tr>
<td>Significance</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>cv (%)</td>
<td>5.62</td>
<td>13.98</td>
<td>14.43</td>
</tr>
</tbody>
</table>

ns- means within a column are not significantly different at 5 % DMRT

CONCLUSIONS

Results of the study indicates that planting densities used have no significant effects on plant biomass and D-leaf mass of ‘Sensuous’ pineapple at flower-induction treatment. On the other hand, heaviest fruit can be obtained using lower (45,000 to 55,000) planting density hectare\(^1\). Moreover, yield (tons hectare\(^1\)) of ‘Sensuous’ pineapple is directly proportional with planting density. Highest yield can be attained using highest (75,000) planting density hectare\(^1\). The chemical properties of ‘Sensuous’ pineapple fruit is not dependent on planting density.

ACKNOWLEDGMENT

The author conveys his deep gratitude to Mt. Kitanglad Agricultural Development Corporation (MKADC) for funding this study. Sincere appreciation is likewise extended to Engr. Tomy S. Castro, Mr. Roel R. Dayondon, MKADC research technical staffs and field workers for their significant contributions extended during the conduct of this research.

REFERENCES


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The Effect of Refugia Block of Long Bean (*Vigna cylindrica*) on the Arthropod Diversity and Composition

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**Abstract**-Rice pest is being a problem that should be treated effectively and efficiently. Recently, pestiside takes a role in negative impact towards ecosystem, give a reason itself to find a pest controller innovation. Started before entering the era of agricultural intensification, local wisdom of Indonesian farmers have used refugia block as microhabitat which decrease population number of pest insect by increasing insect natural enemies roles in crop field. This research was going to study insect abundant, community structure, species diversity, and the similarity between refugia plot and non refugia plot of certain crop field in Desa Tunjungtirto, Kecamatan Singsosari, Kabupaten Malang. The method used is visual control towards incoming insects in crop field. The data are taken in vegetative and generative phase within trice a day in each plot for 15 minutes in each period. Insects abundants are recorded as much as 672 individuals, contains of 13 orders with 44 families. 5 higher frequencies of families belongs to Alydidae, Culicidae, Anthomyzidae, and Acrididae, with higher importance value index on Alydidae (32.68%). The highest insect diversity is found in the vegetative phase of cowpea plot in medium until 2-3 high category. Avarage similarity of of insect composition shows its low similarity rate. Found insect functional status contains from predator (42%), herbivore (40%), pollinator (17%), and parasitoid (1.5%). Decreasing insect pest population on refugia plot indicates a significant role of pest natural enemies. Based on these results, refugia is being recommended as a habitat manipulation.

**Keywords**- insect, refugia, visual control, community structure, crop field, population

I. **INTRODUCTION**

The diversity and composition of Arthropods is very important to maintain the balance of the ecosystem, including an agroecosystem [1]. Arthropods have important roles in paddy filed ecosystems as pollinators, natural enemies and decomposers. One of the efforts to preserve the diversity and composition of Arthropods in paddy fields is to permeate refugia blocks. The refugia block is a microhabitat that provides temporary shelters for natural enemies of pests, such as predators and parasitoids, and helps biotic interactions such as predation and pollination [2]. Refugia blocks on farmland are applied by allowing or growing local plants that provide shelter, feeding resources and resources for natural enemies [3]. Refugia blocks may be made either at the edges or within the cultivated area [4].

The presence of natural enemies can suppress pest populations that cause damage to rice cultivation [5]. Refugia is a microhabitat that provides temporary shelter for natural enemies of the pests, like predator and parasite, and help the biotic interaction such as polination [2]. This specific area also can provide an alternative host and additional food for the imago of the parasite when in unsuitable conditions [5]. Good engineered microhabitat is made either on the edge or inside the crop field [4]. The presence of the predator can suppress the population of the pests that caused damage to the rice cultivation [5].

![VEGETATIVE PHASE (%)](http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7920)

Research on refugia blocks has been done in Malang [6], apple orchard [7,8,9,10] as well as on paddy fields [12,13,14,15]. Types of plants commonly used are wild plant species such as *Pocota* sp., *Eristalis tenak*, *Cyperus rotundus*, *Capsicum frutesens*, *Bidens pilosa*, *Mimosa pudica*, *Vernonia cinera*, *Marsilea crenata*, *Pistia startiotes*, *Commelina difussa*, *Ageratum conyzoides*, *Chromolaena odorata*, *Brachiaria mutica*, *Panicum repens*, *Vetiveria zizanioides* and *Ipomoea crasicaulis*. The use of wild plant species is often less successful because farmers consider wild plants as weeds that compete with main
crops [12, 16]. Recently, study conducted a search for the type of plant that acts as refugia as well as can be utilized by farmers. The plant species ever used is *Zea mays* [17]. Based on this, this study analyze the relative abundance, community structures, diversity, and refugia effects on the pattern of Arthropod visit, on the Long Bean (*Vigna unguiculata*) grown on the edge of paddy field.

II. MATERIAL AND METHOD

This research was held on June-July 2016 in certain a paddy field in Singosari Sub-district, Malang District, East Java, Indonesia. The Arthropods were observed three times a day (morning, noon and afternoon) using visual encounter survey method on both vegetative and generative phase in each refugia block. The refugia plant used was the long beans (*Vigna unguiculata*). This species was planted along small dike in a side of paddy field. The block size was 0.5 x 2 meter square. Observations of Arthropod visitors were made by observing the blocks recording all Arthropod families and abundances during a 15-minute period. When species identity was not determined at the time of observation, specimens were collected and taken back to the laboratory for identification. Further identification was done in Animal Diversity Laboratory of Biology Department, Brawijaya University.

Arthropod community structure were analyzed with parameter of importance value index, diversity index (Shannon-Wiener Index), and community similarity (Bray Curtis Index) done with PAST program. Comparison of individuals average of each block and insect differences between refugia block and control treatment was observed to analyze refugia block effect. Last, both effects of abiotic factor and insects ecological roles were explained descriptively.

III. RESULT AND DISCUSSION

There were 668 individuals of Arthropod belong to 43 families observed visually consisted of 212 individuals during vegetative phase and 117 individuals during generative phase in Refugia blocks and 339 individuals in grasses (control). There were in control 29 families during vegetative phase (figure 1) and 16 families during generative phase (figure 2); while those in refugia block, there were 19 families during vegetative phase (figure 3) and 21 families during generative phase (figure 4). Culicidae, Alydidae and Acrididae were dominated the sample composing of 12.8 % of total individuals in Refugia blocks and 18.1% individuals in grasses. The other dominant families were Drossophilidae, Cicadelidae, Tipulidae, Formicidae, Agromyzidae, and Tephritidae (Table 1).

Diversity Value Index was highest during vegetative phase on refugia block (2.92), while the lowest was during vegetative phase on control block (2.57). All the diversity was fall in medium level (value 2-3).

Importance Value Index shows the effects of a family of insect towards community structure of an ecosystem. Importance value Index up to 10% indicates a domination. During vegetative phase, the highest IVI in the refugia block was belong to Anthomyzidae (14%), followed by Culicidae (14%) and Acrididae (11.2%); while that in control was belong to Acrididae (26.5%), Drossophilidae (20.8%), Formicidae (15.7%) and Culicidae (15.7%).

During generative phase, the highest result of Arthropod in the refugia block was Alydidae (32.7%). This number was followed by Culicidae (20.7%), and Formicidae (16.4%). That in control was dominated by Drossophilidae (20.8%), Formicidae (15.7%) and Culicidae (15.7%).

Table 1 Important value index in each rice field blocks

<table>
<thead>
<tr>
<th>NO</th>
<th>FAMILY</th>
<th>RV (%)</th>
<th>RG (%)</th>
<th>CV (%)</th>
<th>CG (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Culicidae</td>
<td>14.01</td>
<td>20.71</td>
<td>15.64</td>
<td>19.10</td>
</tr>
<tr>
<td>2</td>
<td>Acrididae</td>
<td>11.20</td>
<td>4.34</td>
<td>26.54</td>
<td>13.69</td>
</tr>
<tr>
<td>3</td>
<td>Drossophilidae</td>
<td>10.27</td>
<td>13.88</td>
<td>20.77</td>
<td>15.85</td>
</tr>
<tr>
<td>4</td>
<td>Cicadelidae</td>
<td>9.80</td>
<td>12.17</td>
<td>13.72</td>
<td>13.69</td>
</tr>
<tr>
<td>5</td>
<td>Tipulidae</td>
<td>6.06</td>
<td>6.97</td>
<td>13.72</td>
<td>18.01</td>
</tr>
<tr>
<td>6</td>
<td>Formicidae</td>
<td>7.00</td>
<td>16.44</td>
<td>15.64</td>
<td>8.28</td>
</tr>
<tr>
<td>7</td>
<td>Agromyzidae</td>
<td>9.80</td>
<td>11.31</td>
<td>7.65</td>
<td>10.99</td>
</tr>
<tr>
<td>8</td>
<td>Tephritidae</td>
<td>7.00</td>
<td>13.88</td>
<td>10.51</td>
<td>10.45</td>
</tr>
<tr>
<td>9</td>
<td>Alydidae</td>
<td>-</td>
<td>32.68</td>
<td>7.01</td>
<td>24.50</td>
</tr>
<tr>
<td>10</td>
<td>Anthomyzidae</td>
<td>14.01</td>
<td>3.49</td>
<td>-</td>
<td>2.58</td>
</tr>
</tbody>
</table>

Figure 2. Relative Abundance of visitor insects on control generative phase

Figure 3. Relative Abundance of visitor insects on control vegetative phase
Result of the cluster analysis showed that Arthropod visitors were assemblage according to treatment. Family similarity was greater between the Arthropod visitor compositions in the control. The highest similarity of insects composition is found between generative phase on control field and vegetative phase on control field. It provides substitutive properties at different time. Composition of predators was slightly dominant in refugia block (42%) compared herbivores (40%); while that in control block was vice versa. It was dominated by herbivores (59.4%), while predators were 20.59%.

Observation results show that Acrididae, Drossophilidae, Formicidae and Culicidae were among the dominant families during vegetative phase. Acrididae showed the highest percentage of relative abundance value in control blocks. Acrididae is common in grassland vegetation [1, 18, 19]. It is predicted due to Acrididae food gathering behaviour, when vegetative phase of rice field provides more suitable food for this family of insect. Not only that, high population rate of Acrididae was caused by low population of insect predators. Therefore, Acrididae has less threat and its frequencies were burst out.

Alydidae, Drossophilidae, Culicidae, and Formicidae were among the dominant families during vegetative phase. High population of Alydidae in phase caused by vegetative phase of rice field provides more suitable food for Alydidae. The high Alydidae abundant in the refugia block indicate that this family attacked the refugia plant (Long Bean). Also, less predators for Alydidae causes this herbivore insect more abundant [12].

This study showed that the effect of refugia block on the diversity of Arthropod visitors. Compare to the control blocks, refugia block seem to balance the composition between predator and herbivores. The observation shows that not only herbivore, but predator and parasitoid also take a role on crop field without refugia. This result indicates that the composition structure of Arthropod is well distributed. Refugia provides a new shelter and hiding place for predators. Several predator families were found in this study including Oxyopidae, Tettigoniidae, Syrphidae, Aeshnidae, Coenagrionidae, Coccinellidae and Libellulidae.

Paddy field with refugia block attracted several natural enemies such as Coccinellidae, Aeshnidae, Syrphidae, and Ichneumonidae [6]. Among the predators, Odonata is one of the important in paddy field [17, 19].

The diversity of Arthropod in all blocks was considered medium. This situation indicated relatively medium environment stability. Therefore, the interactions between species are high. High diversity in a ecosystem indicates a stability of a living environment [20]. Arthropod diversity is seldom to reach more than 3 [6, 13]. This may be caused by analysis at family level. Diversity of Arthropod in the refugia blocks indicate that this block support paddy field community diversity. Diversity of Arthropod in the paddy field was higher than in control blocks [13].
The Arthropod was most abundant in the morning (09.00-10.00), decreased in the noon (12.00-13.00) and increase again in the afternoon (15.00-16.00). In the morning, the humidity and light intensity are almost the same as evening. High abundance of predators is predictedly caused by refugia plant which have striking organs that attract the predators to come. Predator’s abundance indicates its prey abundance. But not only predators, it also can be effected by chemical substances and plants species. More number of insects visited the flower during late morning hours (09.00-10.15) followed by a sharp decline afterwards the noon. Variation in the abundance and diversity associated with resource abundance and temperature [18, 21]. Other study also showed the most favorable range of temperature has been 25ºC to 35ºC for the visits of pollinators on the blossom of Z. mauritiana.

Abiotic factors are important to affect some varieties of insect to come. At the day, high intensity of light and temperature cause the insects rarely to come. This might happen due to adaptical behaviour of insects towards the sun light. This adaptation allows insects decrease the dehidration inside the body. But, some observations show the light intensity and temperature during the day (12.00-13.00) are lower than the morning observation (09.00-10.00). These phenomena are predictedly caused by natural anomalies, cloudy, windy, and plant’s canopy.

**CONCLUSION**

This study concluded that the refugia blocks support family richness and diversity of Arthropod visitors. These refugia blocks contribute to balance composition between predator and herbivore. The Arthropod was peak in the morning.

**ACKNOWLEDGEMENT**

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**REFERENCES**


Hydrolytic activity of amylase produced in solid-state fermentation by a local isolate of *Aspergillus niger*

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Abstract- The increase in demand for local enzymes for industrial activities has stimulated the exploration of the extracellular enzymatic activities of several microorganisms. Using validated values from a central composite designed experiment, amylase from a locally isolated strain of *Aspergillus niger* was produced in a larger quantity by solid-state fermentation for characterization and its subsequent application in the hydrolysis of raw native starches. The optimum activity of the enzyme was 30.96 U/ml-min. Partial purification using ammonium sulphate saturation was attained at 50% (NH₄)₂SO₄. The enzyme was stable over a wide range of pH (4 - 8) and temperature (30°C – 60°C). Other optimum values determined were; Ca²⁺ concentration – 5 mM, starch (substrate) concentration – 3%, enzyme - substrate reaction time – 6 min and enzyme dosage – 4 mg total protein / 3% starch solution. The enzyme was able to hydrolyse the raw starchy substrates studied, producing glucose concentrations of 31.90 mg/ml, 24.78 mg/ml, 19.31 mg/ml and 8.85 mg/ml from maize, sweet potato, yam, and cassava respectively. The optimal substrate concentration of these substrates investigated also showed that different starchy substrates behaved differently towards hydrolysis by amylase. The study has shown the possible production of a local enzyme that was capable of hydrolyzing raw native starches with good activity. This result indicates the possibility of less dependence on imported enzymes.

Index Terms- Amylase, *Aspergillus niger*, Hydrolysis, Native starch, Solid-state fermentation

I. INTRODUCTION

The application of biotechnology to produce industrially competent enzymes has stimulated the quest for the extracellular enzymatic activities of several microorganisms (Saranraj and Stella, 2013). Amylase is a very common enzyme found in most starch processing industries due to its hydrolytic action on starches to produce simple sugars (Reddy et al., 2003). The potential technological importance and economic profits of amylases have made it receive a great deal of attention in developing countries (Suganthi et al., 2011). Amylase sourced from molds, bacteria, and yeasts have been reported and their biochemical characteristics documented (Buzzini and Martini, 2002; Liaquat et al., 2015; Suganthi et al., 2011). Molds are identified to produce high amounts of amylase (Suganthi et al., 2011) and amongst these, *Aspergillus niger* is seen as the most important source of industrial enzymes (Sakthi et al., 2012). Commercially, fungal amylases have been reported to be more stable than bacterial amylases (Suganthi et al., 2011); this has therefore called for several researchers to optimize the culture conditions of suitable fungal strains (Abu et al., 2005).

Solid-state fermentation (SSF) holds unlimited potential for the production of enzymes (Pandey et al., 1999), particularly when fungi are involved (Bhargav et al., 2008). SSF present benefits such as; simplified operations, high volumetric production, and the requirement for low initial capital (Omemu et al., 2005; Pandey et al., 1999).

Starchy tubers (such as yam, cassava, sweet potato, and cocoyam) and cereals occur abundantly in most developing countries in the tropics, with the former being the most cultivated; since these remain the important staple foods in the diet of most people living in these developing countries (Okolo et al., 1995). Annual losses of large proportions of these tubers to spoilage agents are encountered due to inadequate storage facilities and improper post-harvest practices (Okolo et al., 1995; Omemu et al., 2005; Owusu - Darko et al., 2016). These tubers, rich sources of starch, could be put to an alternative use; enzymatic conversion into reducing sugars by saccharification (Omemu et al., 2005). Enzymatic hydrolysis has been shown to be economically superior in terms of process simplicity and energy utilization as compared to the conventional method that uses pregelatinized starch as substrates (Okolo et al., 1995; Omemu et al., 2005). Resistance to amylase enzymatic action has been observed in starches from tubers as compared to the susceptibility in cereal starches (Omemu et al., 2005). This paper reports on some properties of amylase produced by a locally isolated strain of *Aspergillus niger* as well as its hydrolytic characteristics on some raw native starches.
II. MATERIALS AND METHODS

Preparation of starches from tubers

Cassava, sweet potato and yam starches were prepared according to the procedure outlined by (Rasper, 1969). Maize grains were steeped in water for 3 days with intermittent changes of the water. It was milled using a double disc attrition milling machine and the resulting dough was mixed with adequate water. The suspension was filtered through a 250 μm sized mesh gauze. The filtrate was allowed to stand for 3h and the water was decanted leaving the settled starch slurry at the bottom. The starch was carefully dried in circulating air temperatures below 45°C. Corn-derived soluble starch (Sigma – Aldrich) was used as the standard. All other chemicals were of analytical grade and obtained from Sigma – Aldrich St. Louis, MO, USA.

Source of fungal culture

Five (5) fungal colonies were isolated from a serial dilution of a mouldy bread sample and they were identified as *Aspergillus niger* by employing the lactophenol cotton blue staining technique and studying morphology using standard identification manuals (Barnett and Hunter, 1972). These fungal colonies were screened for their ability to synthesize amylase on potato dextrose agar (PDA) amended with 2% (W/V) soluble starch medium (Uguru *et al.*, 1997). The ability of individual colonies to produce amylase was indicated by the zone of clearance shown on the medium. The isolate, *Aspergillus niger* KV5B showed the highest clearance zone (29 mm) and thus was selected for further studies. *Aspergillus niger* KV5B was maintained on PDA slants and stored in the refrigerator at 4°C.

Culture conditions and solid state fermentation

A spore suspension of *Aspergillus niger* KV5B was obtained from a 5-day old culture grown on PDA plates at room temperature by adding 10 ml of sterile distilled water to the spores within a 1 cm cork borer and making the suspension to a 60 ml mark (Bentil *et al.*, 2015). Two (2 ml) of the spore suspension, containing about 3.96 x 10⁶ cells/ml, was used as the inoculum. Yam peels, ground into about 0.3 mm particle sizes, was used as the substrate for the amylase production. The enzyme was produced by SSF using the central composite designed optimized conditions (pH - 5.95, Temperature - 49.53°C and incubation time – 104 h) as previously described (Kwatia *et al.*, 2017). The fungi were grown in a 100 ml Erlenmeyer flask containing 5 g of the ground yam peel and moistened with 5 ml of a mineral solution (comprising KH₂PO₄ – 0.35 g, NH₄NO₃ – 2.5 g, KCl – 1.25 g, MgSO₄·7H₂O – 0.025 g, FeSO₄·7H₂O – 0.0025 g, soluble starch – 5 g in 250 ml of distilled water) (Sethi and Gupta, 2015).

Extraction of the enzyme from the fermentation medium

The enzyme was extracted using 50 ml of 0.1 M phosphate buffer (pH 6). The buffer on the substrate bed was shaken on an orbital shaker for 30 min at 250 rpm, the resulting mixture was filtered through cheesecloth and the filtrate centrifuged at 3600 g for 15 mins (Abu *et al.*, 2005). The supernatant was decanted and used as the crude enzyme.

Amylase assay

The activity of amylase was assayed as described by (Uguru *et al.*, 1997). The reaction mixture comprised of 0.5 ml of the crude enzyme, 0.5 ml of 1% (W/V) starch solution in 0.02 M phosphate buffer with 0.006 M NaCl (pH 6.9). The reaction was incubated for 3 min at 37°C and was terminated using 1 ml of 3, 5 dinitrosalicylic acid (Miller, 1959), followed by boiling for 5 min, cooled and absorbance were taken at 540 nm. The amount of reducing sugars liberated (Miller, 1959) was estimated using glucose as standard. A unit of amylase activity was expressed as the amount of enzyme that released 1 μmol of reducing sugars (maltose/glucose) per minute under the assay conditions (Sakthi *et al.*, 2012).

The protein content (Lowry *et al.*, 1951) of the extract was also determined using bovine serum albumin as the standard at 540 nm.

Partial Purification of the crude amylase

Precipitation of the crude enzyme was carried out using ammonium sulphate ((NH₄)₂SO₄). The extracted crude amylase was saturated with ammonium sulphate up to 80%. Precipitates were obtained by gently stirring the mixture and leaving on ice for 30 min after which the mixture was centrifuged at 3600 g for 15 min. The resultant precipitates were solubilized in 0.1M phosphate buffer (pH 6) and their activities and protein concentrations determined.

Characterization studies
Effect of pH on enzyme activity and pH stability of the enzyme

The effect of pH on the enzyme activity was investigated by dissolving 1% (W/V) soluble starch in 0.1 M sodium citrate buffer (pH 4 – 6), 0.1 M phosphate buffer (pH 7 – 8) and glycine NaOH buffer (pH 9 – 10) (Shah et al., 2014). A fraction of the enzyme was incubated at different pH values (4 – 10) without the substrate in order to determine the pH stability of the enzyme. The DNS method was used to estimate the enzyme activity using 0.5 ml of the crude enzyme.

Effect of temperature and temperature stability of the enzyme

An enzyme substrate reaction mixture was incubated at different temperatures of 30°C – 90°C for 3 min to determine the optimum temperature of the enzyme. Thermostability of the enzyme was also determined by incubating the enzyme fraction without a substrate at temperatures of 30°C – 80°C. The DNS method was used to estimate the enzyme activity using 0.5 ml of the crude enzyme.

Effect of calcium ion concentration on the stability of the enzyme

Amylase stability at 60°C was investigated by incubating the enzyme-substrate reaction mixture with different concentrations of CaCl2 (2 mM, 5 mM, 7 mM and 10 mM). An untreated sample was used as the control.

Effect of substrate (starch) concentration on amylase activity

Starch concentrations of 1%, 2%, 3%, 4%, and 5% suspended in 0.1 M phosphate buffer (pH 6.9) with 0.05 M NaCl were used to investigate the effect of starch concentration on amylase activity. The DNS method was used for the amylase activity determination.

Enzyme substrate reaction time

The effect of reaction time on amylase activity was investigated by incubating the enzyme-substrate reaction mixture at different time intervals of 0, 3, 6, 9, 12 and 15 min and the enzyme activity assayed using the DNS method.

Effect of enzyme concentration

The enzyme saturated at 50% of (NH₄)₂SO₄ with a protein concentration of 1.90 mg/ml (approximated to 2 mg/ml). Thus, multiples of 2 mg/ml i.e. 2 ml (4 mg of protein), 3 ml (6 mg of protein), 4 ml (8 mg of protein) and 5 ml (10 mg of protein) were used to determine the effect of enzyme concentration on amylase activity. The enzyme assay was by the DNS method.

Hydrolysis of starchy substrates

The ability of the enzyme to hydrolyze starch was investigated by using starches from cassava, sweet potato, yam, and maize. Commercial corn – derived soluble starch (Sigma – Aldrich, St. Louis MO, USA) was used as the standard. The starch hydrolysis was investigated using the optimized conditions that were obtained after the characterization. The rate of hydrolysis of each starch was evaluated based on the quantity of reducing sugars (mg/ml) produced. In order to extend the substrate range of the substrates industrially, the optimal substrate concentrations of the native starches were also investigated with starch concentrations of 1 %, 2 %, 3 %, 4% and 5 %. The amylase activity was determined using the DNS method after incubating the enzyme – substrate mixture for 30 min.

Statistical analysis and experimental design

All determinations were of 3 independent experiments. Mean values of each experiment were reported and the least significant difference (LSD) test was used to identify means that differed significantly. Sigma plot (Ver. 10.1) software was used for the analysis and graphs.

III. RESULTS AND DISCUSSION

Partial purification of amylase
The stages of purifying amylase produced by *Aspergillus niger* KV5B using ammonium sulphate (NH₄)₂SO₄ is shown in table 1. Table 1 indicates that the specific activity of amylase increased from one purification step to another until the highest activity (18.04 U/mg) was reached at 50% (NH₄)₂SO₄ saturation. The increase of specific activity from 0% to 50% (NH₄)₂SO₄ saturation was an indication that the purification steps used were effective in eliminating contaminant proteins. The ability of the (NH₄)₂SO₄ to concentrate enzymes makes it employable even in later stages of purification to concentrate enzymes from dilute solutions.

**Table 1: Purification table for the crude extracted amylase using ammonium sulphate**

<table>
<thead>
<tr>
<th>Purification step</th>
<th>Total activity (U/ml-min)</th>
<th>Total protein (mg/ml)</th>
<th>Specific activity (U/mg)</th>
<th>Purification fold (X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude extract</td>
<td>16.06±2.02</td>
<td>8.71±2.00</td>
<td>1.93±0.66</td>
<td>1.00</td>
</tr>
<tr>
<td>20% (NH₄)₂SO₄</td>
<td>30.83±0.49</td>
<td>6.99±1.29</td>
<td>4.52±0.87</td>
<td>2.34</td>
</tr>
<tr>
<td>50% (NH₄)₂SO₄</td>
<td>35.16±1.44</td>
<td>1.96±2.20</td>
<td>18.04±1.46</td>
<td>9.33</td>
</tr>
<tr>
<td>80% (NH₄)₂SO₄</td>
<td>39.05±2.22</td>
<td>4.89±1.60</td>
<td>8.67±3.15</td>
<td>4.48</td>
</tr>
</tbody>
</table>

**Effect of pH and pH stability of the enzyme**

Figure 1 shows the effect of pH as well as pH stability on the activity of the enzyme. The highest activity (31.88 U/ml-min) was observed at pH 5. A pH of 28 also recorded a high activity of 29.91 U/ml-min. This pH range shows the versatility of the enzyme for several process conditions. These optima observed indicated the enzyme was at its satisfactory conformation (Sachdev et al., 2016). Kumar and Duhan (2011) and Alva et al. (2007) reported similar pH ranges of (4.2 and 8.4) and (5.8 and 9) for *Aspergillus niger* MTCC – 104 and *Aspergillus sp* JG112 amylases respectively. They attributed such observations to the existence of at least two amylolytic activities, i.e. glucoamylase and α-amylase since both enzymes synergistically degrade starch molecules. The enzyme retained more than 80% of its activity across a pH range of 4 – 8. This implied the enzyme was stable over the pH ranges 4 – 8. The drop in activity at pH 9 and 10 (Figure 1) could be attributed to severe denaturation of the structure of the enzyme due to the changes in pH thus leading to the reduction of activity at such pH levels (Kumar and Duhan, 2011).
The effect of temperature on the activity of amylase showed that the enzyme activity increased progressively with an increase in temperature from 30 °C (16.73 U/ml-min) to a maximum of 28.41 U/ml-min at 60 °C (Figure 2). Reduction in amylase activities was observed at temperatures below 60°C. The decrease in amylase activity may be attributed to the disruption of the secondary, tertiary and quaternary bonds of the amylase enzyme (Sachdev et al., 2016; Schokker et al., 1998). An optimum temperature of 70 °C was recorded for an amylase produced by Aspergillus niger on yam peels (Uguru et al., 1997). The enzyme showed thermal stability across a temperature range of 30 °C – 60 °C, beyond which the activity decreased (Figure 2), this may probably be the result of amino acids destruction, peptide chain hydrolysis and aggregation thus causing incorrect conformation of the enzyme (Alva et al., 2007).

![Figure 2: Effect of temperature and temperature stability of A. niger KV5B amylase activity](image)

**Effect of calcium concentration on the stability of the amylase**

The influence of Ca\(^{2+}\) varied with concentrations of calcium that the enzyme was exposed to at 60°C (Figure 3). A concentration of 5 mM of calcium ions recorded the highest activity (39.51 U/ml-min) and the least was found with 2 mM calcium concentration. Amylase is a metalloenzyme and is stabilized in the presence of calcium ions (Konsoula and Liakopoulou-Kyriakides, 2007; Prajapati et al., 2015). The results of this study indicated that amylase from Aspergillus niger KV5B was stable in the presence of Ca\(^{2+}\).

The stability of an enzyme from Aspergillus sp cmst 04 at 5 mM concentration has been reported (Ajikumar et al., 2014). An inhibitory action of Ca\(^{2+}\) at 10 mM was also reported by (Babu and Satyanarayana, 1993). Other reports also suggest that Ca\(^{2+}\) does not affect the enzyme activity (Asgher et al., 2007).
Effect of substrate (starch) concentration on amylase activity

Amylase activity increased with increase in starch concentrations from 1% (21.88 U/ml-min) to 3% (37.92 U/ml-min), but the activity decreased beyond 3% (Figure 4). The active sites of the enzyme were not saturated at low substrate concentrations; therefore, increase in activity was expected when the substrate concentration increases (Kumar and Duhan, 2011). Low activities recorded beyond 3% might have been a result of blockage of the active site of the enzyme due to competition for these sites by the substrates, thus preventing other molecules from binding (Nyamful, 2013).
Effect of enzyme-substrate reaction time

The time allowed for starch hydrolysis increased the enzyme activity from 3 min (25.35 U/ml-min) to a maximum of 6 min (32.41 U/ml-min) (Figure 5). Incubation beyond 6 min, however, decreased the activity (Figure 5). The enzyme showed efficiency within a relatively shorter time, thus saving time and energy and also a possible prevention of the formation of undesirable products (Dzogbefia et al., 2008).

![Figure 5: Effect of reaction time on A. niger KV5B amylase activity](image)

Enzyme dosage

Figure 6 depicts the effect of enzyme dosage on the hydrolysis of starch. Two (2) ml of the enzyme extract (i.e. 4 mg of total protein) per 3% starch solution gave the highest activity of 58.10 U/ml-min and the least activity was observed with 1 ml of the enzyme extract (i.e. 2 mg of total protein). A probable inhibitory action of the enzyme beyond 4 mg total protein / 3% starch solution as a result of increased enzyme dosage thus introducing competition for binding could have resulted in the decrease in amylase activity. The enzyme application could be cost-effective since lower concentrations will be required if it should be used by industries for starch hydrolysis.

![Figure 6: Effect of enzyme dosage on A. niger KV5B amylase activity](image)
Hydrolysis of native starchy substrates

The ability of the amylase to hydrolyse starches from tubers (cassava, yam, and sweet potato) and cereal (maize) was studied using corn-derived soluble starch as a standard. The results that portrayed the amount of reducing sugars (mg/ml) produced are shown in Figure 7. The corn-derived soluble starch was also used as a standard (100%) to evaluate the susceptibility of each starchy source to amylase hydrolysis. By keeping all the previously determined parameters at their optimized levels, rapid hydrolysis was observed on the corn-derived soluble starch and maize to give reducing sugar concentrations of 30.68 mg/ml and 31.90 mg/ml respectively. In general, the order of starch hydrolysis was maize > soluble starch > sweet potato > yam > cassava (Figure 7). Statistically, reducing sugars produced by maize, sweet potato and yam were significantly higher (p<0.05) than that produced by cassava starch within the six minutes of hydrolysis. However, no statistical difference (p>0.05) was observed between hydrolysis of sweet potato and yam starches. The conversion efficiency of the substrates as shown in Table 2 indicated that starch from maize was rapidly hydrolyzed (103.98%) followed by sweet potato, yam, and cassava with conversion efficiencies of 80.76%, 62.56%, and 28.83% respectively. The optimal substrate concentration of each substrate after 30 min incubation is summarized in figure 8. Maize starch recorded the fastest optimal level and thus highest hydrolysis and activity at 2% concentration (65.29 U/ml-min) followed by soluble starch (60.55 U/ml-min), cassava (56.54 U/ml-min) and sweet potato (48.45 U/ml-min) starches, all at 3% concentration. Yam recorded the least hydrolysis and thus the least activity (34.24 U/ml-min) at 4% concentration (Figure 8). Results in figure 8 also showed that the ability of amylase of Aspergillus niger KV5B to digest raw starches is directly proportional to incubation time.

Table 2: Conversion efficiencies of the native starchy substrates at 6 min of incubation

<table>
<thead>
<tr>
<th>Starches</th>
<th>Amount of reducing sugars (mg/ml)</th>
<th>Relative conversion efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soluble starch</td>
<td>30.69 ± 0.45</td>
<td>100.00</td>
</tr>
<tr>
<td>Maize</td>
<td>31.91 ± 0.48</td>
<td>103.98</td>
</tr>
<tr>
<td>Yam</td>
<td>19.31 ± 0.43</td>
<td>62.56</td>
</tr>
<tr>
<td>Sweet potato</td>
<td>24.78 ± 0.11</td>
<td>80.76</td>
</tr>
<tr>
<td>Cassava</td>
<td>8.85 ± 0.18</td>
<td>28.83</td>
</tr>
</tbody>
</table>

Figure 7: Hydrolysis of raw native starches by A. niger KV5B amylase
Many factors have been attributed to the differences in enzymatic susceptibilities of starches; viz, starch source, extension of association between starch components, granule size, crystallinity, rate of amylose and amylopectin, polymeric type (A,B,C), amylose-lipid complex, type of enzyme and hydrolysis condition (pH, temperature, concentration) (Oates, 1997; Rocha et al., 2010). Maize starch granules have been identified to exhibit A – type crystal polymorphism with characteristics such as having a porous surface, faster chemical penetration and derivatization reactions, weak points and more susceptible to the enzyme-catalyzed reactions (Jane, 2009). Starches with such A polymorphism are more susceptible to hydrolysis by enzymes because the crystalline structure of such starches contains the A and B1 chains which are unstable and more vulnerable to rearrangement; therefore making them susceptible to hydrolysis (Rocha et al., 2010).

Cassava and sweet potato starches also exhibited more susceptibility to the enzyme hydrolysis as compared to yam starches (Figure 8). The high susceptibility of cassava and sweet potato to the enzymatic hydrolysis may also be attributed to its A – type polymorphism as reported by (Rocha et al., 2010). Yam starches, however, displays the B – type polymorphism which normally displays a nonporous internal granule structure thus, making them less susceptible to amylose hydrolysis (Jane, 2009). B – type starches present higher proportions of long B – chains, which extend for two or more clusters and stabilize the internal structure of granules thus becoming more resistant to enzymatic action (Jane, 2009; Rocha et al., 2010).

Amylose content of maize, sweet potato, cassava and yam starches have been stated as 70 %w/w (Lim et al., 1994; Morrison et al., 1984), 28.9 ±0.35 %w/w (Tan et al., 2006), 23.7±0.1 %w/w 8 -25 %w/w (Paes et al., 2008; Yuan et al., 2007) and 26.3±0.2 %w/w (Yuan et al., 2007) respectively. A report by Tester et al. (2006) suggested that the amount of native starch hydrolysis by amylases is inversely proportional to the amylose content, indicating that high amylose starches are more resistant to amylose hydrolysis. This is supported by (Jane, 2009) who also reported that such amyloses are strongly associated with the periphery of the granules thus making them less susceptible to enzyme attack. These might be some contributing factors to the results recorded in this investigation.

Results from the study agree with reports made by Omemü et al., (2005) and Okolo et al., (1995) that starch susceptibility to amylose hydrolysis is dependent on the botanical source and the duration of the amylose treatment. The ability of the partially purified amylose of Aspergillus niger KV5B to hydrolyse roots starches especially cassava starch presents an incredible property since these roots are the most abundant in the tropics.

In conclusion, the amylose of Aspergillus niger KV5B selected for this study could be effectively used in hydrolysis of both native tuber and cereal starches to produce sugars which will find applications in several industries such as the brewing industry.


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Design Considerations of Electrorheological Damper

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Abstract- Damper is simply a shock absorber which is a spring or hydraulic device used in the vehicles suspension system. A car spring will extend and release the energy it absorbs from the bump at an uncontrolled rate if a damping structure is not present. The normal application of ER fluids is in fast acting hydraulic valves [10] and clutches. The other applications of ER are in brakes [6] and shock absorbers [5] which can be thought of as closed hydraulic systems where the shock is used to try to pump fluid through a valve. The vibration damper is also an essential part of the automobiles suspension system. Suspension system is the combination of various types of spring which include leaf springs, coil springs, shock absorbers, air springs and torsion bars. These are four sets of suspension springs in each vehicle.

This paper is intended to express design considerations of ER damper for Land Cruiser. The purpose of the damper is to control spring and suspension movement. In this paper, the type of damper used is the twin-tube type applied with electrorheological fluid and nitrogen gas. The main purpose of this research paper is how to consider and design calculation of ER damper from the required known data such as piston diameter, rod diameter, ER liquid density, applied electric potential and moderate damper speed. This data had been applied in the design calculations. In this paper, it had been calculated the volumetric flow rate through the tube, the viscous pressure drop, shear damper force and damping force. From the calculated result, the shear damper force is 4 k Pa. The viscous pressure drop is 1.731 M Pa and damping force is 2270 N. In practical use, the damper force is in the range of 250-5000 N.

Index Terms- Damping force, electrorheological fluid, suspension system, viscous pressure drop

I. INTRODUCTION

Electrorheological fluid, composed of dielectric particles suspended in insulating oil, is a type of smart material that can be utilized as a two-phase system namely fluid phase or solid phase. The viscosity of ERF can vary by a few orders of magnitude under the application of an external electric field. If the field is sufficiently strong, ERF can solidify into an anisotropic solid boasting a yield stress befitting its strength. The change in rheological characteristics usually is accomplished within 10 ms and is reversible. Hence, ERF has utility as an electrical–mechanical interface [1-3] for potential active-control clutch, damper, and valve applications [4-6], and is denoted smart. These days, transportation is increasing with continuing population growth and industrial expansion. The suspension system of a car is one of the car's most integral parts. An automotive suspension supports the vehicle body on the axles. The frame and body of the automobile are mounted on the front and rear axle not directly but through the springs and shock absorbers. The suspension system prevents the car body from shaking and vibrating from road noise, and also helps to sustain wheel contact with the ground, interacts with the steering system to provide vehicle control, and aids in maintaining a comfortable car ride. A basic suspension system includes springs and dampers. The primary purpose of the vibration damper is to control spring and suspension movement. This action is received by transforming the kinetic energy of suspension movement into thermal energy, or heat energy, to be dissipated through the hydraulic fluid. Vibration damper are also oil pumps in which a piston is attached to the end of the piston rod. It works against the hydraulic fluid in the pressure tube. Figure 1 show the piston, piston rod and base valve in vibration damper. When the suspension travels up and down, the hydraulic fluid is forced through tiny holes called orifices inside the piston. However, these orifices let only a small amount of fluid pass through the piston. This action slows down the piston and which in turn slows down the spring and suspension movement.
II. CLASSIFICATION OF DAMPERS

The dampers can be classified into three main groups according to their construction, operation and medium.

Classification by operation
(1) Single action type
(2) Multiple-action type

Classification by construction
(1) Twin-tube type
(2) Mono-tube type

Classification by working medium
(1) Hydraulic Type
(2) Gas-filled type

Among these three groups, multiple action type operations with mono-tube or twin-tube damper are mostly used in modern cars. In hydraulic type, damper can be classified into two. They are electrorheological damper and magnetorheological damper. In this research paper, electrorheological damper is used for good situation of shock absorption [5].

III. THEORY FOR ELECTRORHEOLOGICAL DAMPER

A conventional damper oil is considered as a Newtonian liquid because it has simple viscosity, albeit temperature dependent. ER liquid has a yield stress and a post-yield marginal viscosity. Both of them are dependent on the applied field. So, they are characterized by two parameters, the yield shear stress \( \tau_Y \) and the subsequent marginal viscosity \( \mu \). In practical use, the main operational parameter is to control the variation of the yield stress. The annular flow design such as Figure 3 uses a free piston to...
accommodate oil expansion and the rod insertion volume. A conventional double-tube configuration could be used although there would then be a total of three concentric tubes. In this design, it is assumed that the force will be controlled entirely by the electric field, i.e. there are no conventional valves in the piston. The material of the piston of the electrorheological damper is soft iron or steel [8].

![Figure 3. Basic Design of an Electrorheological Damper](image)

In practical design value, the following data are used: \( D_R = 16 \text{ mm}, D_P = 30 \text{ mm}, R_{FA} = 25 \text{ mm}, t_{FA} = 0.5 \text{ mm}, L_{FA} = 280 \text{ mm} \). Shock absorber is designed by using the parameters shown in Table I.

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Symbols</th>
<th>Units</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate damper speed</td>
<td>( V_D )</td>
<td>m/s</td>
<td>0.5</td>
</tr>
<tr>
<td>Applied electric potential</td>
<td>( E )</td>
<td>V</td>
<td>( 5 \times 10^3 )</td>
</tr>
<tr>
<td>Max: shear stress</td>
<td>( \tau_{V_{max}} )</td>
<td>kN/m²</td>
<td>4</td>
</tr>
<tr>
<td>Density</td>
<td>( \rho )</td>
<td>kg/m³</td>
<td>( 1.5 \times 10^3 )</td>
</tr>
<tr>
<td>Viscosity</td>
<td>( \mu )</td>
<td>N-s/m²</td>
<td>( 4 \times 10^{-2} )</td>
</tr>
</tbody>
</table>

### IV. DESIGN CONSIDERATIONS OF ELECTRORHEOLOGICAL DAMPER

The fluid annulus cross-sectional area, using the annulus central radius \( R_{FA} \), can be calculated from the following equation,

\[
A_{FA} = 2 \pi R_{FA} t_{FA}
\]  

(1)

The piston annulus area can be calculated from the following equation,

\[
A_{PA} = \frac{\pi}{4} (D_{P}^2 - D_{R}^2)
\]  

(2)

The area factor can be calculated from the following equation,

\[
f_A = \frac{A_{PA}}{A_{FA}}
\]  

(3)

The mean fluid flow velocity \( V_{FA} \) in the tube can be calculated from the following equation,

\[
V_{FA} = \frac{Q}{A_{FA}}
\]  

(4)

At a damper velocity \( V_D \), the volumetric flow rate through the tube can be calculated from the following equation,

\[
Q = A_{PA} V_D
\]  

(5)

For a circular or approximately circular section, the limits for Reynolds are

\[
Re < 2000 \quad \text{(Laminar flow)}
\]
The properties of fluid flow are found to be two types of flow, laminar and turbulent. The criterion for this is the Reynolds number can be calculated from the following equation,

$$Re = \frac{\rho V D}{\mu}$$  \hspace{1cm} (7)

The pressure drop acts on the piston annular area so the viscous damper force can be calculated from the following equation,

$$F_{D,V} = A_{PA} P_{V}$$  \hspace{1cm} (8)

The viscous pressure drop can be calculated from the following equation,

$$P_{V} = \frac{6 \mu L_{FA} Q}{\pi R_{FA} \tau_{FA}^{3}}$$  \hspace{1cm} (9)

The damper coefficient $C_{D}$ can be calculated from the following equation,

$$C_{D} = \frac{F_{DV}}{V_{D}}$$  \hspace{1cm} (10)

To initiate any movement of the ER fluid, a force must be applied axially to the fluid to overcome the total shear resistance. This ER fluid shear force in the annulus can be calculated from the following equation,

$$F_{ER} = 2(2\pi - R_{FA})L_{FA} \tau_{ER}$$  \hspace{1cm} (11)

To obtain the ER effect, an applied electric potential difference between the inner and outer tubes gives a radial electric field strength $E_{FA}$ (V/m). This gives the ER liquid a yield shear stress $\tau_{ER}$ according to

$$\tau_{ER} = C_{\tau E} \frac{E}{\tau_{FA}}$$  \hspace{1cm} (12)

where $C_{\tau E}$ is a coefficient depending only on the properties of the ER fluid, e.g. the concentration of particles, but not on the damper geometry. The ER shear stress acts over the two cylindrical surfaces of the fluid in the annulus. This force is produced by a pressure drop acting on the fluid annulus cross-sectional area. The effective ER shear pressure drop can be calculated from the following equation,

$$P_{ER} = \frac{F_{FA,ER}}{A_{FA}}$$  \hspace{1cm} (13)

This resistance pressure acts on the piston annulus area, so the resulting ER shear damper force can be calculated from the following equation,

$$F_{D,ER} = P_{ER} A_{PA}$$  \hspace{1cm} (14)

The effective damping coefficient can be calculated from the following equation,

$$C_{E} = \frac{2 L_{FA} A_{PA} C_{\tau E}}{\tau_{FA}^{3}}$$  \hspace{1cm} (15)

The quadratic damper force coefficient $C_{Q}$ is given approximately by

$$C_{Q} = \frac{1}{2} \rho \alpha A_{PA}$$  \hspace{1cm} (16)

The damper extension force can be calculated approximately by

$$F_{D} = C_{D} V_{D} + C_{Q} V_{D}^{2} + C_{E} E \hspace{1cm} (V_{D} > 0)$$  \hspace{1cm} (17)

In this paper, the net weight of vehicle is 2230 kg and gross vehicle weight is 2690 kg. In today's standard size automobile, the weight of unsprung components is normally in the range of 13 to 15 percent of the vehicle net weight. For Land Cruiser car, the ratio of the unsprung weight to vehicle weight is 0.15.

$$\text{Vehicle Weight} = \text{Sprung Weight} + \text{Unsprung Weight}$$  \hspace{1cm} (18)

Unsprung Weight can be calculated from the following equation,

$$M_{u} = 2230 \times 0.15$$

$$= 334.5 \text{ kg}$$

Sprung Weight can be calculated from the following equations.

For full load,

$$M_{s} = 2690 - 334.5$$

$$= 2355.5 \text{ kg}$$

For empty load,
Force on each shock absorber can be calculated from the following equation,

\[ W = m \times g \]  

(19)

Load on each shock absorber can be calculated from the following equation,

\[ m_s = \frac{M_s}{4} \]  

(20)

Direct shear stress due to force acting on the shock absorber can be calculated by the following equation,

\[ \tau = \frac{\text{Load}}{\text{cross – section area of the piston}} \]  

(21)

where, \( W \) = force on each shock absorber

\( D_p \) = diameter of piston

### V. CALCULATED RESULT DATA FOR ELECTRORHEOLOGICAL DAMPER

The calculated results for electrorheological damper are shown in Table II.

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Symbols</th>
<th>Units</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annular area of the piston</td>
<td>( A_{PA} )</td>
<td>mm²</td>
<td>5.06x10²</td>
</tr>
<tr>
<td>The fluid annulus cross-sectional area</td>
<td>( A_{FA} )</td>
<td>mm²</td>
<td>0.79x10²</td>
</tr>
<tr>
<td>The area factor ratio</td>
<td>( f_A )</td>
<td>-</td>
<td>6.44</td>
</tr>
<tr>
<td>The volumetric flow rate</td>
<td>( Q )</td>
<td>mm³/s</td>
<td>2.53x10⁵</td>
</tr>
<tr>
<td>The mean fluid flow velocity</td>
<td>( V_{FA} )</td>
<td>m/s</td>
<td>3.22</td>
</tr>
<tr>
<td>The Reynolds number</td>
<td>( \Re )</td>
<td>-</td>
<td>0.36x10²</td>
</tr>
<tr>
<td>The viscous pressure drop</td>
<td>( P_v )</td>
<td>MN/m²</td>
<td>1.73</td>
</tr>
<tr>
<td>The viscous damper force</td>
<td>( F_{D,V} )</td>
<td>N</td>
<td>8.76x10²</td>
</tr>
<tr>
<td>The damper coefficient</td>
<td>( C_D )</td>
<td>kN-s/m</td>
<td>1.75</td>
</tr>
<tr>
<td>The yield shear stress of ER liquid</td>
<td>( \tau_{ER} )</td>
<td>k N/m²</td>
<td>4</td>
</tr>
<tr>
<td>The ER fluid shear force</td>
<td>( F_{FA,ER} )</td>
<td>kN</td>
<td>3.52x10³</td>
</tr>
<tr>
<td>The effective ER shear pressure drop</td>
<td>( P_{ER} )</td>
<td>MN/m²</td>
<td>4.48</td>
</tr>
<tr>
<td>The ER shear damper force</td>
<td>( F_{D,ER} )</td>
<td>kN</td>
<td>2.27</td>
</tr>
<tr>
<td>The quadratic damper force coefficient</td>
<td>( C_Q )</td>
<td>kg/m</td>
<td>0.32x10²</td>
</tr>
<tr>
<td>The effective damping coefficient</td>
<td>( C_E )</td>
<td>MN/V</td>
<td>0.45</td>
</tr>
<tr>
<td>The damper extension force</td>
<td>( F_D )</td>
<td>kN</td>
<td>2.25</td>
</tr>
</tbody>
</table>

### VI. CONCLUSION

In this research paper, the design of electrorheological damper for four wheel drive car is described. This paper states the design calculations of shear stress and damper force for electrorheological damper. In practical use, the damper force is in the range of 250-5000 N. So, the damper force in this research paper was satisfied.

### ACKNOWLEDGEMENT

The author especially wishes to acknowledge her respective teachers of Mechanical Engineering Department, Mandalay Technological University who gave their knowledge, helps during the theoretical study and thesis paper preparation. Finally, the author wishes to extend her gratitude to her parents and family for their sacrifices, love, moral support and encouragement throughout her entire life.

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Application of Chemical Oxidants in the Remediation of Petroleum Products Contaminated Ground Water

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Abstract - Ground water is a major source of drinking water and very vital for domestic, industrial and agricultural purposes. Pollution of this important natural resources poses a great danger to life. Groundwater pollution affects useful land site as well as negatively impact the immediate environment. Pollution of ground water associated with health hazard through diet, drinking contaminated water. Although, many remediative techniques are available for the treatment of these organic contamination. The chemical oxidation application is a proven remedial method for achieving effective remediation. The study is focused on the chemical oxidation technique in the remediation of petroleum products in contaminated ground-water. This was an actualised by the use of the most of appropriate oxidants and concentrations of three different oxidants. These are Fenton reagent, sodium persulfate the KMnO4. Experiment showed that the optimum oxidative performance was at a concentration above 10% sodium persulphate radical proved best at 30% w/v concentration treatment of diesel and kerosene. The results proved a decision making remedial strategy for site specific field application. A mathematical principle was used to express and vindicate analysis of result of samples obtained.

Index Terms - Ground water contamination, Petroleum product, Chemical Oxidation, Decision Support Tool.

I. INTRODUCTION

Ground water is one of the major sources of portable and domestic water globally. It is also very vital to human, agriculture and industrial purposes. Therefore pollution of this important natural resource poses a great danger and hazards to man and its natural resources. [1, 2] The contamination of ground water as a result of leakage and spills from piles has become a global concern to major players of oil industry. [3] Drinking contaminated water can lead to diseases such as hepatitis, dysentery, cancer, pile, aches and many others. There are other long term effects such as cancer and HBP can also be traced to poisoning and toxins from septic tanks. [2, 1, 5, 4]. Spilled crude oil can exert adverse effect on our environment because of the Polycyclic Aromatic Hydrocarbon (PAH) that comes out from it. Similarly, Total Petroleum Hydrocarbons (TPH) are also pollutants precursors of the environment. [6, 7].

All over the world, especially in developing countries, ground become a source of ground water has become a source of agricultural and drinking water. The high dependence on groundwater due to belief that it is free from pathogens found in surface waters [8, 9]. However, groundwater may contain a wide variety of inorganic and organic dissolved constituents resulting from reactions between water and geological materials [10, 11].

The menace of polluting our ground water with Petroleum hydrocarbons through leakages to the underground needs serious attention since it is most prevalent and ubiquitous water source to most rural and urban dwellers in this country. It is against this background that the chemical oxidation method for groundwater clean-up becomes necessary. Chemical oxidation method is fast and efficient for remedial mass reduction at a lower overall cost because there are no moving parts that could break down. [14, 15]. The treatment involved one-half of a redox reaction in which, there is a loss of electron i.e. oxidised and the other becomes reduced or gain electron.

In-situ Chemical oxidation, involves the introduction of Chemical oxidants into the ground water with an intention to converting inherent hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile and inert. [15] The oxidising agents used in this case are hydrogen peroxide catalysed with Ferrous in Fenton reagent [11, 10] Potassium permanganate and sodium persulfate [13, 16].

II. EXPERIMENTATION

The salts and reagents used in this research work were of Analar grade and were used without further purification. Below is a list of the reagents and sources.
Permanganates appears as NaMnO4 or KMnO4 and comes from …………………………….. BDH chemical Ltd Poole England
Persulphates appears as ammonia and potassium NH3.S2O8 or KS2O8 and was obtained from ………………………... Qualikem laboratory, India
Crude Oil ……………………………………. Bomu Oil field in Rivers State, Nigeria
Sodium Hydroxide…………………………. BDH Chemical Ltd. Poole England

and was obtained from ………………………. Qualikem laboratory, India

Crude Oil ……………………………………. Bomu Oil field in Rivers State, Nigeria
Sodium Hydroxide…………………………. BDH Chemical Ltd. Poole England

The persulphate anion reacted with the natural organic matter (NOM) in a simulated type of environment.
The Sodium Persulphate were prepared by dissolving varying weights of 0.34g, 1.98g, 8.57g, 19.7g and 30.68g of the solids in deionised water [16].

The contaminated water samples were prepared by adding the hydrocarbons (diesel motor oil and kerosene) into deionised water container. The mixture was vigorously shaken for 20-30 minutes to settle. 5.0ml of the hydrocarbon sample was added to 20ml of the saturated water in a 50ml beaker and was kept for twelve hours degradation period. The solution was shaken vigorously and was sent for the GC-FID for onward chromatographic analysis. Each of the 5 samples of the three (3) types of hydrocarbons were analysed

### III. RESULTS

#### Table 1

<table>
<thead>
<tr>
<th>Samples</th>
<th>Motor Oil Mg/L</th>
<th>Diesel Mg/L</th>
<th>Kerosene Mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>11</td>
<td>38</td>
</tr>
<tr>
<td>2</td>
<td>28</td>
<td>53</td>
<td>73</td>
</tr>
<tr>
<td>3</td>
<td>49</td>
<td>25</td>
<td>41</td>
</tr>
<tr>
<td>4</td>
<td>21</td>
<td>50</td>
<td>74</td>
</tr>
<tr>
<td>5</td>
<td>26</td>
<td>15</td>
<td>54</td>
</tr>
</tbody>
</table>

#### STATISTICAL INTERPRETATION

The statistical or Mathematical method employed in this analysis is the ANOVA – Analysis of Variance

The null hypothesis as Ho stands for no significant difference in:

i. Chemical oxidation as effective remediative method
ii. The persulphate not effective remediant
iii. Chemical Oxidative is not fast

The alternative hypothesis H1 holds true for

i. There is a difference to the H0 as in above

Therefore the ANOVA being hypothetical shall serve as a tool for either accepting or rejecting the hypothesis

#### IV. ANOVA SETTING

#### Table 2

<table>
<thead>
<tr>
<th>T1=139</th>
<th>T2 = 154</th>
<th>T3 = 280</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>28</td>
<td>53</td>
</tr>
<tr>
<td>3</td>
<td>49</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>21</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>26</td>
<td>15</td>
</tr>
</tbody>
</table>

n=n1 +n2 + n3 = 15

i. Grand Total G = Σxij = 573

ii. Correction factor C = G²/n = 328329/15 = 21888.6

iii. Total sum of square – C = 27653-21888

iv. Treatment Sum of sq. Tyy – C

v. Error sum of sq. SSyy – Tyy

#### V. ANOVA TABLE

<table>
<thead>
<tr>
<th>Source</th>
<th>Df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>3-1=2</td>
<td>2399</td>
<td>1199.5</td>
<td>4.8</td>
</tr>
<tr>
<td>Error</td>
<td>15-3=12</td>
<td>3366</td>
<td>2166.5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15-1</td>
<td>5765</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Degree of Freedom t – 1

Fc = F ∞ (2, 12) = F0.005 (2, 12)

Decision Rule

Reject if: F > Fc

Since F is greater than Fc, we reject all (H0) null hypothesis and accept the (H1) alternative hypothesis which holds true as:

H1

i. Chemical Oxidation technique is effective for remediative contaminated ground water.
ii. The persulphate oxidant is an effective remediant for ground water pollution.
iii. There exist a significant difference in the remediative methods of ground water polluted by hydrocarbon.
iv. There exist a significant decision report tool for in-situ oxidation remedial technique in treating ground water polluted with petroleum products.

#### VI. CONCLUSION

Ground water pollution can be remediated using the chemical oxidative technique. The validity was made real using a mathematical check-up called the ANOVA. Major users of ground water are advised to sink their materials to the main aquifers level for purity of the ground water. The leakages and spills from piles and oil wells are to be monitored periodical to avoid the hydrocarbon pollutants. The clean ups by regular use of chemical oxidation method is encouraged because all their products are useful environmental inorganic species like Carbon dioxide and water. Chemical oxidation methods are fast, neutralizing and efficient for massive remediation petroleum pollutants. The method is considerably less cost effective and environmentally friendly.

### ACKNOWLEDGEMENT

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all the assistance and cooperation. The authors declare that there is no conflict of interest regarding the publication of this article.

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Abstract- Domestic water in the D/line area of Port Harcourt was assessed for portability by analysing water samples from four selected bore holes chosen at random to see how safe they are drinking. Results obtained from this study compared well with permissible limits for safe drinking water as provided by NAFDAC, SON, and WHO. Results also showed pH values ranging from 3.5 – 5.7, for total alkalinity range within 16mg/l – 20mg/l. Total dissolved solids from 0.08mg/l – 1.20mg/l. Total hardness range between 9mg/l and 17mg/l while calcium hardness range between 6mg/l and 11mg/l. All the samples from B1 – B4 were slightly acidic. The study showed that water from these bore holes did not meet the standard parameters for safe drinking water. It is therefore recommended that in future studies boles in the area should be monitored and further treated to avoid break out of disease epidemic within the study area.

Index Terms- Bore-hole water, physico-chemical parameters, NAFDAC, Analysis, domestic water.

I. INTRODUCTION

Water is a universal solvent that dissolves all solutes. Bore-hole water forms a major source of domestic, industrial and agricultural water sources globally (1). As a result of rapid population growth in the world, and accelerated industrialisation, there is an increase in demand and use of fresh water. The purity and quality of ground and surface water is constantly affected due to pollution caused by improper waste disposal methods both in urban and rural areas (1, 2). The D/line dwellers are affected by a lot of urban pollutants ranging from chemical wastes from industries to human wastes. The study area lies between latitude 4.5° and 5.0° N of the equator and on longitude 7.0° E of the Greenwich meridian. Literature has shown that drinking water is easily exposed to water-borne diseases (2, 4, 5). The complaints and health conditions of the inhabitants of this area necessitated this study. The study therefore, provides baseline information for the physicochemical analysis of the main sources (bole holes) of drinking water supply in the D/line area of Port Harcourt, Nigeria.

II. MATERIALS AND METHODS.

Water samples were selectively collected from four different bore-hole locations (B1 – B4) in the D/line area of Port Harcourt, Rivers state Nigeria. Each water sample was collected in a clean 1 litre plastic container. Parameters selected for estimation of water quality were pH, temperature (T), electrical conductivity (EC), salinity (S), total dissolved solids (TDS) chlorides (Cl), total alkalinity (TA), total dissolved oxygen (DO), and biochemical oxygen demand (BOD), the containers were stored in a refrigerator for physicochemical analysis in the laboratory.

III. RESULTS.

The results of the variables measured in the bore-hole water samples from the study area.

Table 1: Variables measured from water samples.

<table>
<thead>
<tr>
<th>Parameters detected</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°c)</td>
<td>26</td>
<td>27</td>
<td>27</td>
<td>28</td>
<td>27</td>
<td>13.5</td>
</tr>
<tr>
<td>TDS (mg/l)</td>
<td>1.2</td>
<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
<td>0.57</td>
<td>0.28</td>
</tr>
<tr>
<td>Conductivity Ec (µs/cm)</td>
<td>3.5</td>
<td>0.13</td>
<td>0.13</td>
<td>0.13</td>
<td>0.96</td>
<td>0.48</td>
</tr>
<tr>
<td>Chlorides (mg/l)</td>
<td>85</td>
<td>50</td>
<td>37</td>
<td>55</td>
<td>56.7</td>
<td>28.35</td>
</tr>
<tr>
<td>Total hardness (mg/l)</td>
<td>13</td>
<td>14</td>
<td>9</td>
<td>17</td>
<td>13.3</td>
<td>6.65</td>
</tr>
<tr>
<td>pH</td>
<td>3.9</td>
<td>3.6</td>
<td>3.8</td>
<td>5.7</td>
<td>4.3</td>
<td>2.15</td>
</tr>
<tr>
<td>Total alkalinity (mg/l)</td>
<td>20</td>
<td>16</td>
<td>16</td>
<td>18</td>
<td>17.5</td>
<td>8.75</td>
</tr>
</tbody>
</table>

Table 2: Standard for portable water (3, 6).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>NAFDAC</th>
<th>SON</th>
<th>WHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMP °C</td>
<td>–</td>
<td>Ambient</td>
<td>28</td>
</tr>
<tr>
<td>pH</td>
<td>6.5 – 8.5</td>
<td>6.5 – 8.5</td>
<td>7.0 – 8.5</td>
</tr>
<tr>
<td>Electrical cond. (µs/cm)</td>
<td>1000</td>
<td>1000</td>
<td>1200</td>
</tr>
<tr>
<td>Total dissolve solids (mg/l)</td>
<td>100</td>
<td>500</td>
<td>1000</td>
</tr>
<tr>
<td>Total hardness (mg/l)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Chlorides (mg/l)</td>
<td>100</td>
<td>100</td>
<td>250</td>
</tr>
<tr>
<td>Total solids (mg)</td>
<td>500</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total alkalinity (mg/l)</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

IV. DISCUSSION

The pH of the water samples from the area surveyed ranged from 3.6 to 5.7. The mean value is at 4.3, which shows that drinking water in D/line area is slightly acidic and therefore not conducive for drinking as well as for other domestic purposes. The water may thus be considered to be acidic for human consumption which could result to an ill health especially acidosis (7, 8). Drinking water should have a temperature of 27°C which is ideal and falls within acceptable standards (9, 10, 11). TDS values were uniform at 0.08mg/l in B2, B3 and B4 with mean value 0.57mg/l. the amount of total dissolved solids in water is generally determined by many factors which include temperature, atmospheric pressure, salinity, hardness etc. (12).

Their concentrations showed no adverse physiological effect on humans as total alkalinity obtained in this study was 17.5mg/l. Conversely, water saturated with dissolved oxygen is best for humans, fish and other aquatic organisms. However drinking water has no specific guidelines for dissolved oxygen (5, 14, and 15). High pH values could cause corrosion to metals while lower values tend towards acidity.

Hardness of water above the standard limits of 100 – 500mg/l is not acceptable for drinking (13, 14) therefore hardness of water in this area is moderate. The table below explains all hardness of water which is in conformity to safe drinking water guidelines [1, 9].

Table 3 shows safe drinking water guidelines

<table>
<thead>
<tr>
<th>Hardness (mg/l CaCO₃)</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 75</td>
<td>Soft</td>
</tr>
<tr>
<td>75 – 150</td>
<td>Moderately hard</td>
</tr>
<tr>
<td>150 – 300</td>
<td>Hard</td>
</tr>
<tr>
<td>Over 300</td>
<td>Very hard</td>
</tr>
</tbody>
</table>

V. CONCLUSION

The results from the analysis of D/line bore-hole water shows that the water can be reduced by adding lime to increase in the pH of the water. The water is not completely safe and can cause water-borne disease in both long and short term consumption.

ACKNOWLEDGEMENT.

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Understanding the Impact of E-Logistics Capability on National Statistical System E-Data Performance: A Case Study on Ghana

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  http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7925

ABSTRACT
This study focused on understanding the impact of e-logistics capability involving the Ghana Statistical Service corporate website, and its electronic data interchange (corporate email, SharePoint among others) on the performance of the National Statistical System in e-data transactions. In relying on Wengmann (2008) knowledge management tool and Kaplan & Norton (1996) scorecard on corporate performance (employee learning and growth, and employee satisfaction) theoretical orientation, the study applied SPSS statistical software with principal component and multiple regression analysis to establish that Ghana Statistical Service corporate website and its other electronic data interchange contribute significantly to the performance of the National Statistical system in e-data transactions.

Keywords: e-logistics, corporate website, electronic data interchange, corporate performance, National Statistical System.

I. INTRODUCTION

E-transactions are undertaken on the internet through online applications involving web browsers, electronic mail, electronic data interchange among others (Lewis, 2001, p. 8). These categories of electronic transactions consists of interrelated group of organizations from diverse industries through organization’s intranet, website embedded with online transaction capability involving electronic communication of information often performed through electronic means (Mooddley & Morris, 2004, p. 157). In their studies, Wyn & Katz (1995) discovered that except fora for interactive exchange, corporate websites are largely a mixture of information already available in printed media, and that the web provides a medium for social processes involving orderliness of talk, shared understanding, and accountability.

As an example of genre organizational communication, corporate web presence may embrace multiple identities which are acknowledged as social actions on behalf of members of a corporate organization facilitating interactions among members in order, structure, and process (Brown & Coupled, 2004). Earlier studies conducted on electronic transactions mainly focused on e-commerce, with a few ones which established relationships between e-logistics capability of firms and financial performance (Delong & McLean, 2004; Droge & Germain, 2000; London and Hall, 2011). This study sought to breach the research gap on e-logistics capability and corporate performance by assessing the impact of e-logistics capability and performance of e-data transactions in a National Statistical System (NSS). The research relied on survey responses from four hundred and fifty six (456) staff employed in organizations constituting the National Statistical System in Ghana. The purpose of this empirical research is to contribute to the body of knowledge; a number of significant variables on e-data transactions with tendency to impact on organizational performance.

1.1 Theoretical Framework
This research is premised on two theoretical framework consisting of Wengmann (2008) knowledge management tool and that of Kaplan and Norton (1996) organizational performance (based on scorecard- employee learning and growth, and customer satisfaction). In line with Wengmann (2008) knowledge management tool, the researcher employed Wengmann (2008) e-logistics capability as one of the two theoretical frameworks upon which literature is reviewed. The e-logistics capability employed in this research upon which literature is reviewed include: data
warehousing, business intelligence, and business performance management. The second theoretical framework in line with Kaplan & Norton (1996) scorecard perspective of; employee learning and growth, and customer satisfaction reviewed literature on value added per employee to corporate growth, staff communication, employee satisfaction, leadership development among others (Niven, 2002 & Wegmann, 2008).

2.0 REVIEW OF LITERATURE

E-business occurs on the internet using applications such as web browsers, electronic mail and other forms of electronic data interchange (EDI). Business to business (B2B) commerce deals with commercial transactions involving ICT to perform public internet transactions involving worldwide web-based auctions, and mutual trade arrangements between business partners on organizations extranet, and websites infused with electronic technology involving data interchange (Moodley & Morris, 2004, p. 157). This research reviewed literature on the roles play by corporate website and electronic data interchange in e-data transaction activities. Corporate websites are array of information available through print media which organizes information for shared understanding on a common platform. Electronic data interchange (EDI) serves as a common platform where employees and customers in performing inter-company, computer-to-computer exchange of business documents; in standardized format to streamline transactions devoid of paper work, reduced personnel and inventory costs, reduced order lead time and data errors as a result of electronic transactions replacing manual ones (Droge & Germain, 2000). EDI are mostly employed by large organizations with capacity to process higher volumes of information for easy sharing of these information with their external stakeholders (Al-namlah & Rawashdeh, 2017).

The benefits associated with the electronic transactions include higher service levels, improved communication, product availability, better accuracy in ordering, and reduction in labour costs (Peffers, Dos Santos & Thumer, 1998). Kaplan & Norton (1996) linked corporate performance to four scorecard perspectives involving: (1) Financial performance which describes shareholders and their expectations from the organization, (2) Employee learning and growth, (3) Customer satisfaction, and (4) Business process perspective- focused on creating value and innovation (Niven, 2002 & Wegmann, 2008). Overall employees and client satisfaction in electronic data transactions can emanate from quality of information being shared, effectiveness of the systems being used to distribute information, and how quickly client data needs are met. Researchers agree that satisfaction comes with being impressed with service, being attractive to service delivery, and that institutional satisfaction is a key element in determining organizational performance (Fry, 2014 & Kerai, 2017). This study seeks to understand the performance of the National Statistical System in Ghana through two major scorecard perspective involving employee learning and growth, customer and employee satisfaction in e-data transactions.

3.0 METHODOLOGY

This study employed survey research approach with a Likert Scale within interval of 1-5; where 1 represents disagree strongly and 5 represents agree strongly. The study relied on survey responses from employees of seven government institutions who are members of the National Statistical System in Ghana. Using a systematic random sampling technique, 470 employees of these institutions where selected from a total of 950 employees who constituted the total sampling frame. The research employed the corporate e-logistic capability of corporate website, and electronic data interchange (employee corporate SharePoint and extranet) of Ghana Statistical Service as key independent variables with impact on dependent variables (corporate performance based on employees growth and, customer satisfaction). The study’s independent variables consisted of e-logistics capability in line with Wengmann (2008) knowledge management tool for corporate performance. These variables were: (1) Corporate website with decision support, (2) Electronic data interchange with executive information system, (3) Corporate website with executive information system, (4) Corporate website with data warehousing, (5) Electronic data interchange with data warehousing, (6) Corporate website with business intelligence, (7) Electronic data interchange with business intelligence, and (8) corporate website with business performance management. The dependent variables employed were: (1) Improved knowledgeability of employees on statistical data (2) Improved corporate communication with customers, (3) Improved corporate communication with customers, (4) Improved data needs of clients, (5) Improved data quality, (6) Enhanced capacity of staff in data communication and reporting, (7) Improved intra and inter-agency exchange of data and statistical reporting, (8) Reduction in data errors associated with information sharing, (9) Improved organization-customer relationship in data sharing.

The study aimed to address one main research question; does e-logistics capability of corporate website and electronic data interchange have impacts on corporate performance (employee learning and growth, and improved customer satisfaction). The study hypotheses were:
H1a: The Ghana Statistical Service corporate website contributes significantly to the performance of the National Statistical System.

H0a: The Ghana Statistical Service corporate website does not contribute significantly to the performance of the National Statistical System (NSS).

H1b: The Ghana Statistical Service electronic data interchange system contributes significantly to the performance of the National Statistical System.

H0b: The Ghana Statistical Service electronic data interchange system does not contribute significantly to the performance of the National Statistical System (NSS).

4.0 DATA ANALYSIS AND FINDINGS

Out of the 470 employees of the National Statistical System who were contacted for the study, 456 (97.0%) provided responses to questions on e-data transactions involving the Ghana Statistical Service, institutions constituting the NSS in Ghana, and their customers. The data which were analyzed with SPSS statistical software applied principal component analysis to reduce the large number of variables being studied. The data extraction technique helped reduced independent variables into five (5) and the dependent variables into four (4). The independent variables were (electronic data interchange with executive information system, corporate website with executive information system, corporate website with data warehousing, electronic data interchange with data warehousing, and corporate website with business intelligence). The dependent variables were (satisfying clients data needs, improved relationship with customers, improved organization-client communication, and improve intra and inter-agency data exchange and data reporting. See Appendix Table 1 for details. The adequacy of sampling used in this research was subjected to KMO and Bartlett’s test which produced a sampling adequacy 0.65. Cronbach alpha test of reliability yielded a coefficient of 0.71 to confirm data reliability.

The results from the data extraction indicated that electronic data interchange with data warehousing accounted for the highest variance (87.9%) indicating a higher contribution in predicting the performance of National Statistical System in e-data transaction. It recorded an explained variance of 18.2%; which implies that 18.2% of explained variation can be predicted from independent variables. Again, the results show that electronic data interchange with executive information system accounted for 61.8% of variance. This implies that 12.6% of the variance can be predicted from independent variables. Corporate website with data warehousing accounted for 58.0% of variance. The 58.0% for corporate website with data warehousing also accounted for 12.0% of total explained variation. This implies that 12.0% of the variance can be predicted from independent variables. A correlation coefficient involving both dependent and independent variables revealed a low correlation relationship between dependent and independent variables (r < 0.5); an indication of absence of multi-collinearity. We therefore proceed to Appendix Table 1 and 2 to discuss other outputs.

From the model summary in Appendix Table 1, coefficient of determination (R²= 9.5%) in model 1 implies that 9.5% performance of National Statistical System in e-data transactions associated with meeting client data needs can be attributed to four predictors: GSS electronic data interchange with data warehousing, corporate website with data warehousing, electronic data interchange with executive information system, and corporate website with business intelligence. A higher F value of 11.794 compared to smaller p< 0.01 confirms that the independent variables (GSS electronic data interchange with data warehousing, corporate website with data warehousing, electronic data interchange with executive information system, and corporate website with business intelligence) significantly predict dependent variable (met clients data needs). See Appendix Table 2 for details.

Similarly, coefficient of determination (R²= 16.5%) in model 2 shows that 16.5% of National Statistical System in e-data transactions (improved data communication with clients) can be predicted by electronic data interchange with data warehousing, corporate website with data warehousing, electronic data interchange with executive information system, corporate website with business intelligence. The results is confirmed by larger F (22.17) compared to smaller p value (0.00) that the independent variables (electronic data interchange with data warehousing, corporate website with data warehousing, electronic data interchange with executive information system, corporate website with business intelligence) significantly predict dependent variable (improved data communication with clients) as shown in Appendix Table 2.

The results further revealed that explained variance (R²= 22.7%) indicates that 22.7% performance of National Statistical System resulting from improved intra and inter-agency exchange of data and statistical reports (dependent variable) was attributed to predictors (corporate website with business intelligence, corporate website with executive information system, corporate website with data warehousing, electronic data interchange with data ware-housing). The results have been confirmed with larger F value (33.026) and smaller p < 0.01; an indication that independent variables (corporate website with business intelligence, corporate website with executive information system, corporate website with data warehousing, electronic data interchange with data ware-housing) significantly predict
dependent variable (improved inter-agency exchange of data and other statistical reports). We conclude by accepting the hypotheses: H1a: that Ghana Statistical Service corporate website contributes significantly to the performance of the National Statistical System and H1b: that Ghana Statistical Service electronic data interchange system contributes significantly to the performance of the National Statistical System.

5.0 CONCLUSIONS
The research sought to understand the impact of e-logistics capability (corporate website and electronic data interchange) on performance of National Statistical System (employee learning and growth, employee and customer satisfaction). The study’s theoretical orientation was founded on Wengmann (2008) knowledge management tool and Kaplan and Norton (1996) organizational performance attributed to: employee learning and growth, and customer satisfaction. The review of literature focused on the role of corporate website, and that of electronic data interchange. In relying upon survey responses from 456 Ghanaian employees found on the National Statistical System, a principal component analysis performed on data with SPSS statistical software reduced the relatively large dependent and independent variables to 4 and 5 respectively. The independent variables were (electronic data interchange with executive information system, corporate website with executive information system, corporate website with data warehousing, electronic data interchange with data warehousing, and corporate website with business intelligence). The dependent variables were (satisfying clients data needs, improved relationship with customers, improved organization-client communication, and improve intra and inter-agency data exchange and data reporting.

The results from the data extraction indicated that electronic data interchange with data warehousing accounted for the highest variance (87.9%) indicating a higher contribution in predicting the performance of National Statistical System in e-data transaction. In addition, electronic data interchange with executive information system accounted for 61.8% of variance. These revelations confirmed that the independent variables predict the dependent variables. The study further showed that 9.5% performance of National Statistical System in e-data transactions associated with meeting client data needs were attributed to predictors: GSS electronic data interchange with data warehousing, corporate website with data warehousing, electronic data interchange with executive information system, and corporate website with business intelligence. Similarly, coefficient of determination ($R^2 = 16.5\%$) meant that 16.5% of National Statistical System in e-data transactions (improved data communication with clients) is predicted by electronic data interchange with data warehousing, corporate website with data warehousing, electronic data interchange with executive information system, corporate website with business intelligence.

The results further revealed that explained variance ($R^2 = 22.7\%$) meant that 22.7% performance of National Statistical System (improved intra and inter-agency exchange of data and statistical reports) was attributed to predictors (corporate website with business intelligence, corporate website with executive information system, corporate website with data warehousing, electronic data interchange with data warehousing). We accept the hypotheses: H1c: that Ghana Statistical Service corporate website contributes significantly to the performance of the National Statistical System, and H1d: that Ghana Statistical Service electronic data interchange system contributes significantly to the performance of the National Statistical System. The implication of this research is that National Statistical Systems and institutions involved in e-data transactions should be provided with useful insights of knowledge to improve their e-data transactions involving employee knowledgeability and productivity, client satisfaction, and satisfaction of other key stakeholders involved in e-data transactions. Future research should include agencies involved in e-data transactions such as e-procurements, e-banking, and e-commerce. In addition, researchers should employ mixed method approach to understand e-logistics capability involving electronic browsers and corporate financial performance, employee growth, customer satisfaction among others.
### APPENDICES

**Appendix Table 1: Communalities**

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<thead>
<tr>
<th>Extraction</th>
<th>R</th>
<th>%</th>
</tr>
</thead>
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<tr>
<td>GSS electronic data interchange with executive information system in e-data services</td>
<td>0.40</td>
<td>40.0</td>
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<tr>
<td>GSS corporate website with executive information system in e-data transaction</td>
<td>0.403</td>
<td>40.3</td>
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<td>GSS corporate website with improved e-data warehousing</td>
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<td>60.0</td>
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<td>0.36</td>
<td>36.0</td>
</tr>
<tr>
<td>GSS corporate website with improved organizational corporate business intelligence in e-data production</td>
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<td>39.0</td>
</tr>
<tr>
<td>GSS electronic data interchange with corporate business performance management in e-data production</td>
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<td>36.0</td>
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<tr>
<td>GSS corporate website has enhanced the working relationship between our organization and customers in e-data services</td>
<td>0.372</td>
<td>37.20</td>
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<tr>
<td>GSS corporate website has improved communication between our organization clients in e-data services</td>
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<tr>
<td>GSS corporate website has facilitated e-data transactions in meeting clients data needs</td>
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<td>40.0</td>
</tr>
<tr>
<td>GSS corporate website with quality of our data being produced</td>
<td>0.47</td>
<td>47.0</td>
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<tr>
<td>GSS electronics data interchange with improved intra and inter-agency exchange of data and other statistical reports</td>
<td>0.63</td>
<td>63.0</td>
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<tr>
<td>Cut off point</td>
<td>r= 0.35</td>
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Appendix Table 2: Model Summary

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<tr>
<th>Model</th>
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<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
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<td>0.308</td>
<td>0.095</td>
<td>0.087</td>
<td>0.555</td>
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<td>2</td>
<td>0.406</td>
<td>0.165</td>
<td>0.157</td>
<td>0.663</td>
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<td>0.476</td>
<td>0.227</td>
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<td>0.98</td>
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Table 3: ANOVA

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<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
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<td>4</td>
<td>3.639</td>
<td>11.794</td>
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<tr>
<td>Total</td>
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<td>454</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td>33.026</td>
<td>0.00</td>
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<tr>
<td>Total</td>
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<td>454</td>
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<td></td>
</tr>
</tbody>
</table>

1. Dependent Variable: Met client data needs.
Predictors: (Constant), Corporate electronic data interchange with data warehousing, corporate website with data warehousing, electronic data interchange with executive information system, corporate website with business intelligence.

2. Dependent Variable: Improved data communication with clients.
Predictors: Electronic data interchange with data warehousing, corporate website with data warehousing, electronic data interchange with executive information system, corporate website with business intelligence.

3. Dependent variable: Improve intra and inter-agency exchange of data and statistical reports.
Predictors: Corporate website with business intelligence, corporate website with executive information system, corporate website with data warehousing, electronic data interchange with data warehousing.
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Productivity and Nutrient Uptake of Aerobic Rice as Influenced by Methods of Establishment and Sources of Organic Nutrients

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Abstract- Field experiment was conducted during kharif 2005 and 2006 at Zonal Agricultural Research Station, Mandya to study the effect of organic nutrient sources on productivity and uptake of nutrients by Aerobic rice in Cauvery command area. Soil of the experimental site was red sandy loam in texture, low in organic carbon (0.43%) and available nitrogen (270.60 kg ha⁻¹), medium in available P₂O₅ (32.25 kg ha⁻¹) and K₂O (149.80 kg ha⁻¹). Treatments consisted of 12 treatment combinations, two main plot treatments of establishment methods and six nutrient sources in sub plot were laid out in split plot design with three replications. The results indicated that puddled method of rice cultivation recorded significantly higher grain yield (4600 kg ha⁻¹), straw yield (4325 kg ha⁻¹) and total N, P₂O₅ and K₂O uptake (105.12, 21.0 and 79.85 kg ha⁻¹, respectively) as compare to the aerobic method of cultivation. Among the different organic nutrient sources application of poultry manure 125 kg N equivalent + 25% of recommended N equivalent poultry manure a top dressing recorded significantly higher grain yield (4375 kg ha⁻¹), straw yield (4139 kg ha⁻¹) and Total N, P₂O₅ and K₂O (99.91, 20.05 and 75.95 kg ha⁻¹, respectively) uptake both in puddled and aerobic condition which was on par with application of sewage sludge 125 kg N equivalent + 25% of recommended N equivalent poultry manure at top dressing.

Index Terms- Rice, poultry manure, nutrient uptake, sewage sludge, yield

I. INTRODUCTION

Rice (Oryza sativa L.) is the staple food of more than half of the world population. Among the rice growing countries, India has the largest area (43.0 m ha) and is the second largest producer (109.15 mt) of rice next to china (197 mt). The rice productivity in India is 3.37 t ha⁻¹, while the world average is 4.25 t ha⁻¹ (IRRI, 2011). In Karnataka, rice is grown in an area of 1.32 m ha with an annual production of 4.24 mt and productivity is 3338 kg ha⁻¹ (Anon., 2015). At the current population growth rate (1.5%), the rice requirement of India by the year 2025 would be around 125 million tons (Kumar et al., 2009). To meet the food requirement of the growing population, the rice production has to enhance with good management practices with shrinking availability of land and water resources condition. Increasing water scarcity is becoming real threat for rice cultivation. Hence water saving technologies which also maintain soil health and sustainability and economically beneficial needs to be developed. Rice cultivation is most water consuming system and utilizes about 60 per cent of total available irrigation water. Traditional low land rice grown with continuous flooding in Asia has relatively high water input. To meet the water crisis, there is a need of alternate means of rice cultivation which require less water. Aerobic rice assumes greater importance in the light of the water scarcity and increasing demand for rice. Aerobic rice is a production system in which specially developed aerobic rice varieties are grown in well drained, non-puddled and non saturated soils. With appropriate management, the system aims for yields of at least 4.0 to 6.0 t ha⁻¹.

The essence of practicing organic farming lies in the use of naturally available resources. Using organic sources like farm yard manure (FYM), vermicompost, poultry manure, sewage sludge and urban compost etc., deserves priority for sustained production and better resource utilization compared to chemical farming (Muneshwar Singh et al., 2001). The application of organic source along with inorganic fertilizer leads to increase in productivity of the system and also sustained the soil health for longer period. Organic sources of nutrients applied to the preceding crop benefits the succeeding crop to a great extent (Hegde and Dwivedi, 1992) and system productivity becomes sustainable. A long term field trial on finger millet at Bangalore revealed that FYM or NPK fertilizers alone could not produce high yields and not sustainable. Many essential plant nutrients became deficit after two-three decades with them (Gajanan et al., 2005). Therefore, an investigation was under taken to study the effect of organic nutrient sources on productivity and nutrient uptake by aerobic rice under different establishment methods.

II. MATERIAL AND METHODS

Field experiment was conducted during kharif 2005 and 2006 at Zonal Agricultural Research Station, Mandya, University of Agricultural Sciences, Bengaluru to “Study the effect of..."
organic nutrient sources on productivity and uptake of nutrients by Aerobic rice in Cauvery command area”. Soil of the experimental site was red sandy loam in texture, low in organic carbon (0.43%) and available nitrogen (270.60 kg ha⁻¹), medium in available P₂O₅ (32.25 kg ha⁻¹) and K₂O (149.80 kg ha⁻¹). Treatments consisted of 12 combinations of two main plot treatments (methods of cultivation) and six nutrient sources in sub plot (T₁: Recommended fertilizer dose (FYM 10 t + 100:50:50 N:P₂O₅:K₂O kg ha⁻¹), T₂: FYM @ 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing, T₃: Pressmud 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing, T₄: Poultry manure 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing, T₅: Sewage sludge 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing, T₆: Urban compost 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing) were laid out in split plot design with three replications. The variety used was IR30864; it was developed at Zonal Agricultural Research Station, Vissweshwaraiah Canal Farm, Mandya, University of Agricultural Sciences, Bengaluru by using Mandya Vijay and Bilimukthi varieties. This is a medium duration variety and comes to harvest in 130 to 135 days. The variety produces bold seeds having attractive colour. The variety is capable of producing higher grain and straw yields and resistant to blast disease.

The relevant yield was recorded at harvest and subjected to statistical analysis, results were then analyzed statistically for drawing conclusion using analysis of variance (ANOVA) procedure (Gomez and Gomez, 1984). The plant samples used for recording dry matter production at harvest were used for analyzing nutrients present in the plant. After recording the dry weight from each treatment the samples were powdered in a micro Willey mill. The samples were analyzed for concentration (%) of different macronutrients (N, P₂O₅ & K₂O) present in aerobic rice plant parts. Nitrogen content of grain and straw was estimated by modified micro-kjeldhal’s method as outlined by Jackson and expressed in percentage. Nutrient uptake (kg ha⁻¹) by crop was calculated for each treatment separately using the following formula

\[ \text{Nutrient uptake} = \frac{\text{Nutrient content} \times \text{Dry weight} \times 100}{\text{kg ha}^{-1}} \]

The sum of uptake of nutrients in grain and straw was considered as the total uptake by the crop. The phosphorus content of grain and straw was determined by Vanadomolybdo phosphoric acid yellow colour method and absorbance of the solution was recorded at 430 nm using spectrophotometer and then computed to total uptake by crop as same as that of N uptake. Potassium content in plant sample (grain and straw separately) was determined by Flame photometer method and expressed in kg per ha as explained in nitrogen estimation.

### III. RESULTS AND DISCUSSION

**Grain and straw yield:** Results of the experiments indicated that, significantly, higher seed yield and straw yield of rice was registered with puddle method of establishment (4600 kg ha⁻¹ and 4325 kg ha⁻¹, respectively) as compared to aerobic method of establishment (3658 kg ha⁻¹ and 3433 kg ha⁻¹, respectively) (Table 1). The higher yield in puddle condition is due to continuous availability of water and nutrients that resulted in higher uptake of nutrients which resulted in higher leaf area and higher dry matter as compared to aerobic situation. Continuous availability of moisture throughout crop growth period leads to optimum leaf moisture content and had high leaf turgidity leading to maximum stomatal aperture and minimum stomatal resistance. This might be related to higher photosynthetic efficiency of crop and higher nutrient uptake and assimilation in source and translocation to the sink, which ultimately resulted in higher yield (Shekhara et al., 2010).

Application of recommended dose of fertilizer recorded significantly higher grain yield of rice and straw yield (4858 and 4761 kg ha⁻¹, respectively) as compared to organic source of nutrients. Among different organic source of nutrients application of poultry manure 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing recorded significantly higher grain yield (4375 and 4139 kg ha⁻¹, respectively) and which was on par with application of sewage sludge 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing (4188 and 3931 kg ha⁻¹, respectively) as compared to all other source of nutrients. The increased grain yield in poultry manure applied plot might be due to higher nitrogen content in poultry manure (1.96 % N) which was much readily available as compared to other organic manures. Poultry manure contains about 60 per cent of its nitrogen as uric acid, 30 per cent as more stable organic form of N and less than 10 per cent as mineral N. The uric acid N changes rapidly to ammonical form. Poultry manure contains growth promoting hormones and produce better root growth than fertilizer (Garg et al., 1971).

### IV. NUTRIENTS UPTAKE BY RICE

Among rice establishment methods, rice grown under puddled situation recorded significantly higher nitrogen (61.19, 35.85 and 105.12 kg ha⁻¹, respectively), phosphorous (15.53, 5.53 and 21.00 kg ha⁻¹, respectively) and potassium (19.94, 59.91 and 79.85 kg ha⁻¹, respectively) uptake in grain, straw and total uptake as compared to aerobic condition. Among different nutrient sources, application of recommended dose of fertilizer recorded significantly higher nitrogen (73.07, 37.86 and 110.93 kg ha⁻¹, respectively), phosphorous (14.78, 5.28 and 20.05 kg ha⁻¹, respectively) and potassium (19.87, 35.85 and 105.12 kg ha⁻¹, respectively) uptake in grain, straw and total uptake as compared to organic source of nutrients (Table 2, 3 and 4). Among different organic source of nutrients, application of poultry manure 125 kg N equivalent + 25 per cent of recommended N equivalent poultry manure as top dressing recorded significantly higher nitrogen (65.81, 34.10 and 99.10 kg ha⁻¹, respectively), phosphorous (16.40, 5.86 and 22.26 kg ha⁻¹, respectively) and potassium (21.06, 63.27 and 84.33 kg ha⁻¹, respectively) uptake in grain, straw and total uptake as compared to all other source of nutrients. Application of different
sources of organic manures increased the soil organic carbon content. This was mainly attributed to the slow decomposition rate of organic matter under poultry manure. Increase in uptake of nitrogen could be due to increase in dry matter production. Since the nitrogen added through organic manure was in organic form which releases throughout the crop growth and thus contributed for higher concentration in aerobic rice. This might be further attributed to increased root growth, which was added to soil after death of plant. Similar results were obtained by Ranjan Bhattacharya et al. (2004).

V. CONCLUSION

Among different organic nutrient management practices application of poultry manure 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing has been found superior with respect to yield and nutrients uptake by the aerobic rice.

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AUTHORS

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Table 1: Grain yield (kg ha\textsuperscript{-1}) and straw yield of rice as influenced by methods of establishment and organic sources of nutrients

**Note:** M\textsubscript{1}: Puddled rice cultivation  
M\textsubscript{2}: Aerobic rice cultivation

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Grain yield (kg ha\textsuperscript{-1})</th>
<th>Straw yield (kg ha\textsuperscript{-1})</th>
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<td></td>
<td>Pooled</td>
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</tr>
<tr>
<td></td>
<td>M\textsubscript{1}</td>
<td>M\textsubscript{2}</td>
</tr>
<tr>
<td>T\textsubscript{1}: Recommended fertilizer dose</td>
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<td>4303</td>
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<tr>
<td>T\textsubscript{2}: FYM @ 125 kg N equivalent + 25% of recommended N</td>
<td>4309</td>
<td>3460</td>
</tr>
<tr>
<td>equivalent poultry manure as top dressing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T\textsubscript{3}: Pressmud 125 kg N equivalent + 25% of recommended N</td>
<td>3904</td>
<td>3063</td>
</tr>
<tr>
<td>equivalent poultry manure as top dressing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T\textsubscript{4}: Poultry manure 125 kg N equivalent + 25% of recommended N</td>
<td>4852</td>
<td>3898</td>
</tr>
<tr>
<td>equivalent poultry manure as top dressing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T\textsubscript{5}: Sewage sludge 125 kg N equivalent + 25% of recommended N</td>
<td>4688</td>
<td>3688</td>
</tr>
<tr>
<td>equivalent poultry manure as top dressing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T\textsubscript{6}: Urban compost 125 kg N equivalent + 25% of recommended N</td>
<td>4434</td>
<td>3535</td>
</tr>
<tr>
<td>equivalent poultry manure as top dressing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>4600</td>
<td>3658</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>T</td>
</tr>
<tr>
<td>S.Em\textsuperscript{+}</td>
<td>234.76</td>
<td>77.33</td>
</tr>
<tr>
<td>CDs@5%</td>
<td>694.32</td>
<td>232.18</td>
</tr>
</tbody>
</table>

RDF: Recommended Dose of Fertilizer (100:50:50 kg N:P\textsubscript{2}O\textsubscript{5}:K\textsubscript{2}O ha\textsuperscript{-1}+ FYM 4t ha\textsuperscript{-1})

NS: Statistically not-significant
Table 2: Nutrients uptake by grain of rice as influenced by methods of establishment and organic source of nutrients

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Nutrients uptake by grain (kg ha(^{-1})) (pooled)</th>
<th>N</th>
<th>P(_2)O(_5)</th>
<th>K(_2)O</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M(_1) M(_2) Mean</td>
<td>M(_1) M(_2) Mean</td>
<td>M(_1) M(_2) Mean</td>
<td></td>
</tr>
<tr>
<td>T(_1): Recommended fertilizer dose</td>
<td>81.41 64.73 73.07</td>
<td>18.27 14.53 16.40</td>
<td>23.46 18.66 21.06</td>
<td></td>
</tr>
<tr>
<td>T(_2): FYM @ 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing</td>
<td>64.81 52.04 58.43</td>
<td>14.55 11.68 13.12</td>
<td>18.68 15.00 16.84</td>
<td></td>
</tr>
<tr>
<td>T(_3): Pressmud 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing</td>
<td>58.72 46.07 52.40</td>
<td>13.18 10.34 11.76</td>
<td>16.92 13.28 15.11</td>
<td></td>
</tr>
<tr>
<td>T(_4): Poultry manure 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing</td>
<td>72.99 58.64 65.81</td>
<td>16.39 13.16 14.78</td>
<td>21.04 16.90 18.97</td>
<td></td>
</tr>
<tr>
<td>T(_5): Sewage sludge 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing</td>
<td>70.52 55.97 63.25</td>
<td>15.83 12.76 14.29</td>
<td>20.33 16.29 18.31</td>
<td></td>
</tr>
<tr>
<td>T(_6): Urban compost 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing</td>
<td>66.70 53.17 59.94</td>
<td>14.98 11.93 13.46</td>
<td>19.23 15.33 17.28</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>69.19 55.10 62.15</td>
<td>15.53 12.40 13.94</td>
<td>19.94 15.86 17.90</td>
<td></td>
</tr>
<tr>
<td>M T MxT</td>
<td>4.04 0.94 11.94</td>
<td>0.64 0.21 2.68</td>
<td>1.26 0.26 3.49</td>
<td></td>
</tr>
<tr>
<td>S.Em+</td>
<td>12.13 2.85 NS</td>
<td>3.79 0.79 NS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD@5%</td>
<td>12.13 2.85 NS</td>
<td>3.79 0.79 NS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** M\(_1\): Puddled rice cultivation  
M\(_2\): Aerobic rice cultivation  
RDF: Recommended Dose of Fertilizer (100:50:50 kg N:P\(_2\)O\(_5\):K\(_2\)O ha\(^{-1}\) + FYM 4t ha\(^{-1}\))  
NS: Statistically not-significant

Table 3: Nutrients uptake by straw of rice as influenced by methods of establishment and organic source of nutrients

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Nutrients uptake by straw (kg ha(^{-1})) (pooled)</th>
<th>N</th>
<th>P(_2)O(_5)</th>
<th>K(_2)O</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M(_1) M(_2) Mean</td>
<td>M(_1) M(_2) Mean</td>
<td>M(_1) M(_2) Mean</td>
<td></td>
</tr>
<tr>
<td>T(_1): Recommended fertilizer dose</td>
<td>42.18 33.53 37.86</td>
<td>6.53 5.19 5.86</td>
<td>70.49 56.05 63.27</td>
<td></td>
</tr>
<tr>
<td>T(_2): FYM @ 125 kg N equivalent + 25% of recommended N equivalent poultry manure as top dressing</td>
<td>33.58 26.96 30.27</td>
<td>5.20 4.18 4.69</td>
<td>56.12 45.06 50.59</td>
<td></td>
</tr>
<tr>
<td>T(_3): Pressmud 125 kg N equivalent + 25% of recommended N</td>
<td>30.42 23.87 27.15</td>
<td>4.71 3.70 4.20</td>
<td>50.84 39.89 45.37</td>
<td></td>
</tr>
</tbody>
</table>

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Table 4: Total nutrients uptake by rice as influenced by methods of establishment and organic source of nutrients

<table>
<thead>
<tr>
<th>Treatments</th>
<th>N</th>
<th>P₂O₅</th>
<th>K₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td>M₁: Puddled rice cultivation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M₂: Aerobic rice cultivation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RDF: Recommended Dose of Fertilizer (100:50:50 kg N:P₂O₅:K₂O ha⁻¹⁺ FYM 4t ha⁻¹)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS: Statistically not-significant</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
M₁: Puddled rice cultivation  
M₂: Aerobic rice cultivation  
RDF: Recommended Dose of Fertilizer (100:50:50 kg N:P₂O₅:K₂O ha⁻¹+ FYM 4t ha⁻¹)  
NS: Statistically not-significant
| CD@5% | 13.17 | 3.40 | NS | 2.89 | 0.97 | NS | 12.85 | 2.50 | NS |

**Note:**
- M₁: Puddled rice cultivation
- M₂: Aerobic rice cultivation
- RDF: Recommended Dose of Fertilizer (100:50:50 kg N:P₂O₅:K₂O ha⁻¹ + FYM 4t ha⁻¹)
- NS: Statistically not-significant
Legibility Corridor in Designing Environmental Image  
(Case Study: Malang City Square, Indonesia)  

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Abstract- Legibility is part of designing an environmental image through a visual display consisting of path, edge, district, nodes, and landmarks. Path element is easily recognizable because it is a linear corridor that can be felt by humans while walking through the city. The corridors in Malang City Square must have a visual display that represents the image of the square area as the center of Malang City. This is so that people walking in the corridor can observe and recognize the whole area through the visual appearance of the corridor. By using walkthrough analysis, the legibility of the area is obtained in the form of visual quality in designing the image of Malang City Square. In terms of public and private space, there is the use grating in the form of grating and hedges that give clarity of boundaries between public and private space so that people know the boundaries of their space to walk. While in terms of landmark and environmental features, there are buildings that have the potential as a landmark area, making it easier for people to recognize the area and find the direction of their goals within the area. From the analysis result, it is concluded that there is a need to vegetation arrangements along the corridor and needs to highlight potential landmark buildings in order to increase the legibility of the corridor to strengthen the image of Malang City Square.

Index Terms- Environmental Image, Malang City Square, Legibility, Walkthrough Analysis.

I. INTRODUCTION

LEGIBILITY corridor in area is important for human life. The legibility is part of designing an image of an environment through a visual display consisting of path, edge, district, nodes, and landmarks [1]. Through these five elements, can create a representation of an environment so that people will more easily recognize an area through the visual displayed. The legibility of a corridor is defined as how the designed path helps people to understand their current location and identifies which path they should go to.

Of the five elements mentioned, the path element becomes the most important element in designing an environment representation. Path element is easily recognizable because it is a linear corridor that can be felt by humans while walking through the city [1]. If the identity of this element is unclear, then most people doubt the image of the city as a whole. The existence of the corridor as a formation of the environment of the area will not be separated from the elements forming the corridor [2]. The elements of corridor forming such as building, figure ground, and street and pedestrian ways. A street should not only be perceived as a transit area but should have powers to be an important part to integrate and be an element of cohesion for the city [3]. So the perimeter of success in functional public space for the citizen is a space that could connects community and accommodates to bring liveliness to its environment [4].

There are any reason why legibility is so important to a corridor. First, is to make it easier for people to find a route to their destination. Because there are several ways how people find their way or route of destination. Secondly, the legality of a street is important so that people do not easily get lost on the street. When in an environment with a street network pattern that has many intersections, people tend to be confused to choose where to turn [4].

The most important thing in the legibility of a corridor is to support and clarify existing landmarks and designs that are easily recognizable. Landmarks or existing environmental features can serve as a benchmark for directions. It is helpful to know where their current position is and where to go next. There is theory to expressing the values of landmarks that must be considered so that people in the city can emotionally enjoy a good urban environment through psychological and physical sense [5].

1) Serial Vision. Shaping regional imagery and drama in movement, which can be seen as a real or different view / emerging view, stimulates views through environmental contrast.
2) Place. It is more abstract, because it is based on one's personal feelings in looking at things and phenomenologically.
3) Content. Associated with architectural style, scale, material, layout, texture, color, character, and uniqueness.
The area of Malang City Square is the center of Malang City itself which consists of four street corridors. The four corridors are Merdeka Utara street corridor, Jalan Merdeka Timur street corridor, Merdeka Selatan street corridor, and Merdeka Barat street corridor. Each corridor in the area can be seen in Figure 1. The corridors in Malang City Square must have a visual display that represents the image of the area as the center of Malang City. This is so that people walking in the corridor can observe and recognize the area through the visual appearance of the corridor. Through this paper, researchers want to identify the legibility of each corridor in Malang City Square, in designing a representation of the neighborhood of the square as the center of Malang City that is easily recognizable by local residents and immigrants.

Fig. 1. Research area

II. RESEARCH ELABORATION

In this research will use descriptive-qualitative research based on walkthrough analysis. This analysis can help to assessment of urban quality by walking through the area with observation and seeing the impression that is felt along the way through the existing picture/photo recording of the location [6]. The data collected by direct site-observation, taking photograph of the travel sequence in the area of Malang City Square. This research will try to identify the legibility of the area in the form of visual quality in designing the image of Malang City Square. So that the data obtained the visual quality of the area that is easily recognized by people or less prominent.

III. RESULT

The analysis of the legibility of corridors in Malang City Square is conducted on four street corridors in the area with reference to the creation of the legibility of a corridor, which consists of public and private space, landmark and environmental features.
A. Merdeka Utara Street Corridor

First, public and private space. According to Figure 2 which shows the description of the travel sequence, there is a clear boundary between public and private space which formed by the fence of buildings along the corridor. Visually, the height of the fence does not obstruct the frontage view of the building itself, but the presence of vegetation along the corridor makes the view towards the building becomes slightly obstructed.

Second, landmark and environmental features. The appearance of buildings visually blocked by vegetation along the corridor, so that in this corridor is not found a building that has the potential as a landmark. Meanwhile in terms of environmental features, this corridor is easier to recognize as the area of Malang City Square with the existence of a large row of trees on the right side or side of the square itself.

B. Merdeka Timur Street Corridor

First, public and private space. In the description of the travel sequence at Figure 3, there is a clear boundary between public and private space which formed by the fence of buildings along the corridor. Visually, the height of the fence does not obstruct the frontage view of the building itself, but the presence of vegetation along the corridor makes the view towards the building becomes slightly obstructed.

Second, landmark and environmental features. From the analysis, there is a building that has potential as a landmark on this corridor in terms of the appearance of the façade and the height of the building. The building is Bank CIMB building that provides a unique image on the serial vision of the street users in the middle of the corridor. Although this building is not visible at the beginning.
of the corridor caused by vegetation blocking, the sequel is easily recognizable in terms of façade appearance and altitude, precisely on the numbers 3 and 4 at Figure 3. In addition, this building also stimulates views with contrast in the form and dimensions in the environment.

![Figure 4](image)

**Fig. 4.** The building of Bank CIMB in Merdeka Timur street corridor is potentially to be a corridor landmark

![Figure 5](image)

**Fig. 5.** The contrast of Bank CIMB building is obtained from the height of the building and the façade that is different from the surrounding building

In terms of place, the Bank CIMB building has a height of 3 floors with a low border distance from the street, giving the impression of a monumental and a modern touch. While in terms of content, this building has the potential to increase the legibility of Merdeka Timur street corridor as a landmark with the typology of modern buildings and different altitudes with other buildings. In addition, the use of building facades in the form of glass covering the entire building of Bank CIMB also add contrast to the appearance of buildings with buildings around it.

**C. Merdeka Selatan Street Corridor**

![Figure 6](image)

**Fig. 6.** Serial vision of Merdeka Selatan street corridor

**First, public and private space.** According to Figure 6 which shows the description of the travel sequence, there is a clear boundary between public and private space which formed by the fence of buildings along the corridor. Visually, the height of the fence does not obstruct the frontage view of the building itself, but the presence of vegetation along the corridor makes the view towards the building becomes slightly obstructed.

**Second, landmark and environmental features.** The appearance of buildings visually blocked by vegetation along the corridor, so that in this corridor is not found a building that has the potential as a landmark. Meanwhile in terms of environmental features, this
corridor is easier to recognize as the area of Malang City Square with the existence of a large row of trees on the right side or side of the square itself.

**D. Merdeka Barat Street Corridor**

First, public and private space. In the description of the travel sequence at Figure 7, there is a clear boundary between public and private space which formed by the fence of buildings along the corridor. Visually, the height of the fence does not obstruct the frontage view of the building itself, but the presence of vegetation along the corridor makes the view towards the building becomes slightly obstructed.

**Second, landmark and environmental features.** From the analysis, there is a building that has potential as a landmark on this corridor in terms of the height of the building and the shape of the domed roof used by the building. The building is Masjid Jami’ that can be easily observed and recognized from the beginning of the corridor. This building provides a unique image since the beginning of the corridor on the serial vision with the roof shape of the tower used. So as to stimulate the view with contrast in the form of a roof that is different from the surrounding environment.

In terms of place, the building of Masjid Jami’ has a height of 2 floors with the use of a high roof, so the building of Masjid Jami’ can easily be observed its existence. While in terms of content, this building has the potential to increase the legibility of Merdeka Barat street corridor as well as the area of Malang City Square as a landmark, with a massive size different from the building on the left and right.
IV. CONCLUSION

In terms of public and private space area of Malang City Square, there is the use of grating and hedges that provide clarity of boundaries between public and private space so that people know the boundaries of their space to walk. The use of a low fence and not blocking the frontage view of the building will also give the impression of an attractive walk for pedestrians. so people will enjoy the walking activity as well as other activities with the building frontage generated by the area.

While in terms of landmark and environmental features, there are buildings that have potential as a landmark of the area, which is the building of Masjid Jami’. This building has a massive shape and the use of different types of dome roof with buildings around it. In addition, there are also other buildings that have potential as a landmark in the corridor. The building is Bank CIMB that has a height and facade of the building in contrast with the surrounding buildings. The existence of landmark potential landmarks in the area of Malang City Square, can facilitate people in recognizing the area and determine the direction of their destination within the area.

From the above identification can be concluded that the need for arrangement in order to improve the legibility of the corridor to strengthen the image of Malang City Square area. The arrangement is related to the vegetation arrangement along the corridor blocking the frontage of the building so that the appearance of the building can be easily observed. Then the buildings that have the potential to become landmarks need to be highlighted so that its existence is easier to be recognized as the area of Malang City Square.

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REFERENCES


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Understanding the Relationship between Urban Morphology and Behavior Pattern (Case Study: Kampung Arab Malang, Indonesia)

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** Lecturer, Department of Architecture Faculty of Architecture, Design and Planning, Sepuluh Nopember Institute of Technology (ITS), Surabaya 60111, INDONESIA.

Abstract- Nowadays, cities in Indonesia have undergone many developments and rapid changes. Growth and development of a city is directly proportional to the socio-cultural, economic and political development. The development is also accompanied by population growth, either by natural or non-natural growth which leads to the formation of the morphological pattern of the city. This phenomenon causes changes in the physical characteristics of the area and may also impact on the behavior pattern that occurs. Accordingly, this research will explore the relationship between two main components of place – physical attributes and activities – and concentrates on the relationship between urban morphology related to people’s behavior patterns. This study uses typology-morphological analysis to appraise urban morphology and qualitative assessment to appraise people's behavior pattern. The results of this study gained that some aspects of morphology of the area (ie land use, street pattern and building structure) have a direct relationship to the behavioral pattern. While the plot pattern has an indirect relationship to the behavioral pattern.

Index Terms- Behavior Pattern, Ethnic Village, Place Making, Urban Morphology.

I. INTRODUCTION

KAMPUNG Arab Kota Malang is one of the ethnic villages that survive from the colonial era to the present. This village is inhabited by ethnic Arabs with its cultural distinctiveness. There is a very close mutual relationship between the spatial configuration formed by the socio-cultural community [1]. Outdoor spaces allow people to meet planned and unplanned, within the community or outside. These include family relations, cultural groupings, local social connections, and group meetings through same interest.In a specific way, the outdoor spaces physically form as the outer perimeter or urban dwellings, precisely as public spaces. This kind of public spaces varies, by their typology or morphology [2]. Thus, the social character of an environment can be read through the spatial order and vice versa.

The study of ‘urban morphology’ analyzes the physical form by focusing on the patterns of streets, blocks/parcels and buildings [3]. From these, he derives patterns of movement. Each place has a “unique address” [4]. Without explaining how it becomes identifiable he argued that “physical setting”, “activities” and “meanings” constitute the three basic elements of place identity. Drawing on that statements, places as a realm for “activities”, “physical attributes” and “conceptions” [5] (as shown on Fig. 1).

Fig. 1. Basic Elements of Place [5]

Considering theories of place, this study will present its conceptual and theoretical framework based on two main components of a place: physical attributes and activities. The link between these two components of a place has long been evaluated by public space researchers, particularly planners and urban designers. To provide the more clear illustration of the link’s importance, however, researchers must develop an alternative framework for the relationships of the two components of physical settings and activity. Therefore, the set of typologies of the physical features and activities must be refined, and more empirical knowledge of the actual use of the space and the activity-physical patterns relationship must be developed. The principal theories of place introduced above will form the foundation for this exploration. Especially, by considering the theory of place it would be adapted for

To obtain actual knowledge about the physical setting and behavior patterns relationships and this empirical knowledge in practice, in general, this research focuses on the theories of place and takes advantage of combined methodology including field direct observation and activity mapping. Thus, this thesis draws heavily on classic theoretical works, including the theories of Urban morphology [3] – and the specific theories of place [4] [5] and [6]. In terms of the research methodology, this study draws on a combination of empirical research [7], which is based on field observation and integrated method of activity mapping [8].

Following on from the principal theories and concepts of place, this thesis will contribute to the urban design literature by synthesizing the place theories, adding as well, a practical combined methodology in data collection and analysis. Therefore, this study is an attempt to clarify how physical settings impact people’s activity patterns within the urban public space. Answering such research questions will fill the gap between theory and practice in this particular part of the place–making and urban design process.

II. RESEARCH ELABORATIONS

This research belongs to a qualitative research because it aims to explain the empirical facts that exist in a narrative form and in a comprehensive picture of the physical (typology-morphology) and behavior pattern in Kampung Arab Malang. Data collection can be grouped into four interrelated parts, i.e., presentation of area’s data, presentation of building data, presentation of data having special characteristics, and participant data [9]. To obtain actual knowledge about the physical setting and behavior patterns relationships and apply this empirical knowledge in practice, in general, this research focuses on the theories of place and takes advantage of combined methodology including field direct observation and activity mapping.

Aspects of the research are physical aspects and behavior aspects. Physical aspects associated with elements of urban morphology, that is, land uses, plot pattern, street pattern and building structure. Behavior aspects associated with necessary activities, optional activities, and social.

This study is using typological-morphological analysis to analyze the morphological characteristics of Kampung Arab Malang urban area. The typo-morphological analysis is done by a figure-ground technique. The figure-ground technique is useful in understanding form and is a powerful tool for identifying textures and patterns of an urban fabric [10].

The primary tool for studying daily basis consisting mapping and direct observation, particularly focus on identifying the connection between the use of space with the urban morphology and the location it occurs. These methods were following the type of survey in the previous research performed [11] collaborated with the tracing method [12], which appraises on classify type of activities, including necessary, optional and social activities. Mapping observation was conducted to record the pattern and use of space and the location of engagement. The researcher walked through the street in study area and collected in the map sheet the activities of people engaged in, the behaviours, and the locations. People that were just passing by and not engaged in the activities on the street were not recorded [13].

This study was conducted in 2018 and included Kampung Arab Malang’s area as shown in Figure 2. Kampung Arab Malang has administrative boundaries as follows:
- North Boundary: Ade Irma Suryani street
- South Boundary: Nusa Kambangan street
- East Boundary: Sutan Syahrir street, Halmahera street
- West Boundary: Ade Irma Suryani Gg III street, Selayar street

III. RESULTS AND FINDINGS

Considering basic elements of place [5] this result will present two main components of a place: physical attributes and activities, and its relationship in between.

A. Physical Attributes – Urban Morphology

In this study, the discussion of physical attributes is reviewed through the urban-morphology theory. In general, morphological studies emphasizes spatial forms and their characteristics:

First, Land Uses. Land use is a key component in the region's growth. This component is considered as an activity system generator (activity system) that determines the pattern and direction of growth of the region [14]. Land uses of study area dominated by trade buildings services, worship, government, funerals, and settlements. Buildings with a service trade function are centered on the perimeter segment.

Second, Plot Pattern. The plot pattern or typology is a solid void configuration within an area [10]. Plot pattern of Kampung Arab Kota Malang is an organic pattern, dominated form of irregular building blocks that causes a deflection road.

Third, Street Pattern. The basic element of a void in Kampung Arab Kota Malang is an open linear system and has 4 levels of road hierarchy namely, secondary collector, local primary, local secondary and local roads. The most commonly found of tissue are straight, deflection and dead-end. Deflection and dead-end road forms have limited physical and visual access.

The inner road hierarchy has different levels of privacy: public, semi-public and private.

**Fourth, Building Structure.** From the mapping of the physical aspects of the building structure, found the arrangement of the irregular mass of buildings, especially in the boundary area of the river. There are various types of building mass typology, such as the typography of high-fenced buildings and typography of curtained buildings.

**B. Activities – Behavior Pattern**

In this study, the discussion of behavior pattern is reviewed by activity mapping. Activity mapping is done on the whole area of Kampung Arab Malang City. Activities in outer space categorized in three categories namely: necessary activities, optional activities, and social activity [11]. Here is a map of the spread of activity Arab Kampung Malang City.

**Fig. 3. Behavior Pattern of Study Area**

Referring to Figure 3, the necessary activities that are found are trading and shopping. This is because the dominant land use in the study location is trade and services. The most common type of activity is the optional activity of sitting. Optional activity can occur when there are physical and environmental conditions that support the occurrence of such activity [14]. Many residents are using a short fence as a seat. There are many residents who perform social activities such as playing and talking along the alley shade even without adequate public furniture.

**C. The Relationship between Urban Morphology and Behavior Pattern**

The element of place interpreted into three more operational terminologies [15]. Two of them are; the physical locale and activity linked to this locale. From these statements, it is important to explore the relationship between local physical aspects and activities. Therefore, to strengthen the sense of place of ethnic kampongs concerning urban morphology (land use, road network and building structure) and behavior pattern of Kampung Arab Town of Malang need to be explored.

**First, Land Uses and Behavior Pattern.** From the result of land use map and the behavior pattern distribution in Figure 4, can be seen that the activity tends to be crowded on the street with the type of mixed use.

**Fig. 4. Land Uses and Behavior Pattern**

**Second, Plot Pattern and Behavior Pattern.** Most of the building block in the area of Kampung Arab Kota Malang is irregular. This building block creates a deflection path. The pattern of the plot area affects the street pattern. Therefore, the plot pattern has an indirect relationship to the behavioral pattern.

**Third, Street Pattern and Behavior Pattern.** The interrelationship analysis between the morphology of the area (streets pattern) and other place-forming elements is divided into 3 main parts: the road hierarchy, the level of road privacy and the form of the street pattern.

**Fig. 5. Road’s Hierarchy and Behavior Pattern**
Referring to Figure 5, it can be seen that the pattern of activity tends to be crowded on the road with the primary local hierarchy. This condition caused by the primary local road that equipped by the form of commercial land use and services that attract the occurrence of primary, optional and social activities. Kampung Arab Kota Malang has the same activity intensity pattern, which is directly proportional to the path that has hierarchical order.

The inner road hierarchy marks different levels of privacy: public, semi-public and private. Street privacy in urban environments is the process of arranging interactions with others aimed at increasing or decreasing interactions. [16]

Referring to Figure 6, it can be seen that more activity is found on the street with the level of public privacy. The intensity of this activity tends to decrease as the level of road privacy. This condition illustrates that the intensity of activity in Kampung Arab Kota Malang is directly proportional to the level of privacy of tiered roads (public to private). The level of privacy of this road becomes the rule of the extent to which strangers and inhabitants can access the road.

Referring to Figure 7, it can be seen that people tend to perform activities on a straight road because it is more freely both views and movements, which result in the accumulation of activity on a straight road. This condition leads to a dual role road space; as a means of circulation and also as a space of activity.

**Fourth, Building Structure and Behavior Pattern.**

Referring to Figure 7, at the level of privacy of the semi-public to the private, high-intensity activities are found in Typology B (high fence - 2.5m - high fence). Many activities found in this location due to the massive barrier between public spaces (roads) and private (houses) in the form of a high fence gives the user space freedom to perform activities more freely. Whereas low intensity activity is found in Tipologi A (curtain-2m-high fence).

From the results of these conclusions can be found trends in the typology of roads and structures in relation to the use of space Kampung Arab Kota Malang (as shown in Table 1). Here is a division of the intensity of activities that have been divided into 3 main groups, such as high-intensity, medium-intensity and low-intensity.

<table>
<thead>
<tr>
<th>Typology</th>
<th>High-Intensity</th>
<th>Medium-Intensity</th>
<th>Low-Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Uses</td>
<td>Mixed use</td>
<td>Residential</td>
<td>-</td>
</tr>
<tr>
<td>Hierarchy of Roads</td>
<td>Primary Local Roads</td>
<td>Collector, Secondary Local Roads</td>
<td>Local Roads</td>
</tr>
<tr>
<td>Privacy Level of Roads</td>
<td>Public</td>
<td>Semi-Public Private</td>
<td>-</td>
</tr>
<tr>
<td>Road’s Form</td>
<td>Straight</td>
<td>-</td>
<td>Linear-curve, T-junction, deflection, + junction, dead-end</td>
</tr>
<tr>
<td>Building Structure</td>
<td>Typology C</td>
<td>Typology D</td>
<td>Typology A, D, E, F, H, and I</td>
</tr>
</tbody>
</table>

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IV. CONCLUSION

The results of this study have a direct relationship to the behavioral pattern. While the plot pattern has an indirect relationship to the behavioral pattern. From the studied relationship between urban morphology and behavior pattern of Kampung Arab Malang area can be concluded that:

- The more diverse the land uses, the more activity is found.
- The higher the road hierarchy, the more activity it finds.
- The more private the privacy of the road, the less activity is found.
- Activity is often found on a straight road, because it is more freely both sight and movement.
- Activity is commonly found in home typologies with high fence boundaries rather than houses with curtain borders.

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Understanding the Relationship between Urban Morphology and Crime in South Krembangan, Surabaya

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Abstract - Crime has a diverse understanding and conception of various disciplines related to spatial and social aspects. In the architecture and urban design itself, the concept of crime is concerned with the spatial aspects, in this case is urban morphology and functional attributes of a city. In Surabaya, the highest crime rate is located in South Krembangan. South Krembangan is an area with high historical value but has a criminal problem. Therefore, the purpose of this study is to identify and analyze the morphology of the area to see how it relates to the crime. Based on field observations and typological-morphological analysis results, it is known that there is a tendency for the relationship of each typology to be found with the number of crimes that occurred, that the more public and accessible the area, the higher crime occurs.

Index Terms- Crime, Urban Design, Urban Morphology.

I. INTRODUCTION

Crime or criminality is a phenomenon that is very close to people's lives, especially in big cities in Indonesia. It has a diverse understanding and conception of various disciplines such as sociology, environmental psychology, criminology, as well as design. This shows that the crime have a broad articulation in relation to the form or shape of the built environment of the city. In sociology, psychology, and criminology, an understanding of crime is closely related to the social aspect or sociality. While in the field of architecture and urban design, the concept of crime is more associated with the spatial aspect or space within a city. The spatial aspects including design patterns and spatial configurations including urban morphology and functional attributes of a city [1].

As the second largest city in Indonesia, Surabaya has criminal problems like big cities in general. Based on data from the Surabaya 2015-2016 police report, the crimes committed in Surabaya are spread out but tend to concentrate on Krembangan District. In this study the types of crime focused on crimes related to urban environments such as theft, theft with violence and violence in public places. The distribution of the crime scene map in Krembangan Sub-District is shown in Figure 1. From the map, it can be seen that the distribution of crime in Krembangan Sub-District tends to be centered in the southern part (South Krembangan). Therefore, in this study the authors choose South Krembangan Sub-District as a focus area of research.

II. RESEARCH ELABORATIONS

South Krembangan has grid-shaped street pattern where the area can be reached from various sides. This area which was once the center of activities and settlements of Dutch citizens, is now a cultural heritage area that has lost its vitality[2]. Colonial buildings that used to have functions as settlements and government buildings have now turned function as trade and services, warehouses, and neglected buildings. As a result, the area is only active during the day and becomes quiet at night. Areas that have easy access but are not supported with sufficient activity can increase the potential for crime [3].

Based on empirical facts above, the phenomenon of a crime /criminality in Surabaya centered at a specific point, shows that criminals are more likely to "choose" a location where it can be easily and safely perform the action. Based on the theories and facts described above, it is necessary to identify what kind of environment / location the criminals prefer and facilitate their action.
analyzed it using typological-morphological analysis. The main objectives of this process of analysis are [5]:
1. To find the stability and/or slow changes of the things that form one type of object architecture studied.
2. To create a description of the typology shown by various city artifacts such as roads, buildings, public space, and others.
3. To identify the structure of linkages and/relationships between parts of the city.
4. To study the formation and dynamics of the type and structure of architectural objects studied.

Data collection in the study is divided into two parts, among them are:

<table>
<thead>
<tr>
<th>Table 1 Data Collection Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation (as main data)</td>
</tr>
<tr>
<td>Interviews (as supporting data)</td>
</tr>
</tbody>
</table>

### III. RESULTS AND FINDINGS

#### A. Administrative Boundary of the Study Area

Administratively, Krembangan Selatan Sub-district is included in Krembangan District, Development Unit (UP) V Tanjung Perak. In RTRW Surabaya 2015 UP V has the main functions as a port, military area, strategic industrial area, and trade and services.

![Figure 2. Administrative Boundary of Study Area](image)

South Krembangan Sub-district has administrative boundaries as follows:
- North Boundary: Nelayan Street and Sampoerna Street
- South Boundary: Bubutan Sub-district
- East Boundary: Kalimas River
- West Boundary: Indrapura Street

#### B. Crime Distribution in Study Area

![Figure 3. Crime Distribution map of South Krembangan](image)

#### C. Typological-Morphological Analysis

Typological-morphological analysis (typology and morphology) is an analysis that focuses on urban tissue / urban fabric structure. Urban tissue can be described as a set of rules, which is described as a unique combination of existing morphological components of land use - plot patterns – street patterns - building structures [7].

1. **Land Uses**

   Land use is a key component in the region's growth. This component is considered as an activity system generator (activity system) that determines the pattern and direction of growth of the region [6].

![Figure 4. Land Uses of Study Area](image)

Based on Figure 4 it can be seen that the study area has diverse land uses, but there are three dominant land use functions, that is trade and services, public facilities and settlements. Trade and services mostly located in the north (Rajawali and Veteran corridors) and perimeter segments of residential areas. Public facilities mostly in the south (Indrapura, Kepanjen and Sikatan corridors), and settlements located in the eastern part. While the use of land with small
portions in this area is the Park and warehousing located in the north.

In relation to the crime, the land use map and crime distribution are overlaid as follows:

![Overlaid map of Land Uses and Crime Distribution](image)

Figure 5. Overlaid map of Land Uses and Crime Distribution

From the map it is found that out of 144 reported crimes, most occurred around public areas, that is service trade and public facilities 113 cases (78.5%) , while the rest in the settlements area 15 cases (10.4%), warehousing 11 cases (7.6%) and Open spaces 5 cases (3.5%). Because the open space has a small area and is partly as a passive park, the crimes that occur in this area can not be used as a reference.

2. **Plot Pattern**

The plot pattern or typology is a solid void configuration within an area [6]. Plot pattern in South Krembangan is currently dominated by grid pattern in the middle of the region, while in the south and east areas bordering the Kalimas River is curvilinear. Here is a figure-ground map development of South Krembangan Sub-district:

![The Development of Plot Pattern in Study Area](image)

Figure 6. The Development of Plot Pattern in Study Area

The pattern of the plot was formed based on the development of the area that started since the Dutch East Indies government, where the initial form of the plot is grid. As the area widened, the grid shape adjusted to existing land with small rivers, thus creating a clipped grid shape that resembled a square and trapezoidal blend [8]. In addition, the development of the area that is right on the Kalimas River creates a curvilinear pattern. The solid void configuration in this region will affect the shape of the street pattern.

3. **Street Pattern**

The street pattern is a liaison system within the area. Based on the previously described solid void configuration, the road network formed within the grid-shaped region. Road network pattern in the form of grid, creating many intersections of roads within the area and causing the Village of South Krembangan has an "open" characteristic. It provides enough access options that can be taken by pedestrians or other road users to enter the area.

From the survey results, it found that the study area has 4 levels of hierarchy of streets namely, secondary artery street, secondary collector street, secondary local street, and neighborhood street. A street hierarchy is a grouping of roads based on: road function, government administration and axis loads involving vehicle dimensions and weight.

The street hierarchy within the study area marks a different level of privacy: public – semi-public – semi-private - private. Privacy in an urban environment is the process of arranging interactions with others aimed at increasing or decreasing interactions [9]. The level of privacy within the study area is affected by physical boundaries such as road hierarchy, road width, road material, and fences. Here is a map showing the street privacy within the study area:

![Street Privacy Level Map of Study Area](image)

Figure 7. Street Privacy Level Map of Study Area

<table>
<thead>
<tr>
<th>Typology</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Public street</strong></td>
<td>Public street is a secondary arterial road that has a high vehicle intensity with a width of road between 9-15 m with asphalt material. This road is a liaison within the city with easy access.</td>
</tr>
<tr>
<td><strong>Semi-</strong></td>
<td>Semi - public street are collector street and</td>
</tr>
</tbody>
</table>
Typology | Characteristics
--- | ---
Public Street | Local street that exist in areas with road widths between 5-8m and using asphalt materials. The intensity of the vehicles and activities that occur is lower than the public street.

Semi-Private street | Semi-private street is a 3-6 m wide road with paving material. This street can be passed by the general public but because it uses paving material, vehicles users cannot pass this road at high speed.

Private street | Private street are 2-3.5 m wide roads whose access is limited only by locals by adding a fence to the entry area. This is done to minimize the entry of stranger into the area.

In relation to the crime, the street privacy map and crime distribution are overlaid as follows:

<table>
<thead>
<tr>
<th>Typology</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typology A</td>
<td>This typology is mostly located in residential areas. Comparison between height and width of the road creates a narrow and intimate atmosphere.</td>
</tr>
<tr>
<td>Typology B</td>
<td>In this typology the balance is achieved between the building and the distance between them. Sense of enclosure can still be felt.</td>
</tr>
<tr>
<td>Typology C</td>
<td>In this typology, the impression of the space that is formed is still balanced, but the road space is not well supervised due to the high wall that limits the building by road.</td>
</tr>
<tr>
<td>Typology D</td>
<td>This typology has a wide path. With the availability of pedestrian way, then this typology becomes a room that is comfortable enough to walk, thus allowing a lot of pedestrian activity in it.</td>
</tr>
<tr>
<td>Typology E</td>
<td>With a path that is too wide, the typology of this sense of enclosure is reduced so that supervision in the street space becomes increasingly decreased.</td>
</tr>
</tbody>
</table>

Figure 8. Overlaid map of Street Privacy Level and Crime Distribution

When viewed from overlay map of street privacy with the number of crimes that occurred (Figure 8) it was found that the most frequent crimes occurred on public roads were 95 cases (69.4%) , semi-public roads 31 cases (21.5%), semi private road 7 cases (4.9%) and private road 6 cases (4.2%).

4. Building Structures

Building Structure is discussed through two aspects: mass building arrangement and architecture of the building. Here is the typology of building structures in the area of study:

Table 3 Building Structure Typologies of Study Area

<table>
<thead>
<tr>
<th>Typology</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typology A</td>
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<td>In this typology the balance is achieved between the building and the distance between them. Sense of enclosure can still be felt.</td>
</tr>
</tbody>
</table>

Furthermore, in discussing the structure of buildings is important to assess the character of the region through the physical condition of the buildings that make up the area. The area of study that developed since the colonial era led to the many Dutch heritage buildings. The buildings there are still functioning and maintained, but there are also less well maintained even been abandoned or turned into a warehouse. Abandoned buildings are likely to cause fear of crime is a fear created by situations and circumstances that make people feel vulnerable to crime. Here is a map of the fear of crime depicted by local residents as well as foreigners within the study area:

Figure 9. Overlaid map of Building Structure tipologies and Crime Distribution

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IV. CONCLUSIONS

Based on the typo-morphological analysis that has been done, it found that there are relationship between morphological elements and the number of crimes available. Here is a table of land use, street typologies and building structures typologies in relation to the number of crimes that occurred.

Table 4. Grouping of typologies in relation to the intensity of crime that occurred

<table>
<thead>
<tr>
<th>Physical Aspects</th>
<th>Safe (Crime Rate &lt;10%)</th>
<th>Less Secure (10-30% Crime Rate)</th>
<th>Unsafe (Crime Rate&gt; 30%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td>Warehousing</td>
<td>Settlements</td>
<td>Trade services and public facilities</td>
</tr>
<tr>
<td>Typology Level of Privacy</td>
<td>Semi Privat and Privat Streets</td>
<td>Semi Public Streets</td>
<td>Public Street</td>
</tr>
<tr>
<td>Building Structure Typology</td>
<td>Typology B</td>
<td>Tipology A and Tipology C</td>
<td>Tipology D and Tipology E</td>
</tr>
</tbody>
</table>

- The more public areas (trade in services and public facilities areas) the higher the crime. While in the warehouse area, although not have a high crime rate, but cause fear of crime (based on observation and interview).
- The lower the privacy of the road the higher the crime.
- While the pattern of relationship typology of building structures with crime can be influenced by several factors related to the level of supervision on the road and access control on buildings. Where the lower level of supervision on the road and access control on the building then the crime will be higher.

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Detection and Quantitation of Estrogen in Watersheds

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Abstract- This paper focuses on the detection and quantitation of estrogen hormone in Baltimore’s watersheds. Baltimore is the largest city in the U.S. state of Maryland, and the 30th-most populous city in the United States. Baltimore’s drinking water primarily comes from three watersheds (Loch Raven, Prettyboy, and Liberty). Between 1999 and 2000, the U.S. Geological Survey sampled 139 surface waters throughout the U.S and they discovered that 80% of these waters contained endocrine disrupting chemicals (mostly estrogens). Fish, are changing sex due to exposure to excess estrogen. To check the presence of estrogen in water, we used an enzyme-linked immunosorbent assay (ELISA) kit and to quantify the concentrations, a microplate reader was used. Measurements were made during fall 2017 & winter 2018 to study the seasonal variations. Based on the measured optical density, we found traces of estrogen in the study watersheds during both seasons. The average estrogen levels in the Loch Raven sub-sheds was 0.074 ppb (Fall 2017) and 0.048 (Winter 2018) and for Liberty sub-sheds it was 0.046 ppb (Fall 2017) and 0.040 ppb (Winter 2018). In Prettyboy sub-sheds the level was 0.067 ppb (Fall 2017) and 0.042 ppb (Winter 2018). In Prettyboy sub-sheds the level was 0.067 ppb (Fall 2017) and 0.042 ppb (Winter 2018). Overall, Loch Raven watershed has slightly higher levels of estrogen than the other two watersheds, both during the fall and winter seasons.

Index Terms- Estrogen, Watershed, ELISA, Microplate reader, Baltimore

I. INTRODUCTION

The past several years have seen a steady drumbeat of news reports and scientific studies which have raised concerns about the presence of estrogenic compounds (natural estrogens and synthetic chemicals that mimic natural estrogen) in waterways and drinking water, and potential harm to human health or aquatic life [1]. Three naturally occurring forms of Estrogen are Estrone (E1), 17 Beta Estradiol (E2) and Estriol (E3), which are all produced mainly in women. Estrone (E1) is the estrogen most commonly found in increased amounts in postmenopausal women. The body derives it from the hormones that are stored in body fat. Estriol is the weakest of the three major estrogens. Estriol (E3) is the estrogen that is made in large quantities during pregnancy and has potential protective properties against the production of cancerous cells.

Estradiol (17β-Estradiol) is the principal estrogen found in all mammalian species during reproductive years. High concentrations of E2 in source water can result in adverse health effects (kidney impairment, necrosis, and liver damage) on fish. Even concentrations as low as 25 ng/L (0.025 ppb) have been found to lead to reproductive impairment and feminization of fish resulting in skewed populations. The main sources of high E2 concentrations to the aquatic environment are sewage treatment waste water and livestock waste [2].

The effect of estrogenic compounds in the water supply from industry, agriculture, and other sources raises concerns about human health and deserves scrutiny. Estrogenic compounds are part of a larger category of chemicals known as endocrine-disruptors (EDCs), chemicals that can alter the hormonal and homeostatic systems enabling an organism—like a human being or other animal—to communicate with and respond to its environment [1], [2]. Given the demonstrated effects of EDCs on human reproductive health, it is important to examine the role played by EE2 in contributing to the presence of estrogenic compounds in our water. The good news is this: contrary to what has been stated or implied by media reports and anti-contraception advocates, synthetic estrogen from birth control pills is not the sole or primary source of endocrine-disrupting chemicals in water [3]. New findings from researchers at the University of California San Francisco (UCSF) Program on Reproductive Health and the Environment (PRHE) help explain why—and suggest a role for providers and women’s health advocates in educating and empowering women to make informed choices about using contraception and limiting their exposures to harmful chemicals [2], [3].

Further studies [3] note ongoing concern about possible links between chronic exposure to estrogens in the water supply and fertility problems and other adverse human health effects. Almost 12 million women of reproductive age in the United States take the pill, and their urine contains the hormone. Hence, the belief that oral contraceptives are the major source of estrogen in lakes, rivers, and streams. Knowing that sewage treatment plants remove virtually all of the main estrogen-17 alpha-ethinylestradiol (EE2) - in oral contraceptives, the scientists decided to pin down the main sources of estrogens in water supplies [4]. Their analysis found that EE2 has a lower predicted concentration in U.S. drinking water than natural estrogens from soy and dairy products and animal waste used untreated as a farm fertilizer. And that all humans, (men, women and children, and especially pregnant women) excrete hormones in their urine, not just women taking the pill [4], [5]. The study also suggests that animal manure accounts for 90 percent of estrogens in the environment. Other research estimates that if just 1 percent of the estrogens in livestock waste reached waterways, it would comprise 15 percent of the estrogens in the world’s water supply.
In a South African water source, the first evidence of intersex fish was found. A research was conducted randomly from the Rietvlei Dam (RVD), and the Marais Dam (MD) in the Rietvlei Nature Reserve (RNR) in South Africa on one hundred catfish (Clarias gariepinus). Informal settlements, industrial sites, municipal treatment plants, and agricultural activities drain water streams into these dams. Endocrine disruption verified intersex potential, in the fish through gonads being examined and blood drawn. In majority of the fish primary oocytes were found scattered in testicular tissues showing signs of intersex. In both dams 20% of fish showed intersexuality. Based off the sample feminization of male catfish was more likely the cause of the intersex fish. Further studies [4] have shown that these contaminants may pose a threat, but the detailed facts needed to establish the need for a regulatory standard have yet to be developed. There is emerging evidence that these hormones are finding their way into surface waters and sediments via ground water and surface waters from and the bio-solids that are be land applied.

Baltimore’s water supply relies on surface water from rainfall and snowmelt, collected and stored in reservoirs outside the city. Three major impoundments (the Liberty, Loch Raven, and Prettyboy Reservoirs) derive water from two water sources (Gunpowder and Patapsco Watersheds) and one river (the Susquehanna). Water from the Liberty Reservoir and upstream sources is treated at the Ashburton Water Filtration Plant, while water from Loch Raven and Prettyboy Reservoirs is treated at the Montebello plant. EPA’s Index of Watershed Indicators has determined that the Gunpowder and Patapsco Watersheds have less serious contamination problems but is highly vulnerable to contamination. The watersheds received an overall index rating of 4, on a scale of 1 to 6, with 6 being the worst rating [6].

The main goal of this study was to detect and quantify Baltimore’s watersheds for any presence of estrogen. Once the concentration is measured, the levels will be compared with similar studies as there is no established standard by the Environmental Protection Agency (EPA). To our best knowledge, the distribution of estrogen hormones in Baltimore’s water system is yet to be studied and we have selected 17 Beta-estradiol (E2) for this study as E2 is the principal estrogen found in all mammalian species during the reproductive years.

II. MATERIALS AND METHODS

2.1 Study area: The watersheds

Baltimore’s water source is primarily surface water that feeds into the Liberty, Loch Raven and Prettyboy reservoirs. Three impoundments comprising two water sources and one river provide raw water to the City’s water filtration plants [6]. Figure 1 shows Baltimore’s watersheds and its reservoirs that supply the city’s drinking water.

Liberty Watershed is on the boundary between western Baltimore County and eastern Carroll County with the reservoir located on the North Branch of the Patapsco River (ref). It collects water from a 163.4 square mile drainage area that includes eastern Carroll County and southwestern Baltimore County. After traveling across seven sub watersheds (Beaver Run, Bonds Run, Liberty reservoir, Little Morgan Run, Middle Run, Morgan Run and North Branch), water from the reservoir flows by gravity through a 12.7-mile long, 10-foot diameter tunnel to the Ashburton Water Filtration Plant for treatment [6].

Loch Raven Watershed occupies northern Baltimore County, small parts of western Harford County and southern York County, Pennsylvania and its namesake reservoir is north of Baltimore City. The capacity of Loch Raven Reservoir, largest of the three supplying reservoirs, is approximately 23 billion gallons and the impounded area is roughly 2400 acres [7]. Raw water from this reservoir travels through a 7.3-mile long, 12-foot diameter tunnel for treatment at the Montebello Filtration Plants 1 & 2 in Baltimore City.

Prettyboy Reservoir is in the northwest corner of Baltimore County and its 80-square mile watershed lies in northern Baltimore County and small portions of northeastern Carroll County and southern York County, Pennsylvania. Prettyboy Dam was completed in 1932, has a spillway crest elevation of 520 feet of mean sea level, impounds about 19 billion gallons of water, and covers about 1500 acres. Prettyboy Reservoir water is transferred to Loch Raven Reservoir via Gunpowder Falls rather than directly to Baltimore. The dam releases water as needed into the river channel, which flows into Loch Raven reservoir [7], [8].

2.2 Water Sampling

From each watershed, four representative test points (Figure 2) were identified and surface water samples were collected using a five-foot long-handled dipper. To test the seasonal changes in estrogen levels, water samples were taken during fall (September) and winter (February) months over a period of a
year (2017-2018). In situ analysis was on some physico-chemical characteristics (pH, nitrate-nitrogen, Biological Oxygen Demand, alkalinity and carbon dioxide concentration) using LaMotte test kits.

Figure 2. Map showing representative test points in the Liberty, Loch Raven and Prettyboy watersheds.

2.3 Estrogen analysis

2.3.1 Estrogen ELISA Kit

In this study, the Estrogen (E1/E2/E3) enzyme immunoassay kit licensed from Japan Enviro-Chemicals, Ltd. has been used for the determination of 17 Beta-estradiol (E2). A microplate reader was used to read the absorbance. The Total Estrogen (ES) ELISA test kit detects the estrogenic hormones estrone (E1), 17beta-estradiol (E2) and estriol (E3) with similar specificity (figure 3).

Figure 3. Chemical structure of the Estrogen hormone

The analysis is based on a competitive reaction where enzyme-labeled standard E2 competes with free estrogen in the sample for binding to a specific monoclonal antibody immobilized to the surface of the microplate well or tube. The amount of labelled E2 bound to the plate is determined by addition of a non-colored substrate which is converted into a colored product. The color intensity is measured at 450 nm wavelength (using a microplate reader) and is inversely proportional to the amount of estrogen in the sample. Figures 4 and 5 show color change in a 96 well plate after coloring reagent is added to the wells containing the standards and water sample.

Following the protocol suggested by “Ecologiena” (http://www.jechem.co.jp/eco/index-e.html), a standard curve was developed for concentrations ranging between 0.1 µg/L and 3 µg/L.

2.3.2 Quantitation of Estrogen using Microplate Reader

A microplate reader was used to measure the absorbance at 450 nm wavelength for each standard solution and a standard curve was generated. The quantity of Estrogen in each water sample was calculated from the absorbance reading and interpolated from the standard curve.

Table 1. Average Absorbance reading of the standards

<table>
<thead>
<tr>
<th>Standard Conc. (µg/L)</th>
<th>Absorbance (nm)</th>
<th>Average Absorbance (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.182</td>
<td>1.496</td>
</tr>
<tr>
<td>0.05</td>
<td>0.052</td>
<td>1.175</td>
</tr>
<tr>
<td>0.15</td>
<td>0.676</td>
<td>0.496</td>
</tr>
<tr>
<td>0.5</td>
<td>0.232</td>
<td>0.289</td>
</tr>
<tr>
<td>3.0</td>
<td>0.116</td>
<td>0.133</td>
</tr>
</tbody>
</table>

I. RESULTS AND DISCUSSIONS

3.1 Standard Curve for Estrogen

The standard curve was developed for concentrations ranging between 0.1 µg/L and 3 µg/L. Table 1 presents the absorbance reading results obtained from a microplate reader at 450 nm for
each concentration of the estrogen standards. The standards were assayed in duplicates.

The average absorbance was plotted against the concentration of the standards to create the standard curve for estrogen (Figure 6). This curve was used to calculate the estrogen concentrations in each watershed.

Figure 6. Standard curve for Estradiol (E2)

3.2 Quantitation of Estrogen

3.2.1 Mapping the wells

The table below presents the layout of standards and water samples in a 96-well plate. Well 1 & 2 contain five estrogen standards (0, 0.05 µg/L, 0.15 µg/L, 0.5 µg/L, and 3.0 µg/L) in two replications. Wells 3, 6 and 9 are blanks; Wells 4 and 5 contain Loch Raven samples; Wells 7 & 8 contain Prettyboy and Wells 10 and 11 contain Liberty water samples (all in duplicates).

Table 2. Plate layout of estrogen standards and water samples (LRW- Loch Raven watershed, PB – Prettyboy watershed and LW - Liberty watershed)

<table>
<thead>
<tr>
<th>Standards (µg/L)</th>
<th>Blank</th>
<th>Loch Raven Watershed</th>
<th>Blank</th>
<th>Prettyboy Watershed</th>
<th>Blank</th>
<th>Liberty Watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 0 0</td>
<td>1</td>
<td>LRW1</td>
<td>2</td>
<td>LRW1</td>
<td>3</td>
<td>LRW2</td>
</tr>
<tr>
<td>B 0.05 0.05</td>
<td>4</td>
<td>LRW2</td>
<td>5</td>
<td>LRW2</td>
<td>6</td>
<td>LRW3</td>
</tr>
<tr>
<td>C 0.15 0.15</td>
<td>7</td>
<td>LRW3</td>
<td>8</td>
<td>LRW3</td>
<td>9</td>
<td>LRW4</td>
</tr>
<tr>
<td>D 0.5 0.5</td>
<td>10</td>
<td></td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E 3.0 3.0</td>
<td>12</td>
<td></td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Fall 2017 Estrogen analysis data

<table>
<thead>
<tr>
<th>Standards (µg/L)</th>
<th>Blank</th>
<th>Loch Raven Watershed (ppb)</th>
<th>Blank</th>
<th>Prettyboy Watershed (ppb)</th>
<th>Blank</th>
<th>Liberty Watershed (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 0 0</td>
<td>0.068</td>
<td>0.069</td>
<td>0.049</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Winter 2018 Estrogen analysis data

<table>
<thead>
<tr>
<th>Standards (µg/L)</th>
<th>Blank</th>
<th>Loch Raven Watershed (ppb)</th>
<th>Blank</th>
<th>Prettyboy Watershed (ppb)</th>
<th>Blank</th>
<th>Liberty Watershed (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 0 0</td>
<td>0.051</td>
<td>0.024</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 0.05 0.05</td>
<td>0.05</td>
<td>0.051</td>
<td>0.031</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C 0.15 0.15</td>
<td>0.043</td>
<td>0.051</td>
<td>0.041</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D 0.5 0.5</td>
<td>0.046</td>
<td>0.042</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E 3.0 3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.3 Interpretation of the data

We calculated the average estrogen for each watershed per season (Table 5) to determine if the detected concentrations are comparable with other studies in a similar setting.

Table 5. Average Estrogen levels for each watershed in µg/L

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Fall 2017 (E2), (ppb)</th>
<th>Winter 2018 (E2), (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loch Raven</td>
<td>0.074</td>
<td>0.048</td>
</tr>
<tr>
<td>Prettyboy</td>
<td>0.067</td>
<td>0.042</td>
</tr>
<tr>
<td>Liberty</td>
<td>0.046</td>
<td>0.040</td>
</tr>
</tbody>
</table>

As can be seen from the table, all calculated estrogen values range between 0.4-0.074 ppb. A similar study in the Raccoon River watershed (Des Moines, Iowa) detected estrogen levels between 0.003 to 0.007 ppb in Des Moines water treatment plant [9]. Even concentrations as low as 25 ng/L (0.025 ppb) have been found to lead to reproductive impairment and feminization of fish resulting in skewed populations [2]. Intersex has been recorded in Japanese medaka (O. latipes) exposed to 100 ng/L 17β-oestradiol [10]. Other authors have also reported intersex in medaka; for example [12] reported ovotestes in fish exposed to 10 ng/L. In the zebrafish (D. rerio) all early life stage fish exposed to 100 ng/L developed female-like reproductive ducts with 75% showing this condition at lower concentrations, e.g. 25 ng/L.

Although the detected concentration difference among watersheds is insignificant, Loch Raven has relatively higher concentration than Pretty boy and Liberty watersheds during both fall and winter seasons. To better understand why Loch Raven has the higher levels, we looked into the bio-chemical watershed characteristics data and found out that the dissolved oxygen (DO) values for Loch Raven are higher (9.2 ppm) than Pretty boy (4 ppm) and Liberty (2.1 ppm) suggesting that there is a lot of biological activity in this watershed which could possibly be a sources of estrogen [6].

On the other hand, seasonal comparison reveals that there is relatively higher estrogen concentration in the fall than winter season across all the samples measured. This is mainly due to
high river flow making movement of the contaminants possible whereas during winter (due to the freezing condition) contaminants remain localized.

III. CONCLUSIONS

One of the emerging water contaminants that is raising serious concerns on aquatic life health is coming from estrogentic compounds. Studies have shown that fish are changing sex due to exposure to excess estrogen.

The main goal of this study was to detect and quantify estrogen levels in Baltimore’s watersheds and to see if the concentration warrants serious concerns. Our finding revealed the average estrogen levels in the Loch Raven sub-sheds was 0.074 ppb (Fall 2017) and 0.048 (Winter 2018) and for Liberty sub-sheds it was 0.046 ppb (Fall 2017) and 0.040 ppb (Winter 2018). In Prettyboy sub-sheds the level was 0.067 ppb (Fall 2017) and 0.042 ppb (Winter 2018).

Overall, Loch Raven watershed has slightly higher levels of estrogen than the other two watersheds, both in the fall and winter seasons. Seasonal comparison indicated that more estrogen is found during fall than winter seasons. Future studies will focus on the impacts of estrogen levels on aquatic life and/or humans.

ACKNOWLEDGMENT

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Land-Use Shifting from Residential into Commercial Activities in the Region of Tlogosari Kulon, Semarang

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Abstract- Tlogosari Kulon is a residential space which also rapidly growing along with its commercial activities. This phenomenon promotes a shift in the utilization of residential space that originally built for private housing, now it slowly shifted into trade and service activities or even have mixed functions. The purpose of this research is to study the commercial activities effect of how it transformed residential space utilization in Tlogosari Kulon. Quantitative method will be applied with spatial analysis and quantitative descriptive technique that uses primary and secondary data. Subjects in this research are commercial actors around Tlogosari Kulon perimeter. Post analysis review has been made with no objections to the fact, also, some study findings have been found which are related to this residential to commercial shifts case in Tlogosari Kulon.

Keyword: regional development, residential space utilization, commercial activity, commercial shift

I. INTRODUCTION

Regional development is a transformation process of an area that is characterized by its physical change, which will affect the social and economic aspects of a region (Wardhana & Haryanto, 2016). Such development always attracts heavy migrants to settle down, as it implies the population density (Harahap, 2013). Increased populations will cause a high demand for land (Andriani & Handayani, 2014).

Basically, every resident needs a landholding to live. Various population activities within a region are not separated from different land functions. High demands for land obviously impacts on land-use change, a vacant land rapidly changed into a developed one (Pontoh & Sudrajat, 2009). This is due to the limited land being unable to further accommodate any activity on it (Purwanto, Ernawati, & Wijaksono, 2017). In addition, the high demand for land also encourages housing development as a new growth centre.

Housing is a basic necessity for urban dwellers with socio-economic characteristics (Almaden & Cagayan, 2014). Whereas based on Law No. 1 of 2011 on Housing and Settlement Areas it is clear that housing is a complex of houses as part of a settlement, both urban and rural, equipped with public facilities as a result of the decent housing fulfilment. The existence of residential areas as a new growth centre will have a significant impact on the development of the surroundings. Residential development will also be followed by its main supporting activities, the commercial ones (Indarto & Rahayu, 2015).

Commercial activity is an easy-to-grow sector in a strategic and affordable area by means of transportation. Types of commercial activities can be in the form of industrial, trading and service activities. The expansion of trade and service activities is influenced by several factors such as marketing, market segmentation, and customer behaviour (Syahrir, 2010). Commercial development in a residential space is a natural phenomenon. But it becomes unnatural when commercial activity develops within the scope of housing space, especially in well-planned residential, like what previously occurred in the public housing area of Tlogosari Kulon [West Tlogosari] Pedurungan District. Based on Local Regulation No. 14 of 2011 on Regional Spatial Planning of 2011-2031, this subdistrict has a basic function as a settlement area. While currently Tlogosari Kulon, as a decent residential area, subjected to experience rapid commercial developments (Nugroho & Mardiansjah, 2016). Commercial activities in Tlogosari Kulon can be seen in the following figure,
Tlogosari Kulon is a well-planned public housing and managed by the national housing authority, which in its planning has taken into account and provides a platform for accommodating commercial activities as a housing estate. But in reality, it has now been predicted that commercial activities in the Tlogosari Kulon are increasingly evolving into residential complexes because they cannot be accommodated in the pre-provided business area. Such phenomenon is expected to encourage a shift in the housing space utilization which originally functioned as a residency shifting into trade and service activities or even having mixed functions. The shift in space utilization that happens in socio-cultural environment of the communities affected by the large number of requests to support daily life so that it encourages the occurrence of economic growth and growing community become a commercial activity (Serneels & Lambin, 2001).

The shift in space utilization can be triggered by various factors, one of which is a strategic location. This can be the potential and benefit for landowners to change the utilization of their landholding by selling houses or being rented as a place of business. In addition, limited space and working opportunity make some people use their home as a place to run businesses (Haryanto, Soetomo, & Buchori, 2013). It is anticipated that Tlogosari Kulon will become increasingly dense with the emergence of medium-sized enterprises, which has implications for the widespread commercial function that was originally intended for housing. This commercial activity needs to be examined so it can be known how this kind of shifting process affects residential space in Tlogosari Kulon.

II. RESEARCH METHODOLOGY

A study that examines commercial activities presence on the shift of housing space utilization in the Tlogosari Kulon uses a quantitative research method based on numerical data or numerically processed by statistical methods (Nazir, 2003). Spatial analysis will be applied in the form of imagery maps whilst quantitative descriptive analysis will be shown in the form of tables, diagrams and brief descriptions. The analysis in this study is divided into the identification of residential land-use and commercial activities presence within residential space in Tlogosari Kulon based on the pattern and scale of service aims to know the pattern or form of commercial activity and its coverage. In this analysis, imagery maps are provided to reveal the patterns of commercial activities that occur and the extent to which these commercial activities can serve. Furthermore, there is an analysis of commercial activities presence within residential space in Tlogosari Kulon based on the zoning overview with the intention of knowing the difference related to commercial activities form and characteristics, whether there is a difference in each area or not. Next, there is an analysis of

Source: Field Observation, 2018

Picture 1

Secondary Commodity Trading Activities in Tlogosari Kulon

Shoe Store

Boutique

Stationery Shop

Pharmacy

Legend:
- Jalan Kereta Api
- Sungai
- Jalan Umum
- Jalan Lintas
- Pernikahan
- Perdagangan
- Batas RW

Source: Field Observation, 2018

http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7931
land-use shifting from residential into commercial aimed to find out how much the shift has occurred in Tlogosari Kulon by looking at the pattern, building function, and the physical condition of the commercial buildings. Lastly, this study aimed to find a connection between existing commercial activities and the land-use shifting that occurred.

Research data was obtained from questionnaires, interviews, and observations as the basis of information related to emerging commercial activities. While for sampling techniques, researchers use purposive technique sampling and area technique sampling and Slovin formula is used for the sampling method with a total population of 620 commercial actors, the amount was obtained after conducting a field survey. Subjects in this research are commercial business actors located in Tlogosari Kulon.

Slovin’s Formula:

\[ n = \frac{N}{1+N\left(d\right)^2} \]

After using the Slovin formula, it has been revealed that this research shall involve around 87 commercial actors with 10% margin of error so that the level of trust is 90%.

III. RESEARCH ANALYSIS

Identification of Housing Space Utilization in Tlogosari Kulon

National Housing Development [Perumnas] in Tlogosari Kulon has been established since 1986, where previously it was being part of Genuk District, Demak. Historically, the Tlogosari Area was originally a swamp located on a section that serves as a water catchment area. In line with the government's program to equitable development, Tlogosari was transformed into a public housing area managed by the national housing authority. Thus, Tlogosari has begun to be visited by residents from within and outside the city.

Based on the function of the building, Tlogosari Kulon is dominated by commercial functions along its road corridor. Commercial activities development along the road corridor was part of perumnas plan that deliberately provides a business centre to accommodate the growing commercial activities in the future. High demand for the marketplace has led commercial activity sporadically come forth into the housing complex.

Analysis of Commercial Activities Presence on the Tlogosari Kulon Residential Area Based on Service Pattern and Scale of Service

Based on the research, most of the commercial activities that dominate Tlogosari Kulon are grocery stalls, food stalls, laundry, private-rent flats, mobile display counters and workshop/service places. The number of shopkeepers in this area indicates that the demand for fulfilment of daily necessities is high so it creates opportunities for those who want to profit by selling. In addition, a number of people aged 40 to 65 and above in Tlogosari Kulon indicates that some residents have retired or no longer productive. Most of the retired residents want to keep their income to continue their lives. Therefore, these elders take advantage of business opportunities by changing their landholding utilization into a place of business to earn additional income. Not only grocery stalls, some of them are also looking for new income by opening a food stall, laundry, private-rent flats, etc.

The dominance of business activities such as food stalls, private-rent flats and laundry also indicates that Tlogosari Kulon Area is strategically located where it facilitates a sufficiently comprehensive infrastructure which affects the emerging business activities. This is indicated by the location of Tlogosari Kulon which is close to educational facilities such as Semarang University. The existence of such educational facilities is also a great opportunity for the people around to earn income both as an additional or permanent. The distance between those two is about 500 meters, so it is natural that many people tend to increase the utilization of their space into business activities such as food stalls, private-rent flats, or laundry, as it will provide university students with their daily life needs.

While the presence of mobile display counters in Tlogosari Kulon is due to the high market demand and the similarity factor of the business type. In opening the business, the owners are concerned about the market interest of the goods to be traded and the location of the sale to get the biggest profit. The emergence of a venture will bring other similar efforts. This is because high market demand makes a great opportunity for investors to profit. In addition, such commercial activities will compete in attracting consumers with the promotional strategies provided by each store. Commercial activity map is also provided below.

Overall, commercial activity in Tlogosari Kulon residential area is very diverse and has met the Indonesian National Standard [SNI], even above. Therefore, it is necessary to study and control the utilization of commercial space in Tlogosari Kulon so that there is no overlapping. Here is the table of commercial service suitability standards as follows,
Table 1

<table>
<thead>
<tr>
<th>No</th>
<th>Commercial Types</th>
<th>Population</th>
<th>Supporting Residents</th>
<th>Commercial Activity Based on Standard</th>
<th>Existing Commercial Activities</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stalls/Restaurants/Laundry</td>
<td>32.725</td>
<td>250</td>
<td>131</td>
<td>216</td>
<td>Exceeds Standard</td>
</tr>
<tr>
<td>2</td>
<td>Shopping Centre/Public Facility Services</td>
<td>191.039</td>
<td>6.000</td>
<td>31</td>
<td>404</td>
<td>Exceeds Standard</td>
</tr>
</tbody>
</table>

*Source: Research Analysis, 2018*

Based on the table above it can be seen that the number of stalls, restaurants, and laundry services has already met the SNI and almost doubled by 216 units whilst the shopping centre and public facility services have also exceeded the standard of 404 units in total. This indicates that there is a commercial activity overlap within residential space in Tlogosari Kulon.

**Analysis of Commercial Activity Patterns**

The existence of a residential area in Tlogosari Kulon makes the surrounding area experiencing a rapid development, where many residential supporting activities serve the high demand for the fulfilment of the surrounding community needs. The area of Tlogosari Kulon can be said to be the sub-centre of growth because all trade commodities and services are available in this residential area. The number of investors who tried their luck by opening a business in the Tlogosari Kulon made the area more crowded because they are targeting not only local customers but also the people outside Tlogosari Kulon. Here is the map of commercial activities pattern within the residential space in Tlogosari Kulon,

*Source: Field Observation, 2018*

**Secondary Commodity Trading Activities in Tlogosari Kulon**

Public space function along the road corridor of Tlogosari Kulon residential area differs from the function of space within. This is indicated by the different characteristics of commercial activity types in the area. Commercial space utilization along the dense corridor has characteristic of commercial activity with the customer target not only for the local population but also outside the residential area.
district. In addition, many trade commodities from both primary to secondary needs and all types of services are available along the business centre. Aside from that case, the commercial space within residential area serves a different type of activities where commercial bustles are largely for primary commodities production such as food stalls and grocery stores as well as housekeeping services such as laundry. The dominance of primary commodities within residential area indicates that the growing commercial activity is largely accommodated to meet the needs of the surrounding population.

Analysis of Commercial Activity Coverage
In a commercial activity, there will be a flow of goods from one region to another. The flow of goods should be supported by good means of transport and economy to support the mobility of goods and services that will be sold in commerce. To find out the range of commercial service coverage in Tlogosari Kulon residential area, it is divided into three scale, neighbourhood centres, community centres, and regional centres. Here is the map of commercial services coverage as follows,

Based on the above figure it can be seen that the residential area of Tlogosari Kulon is divided into several service scales. Commercial activity on the road corridor is dominated by regional service centre scale. These commercial activities can serve up to a radius of 1000 meters or can be reached within 20 minutes using vehicles with the average speed of 25 km/h. Goods traded at this regional centre scale include tertiary needs such as mobile display counters, gold stores, perfume stores, and so forth. Most of the commercial activities that sell tertiary needs have customers who are not only domiciled in Tlogosari Kulon but also from outside, even from the suburban cities. With such a customer target, Tlogosari Kulon has become increasingly dense and crowded as many customers enter the residential area. In addition, the existence of online taxi application made it easier for customers to buy the desired item. This is the thing that ultimately makes those business enterprises targeting customers outside their local perimeter.
Based on the above figure it may be noted that commercial activity located in the middle of the residential area, on average has a scale of community centre services. This service scale is capable of serving up to a radius of 500 meters or equivalent with a 25 km/h drive for 10 - 15 minutes. The goods sold are secondary necessities such as toy stores, clothing stores, shoe stores, pharmacies, and so forth. Most of the commercial activities that sell secondary goods have customers who are not only domiciled in Tlogosari Kulon but also from outside the perimeter. Targeted customers at this service scale are limited to inter-district coverage. With such a customer target, Tlogosari Kulon has become increasingly dense and crowded as many customers enter the residential area. In addition, the availability of online taxi application made it easier for customers to buy the desired item.
At this service scale, it can be seen in the picture above that the residential core has a neighborhood center scale where the existing commercial activities can serve up to a radius of 200 meters or the equivalent of a five to ten-minute walk. Goods or services sold are primary needs such as grocery stalls, food stalls, laundry, photocopying, tutoring services, drinking water refills, online payment kiosks, and so on. Most of the commercial activities that sell primary goods have a loyal customer because it is intended only for the residents around the housing area. But the existence of online taxi application makes it easier for customers to buy the desired item. It makes some of the primary commodity trading activities such as food stalls, restaurants, or other culinary spots also targeting potential customer outside the residential zone.

Analysis of Commercial Activities Existence within Residential Space in Tlogosari Kulon Based on the Urban Zone

<table>
<thead>
<tr>
<th>No</th>
<th>Zone</th>
<th>Commercial Characteristics</th>
<th>Space Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Zone A</td>
<td>Commercial activities that dominate space utilization in zone A are <strong>primary commodities</strong>. Most of the commercial activities located in zone A are still in <strong>lease or contract</strong> status. As for the commercial activity operational hours, most businesses operate around <strong>13 - 16 hours</strong> per day and the average commercial activity has existed for more than <strong>15 years</strong>. In addition, many entrepreneurs set up the businesses on the grounds of earning profits.</td>
<td>Most commercial buildings are dominated by the mixed function of housing and commercial.</td>
</tr>
<tr>
<td>2</td>
<td>Zone B</td>
<td>Commercial activities that dominate space utilization in zone B are <strong>tertiary commodities</strong>. Most of the commercial activities located in zone B are still in <strong>lease or contract</strong> status. As for the commercial activity operational hours, most businesses operate around <strong>13 - 16 hours</strong> per day and the commercial enterprises available has just been running for <strong>1-5 years</strong>.</td>
<td>Most commercial buildings are used only as a place of business</td>
</tr>
<tr>
<td>3</td>
<td>Zone C</td>
<td>Commercial activities that dominate space utilization in zone C are <strong>primary commodities</strong>. Most of the commercial activities located in Zone C have been <strong>on their own</strong>. As for the commercial activity operational hours, most businesses operate around <strong>13 - 16 hours</strong> per day and the commercial enterprises available has just been running for <strong>1-5 years</strong>.</td>
<td>Most commercial buildings are used only as a place of business</td>
</tr>
<tr>
<td>4</td>
<td>Zone D</td>
<td>Commercial activities that dominate space utilization in zone D are <strong>tertiary commodities</strong>. Most of the commercial activities located in zone B are still in <strong>lease or contract</strong> status. As for the commercial activity operational hours, most businesses operate around <strong>13 - 16 hours</strong> per day and the commercial enterprises available has just been running for <strong>1-5 years</strong>.</td>
<td>Most commercial buildings are dominated by the mixed function of housing and commercial.</td>
</tr>
</tbody>
</table>

Analysis of Land-Use Shifting from Residential into Commercial Activities
The shifting phenomenon of residential to commercial space is overwhelmingly occurring in densely populated areas supported by high market demands. Limited land and high land prices are also one of the causes that encourage the occurrence of space utilization shifts. Some business people prefer to use the space they have for profit rather than having to rent or buy other spaces. Based on the research that has been done, researchers found that Tlogosari Kulon has experienced a shifting phenomenon, where some of the population has changed or increased the initial function of settlements into commercial activities.
By analyzing the shift of housing to commercial space, it can be known how far the commercial development spread and how many commercial activities with mixed function by looking at the housing space utilization in terms of its function and physical condition of the buildings. The proportion of the result will be shown on the graph as follows,

**Graphical Percentage of the Commercial Building Function in Tlogosari Kulon**

Based on the graphs above, the commercial activities seen from the functionality perspective is largely dominated only for business place reason. The percentage of building function only for business place reaches 52% of the total commercial activity, while the remaining 48% is a mixed function of housing and commercial. The number of functions as a place of business only indicates that the existing commercial activity is still new. On the other hand, some business owners are only using or leasing a small portion of their land for a place of business. Rarely rented out all of its residential buildings because it was originally intended to buy housing lots for shelter. But with time, the high demands of daily living needs encourage households to capitalize on existing opportunities by opening businesses with fewer competitors available. In addition, due to the economic factors, it forces some people to maximize their space function by opening a profitable business. Then after seeing the commercial building functionality, it is also necessary to understand the physical condition. It aims to know how many businesses have been renovating their workplace to date. Here is the following graph,

**Graphical Percentage of Renovated Commercial Activity Buildings**

Based on the physical condition graph above, it can be seen that most business owners have been renovating their business places such as redecorating the wall or building roofs, expanding the building area and increasing the building height by 43%, 7%, and 6% in sequence. While the other 44% have not been renovated because their place of business is still relatively new, under six years timespan. In other cases, businesses that have been running for more than six years, usually have undergone renovations even though they are only doing walls redecoration or repairs the ageing roofs.
Based on these observations, it can be concluded that the shift in commercial activities is very volatile. Some business activities that have a high market demand will last much longer than when it comes to less visited business sites. The low market demand will throw the less-profitable enterprise out of business. So that the shifting term is so relatable because the existing utilization of housing space in Tlogosari Kulon slowly being transformed and can be shifted back to the previous function. To view the distribution of the existing mixed functions, clear zonal mapping has been provided as follows,

![Map of Functional Zones]

Source: Research Analysis, 2018

**Picture 7**

Functional Zone Preview of the Commercial Activity in Tlogosari Kulon

Based on the figure above it is known that the mix function is sporadically dispersed in a residential complex. As previously mentioned, the mixed functions scattered within the housing complex are the result of limited business centre space provided by the national housing authority for trading activities while the demand of surrounding communities is high. In addition, the consequence of not having a job because of unemployment or retirement encourages a person to take advantage of existing opportunities by changing or increasing the utilization of their properties for trading. Hence, mixed functions development is quite obvious.

**Study on the Existence of Residential Shifts to Commercial**

Tlogosari Kulon area is a well-planned and managed community housing, which in its planning has taken into account and provides a platform for accommodating commercial activities as a housing estate. In reality, however, commercial activity in Tlogosari Kulon has been growing and penetrating into the residential complexes because it cannot be accommodated in a pre-provided business centre. Such phenomenon is expected to encourage a shift in the housing space utilization which originally functioned as a residency shifting into trade and service activities or even having mixed functions.

The shift in space utilization can be triggered by various factors, one of which is a strategic location. This can be the potential and benefit for landowners to change the utilization of their landholding by selling houses or being rented as a place of business. In addition, limited space and working opportunities make some people use their home as a place to run businesses. It is anticipated that Tlogosari Kulon will become increasingly dense with the emergence of medium-sized enterprises, which has implications for the widespread commercial function that was originally intended for housing.

Based on previous analyzes, it can be concluded that the existence of commercial activities has been linked to the shift of housing space utilization. The emerging commercial activities within residential has had a major impact on the housing environment and surrounding areas. Most of the commercials that have mixed functionality are commercial with the type of primary trading commodities with the likes of daily needs such as rice, vegetables, cooking spices, meat, eggs, fruits, and so on where the rate of
daily purchase frequency is high and purchasing quantities are in relatively small limits. While the mixed functions are grocery stalls, food stalls, laundry, drinking water refill, online payment kiosk, and many more.

According to the facts, land-use shifting within the area only caused by the residents or their own landowners who intentionally took profits out of their land with a mixed function development. The shift is taking place gradually over the years, yet some of the existing commercial might not survive the tight competition. If a business was unable to compete, business actors would prefer to close or even rent out its space function to other ventures.

IV. CONCLUSION

There is a difference in the existing land-use implementation with the official plan that has been announced by the authorities. The incompatibility lies within the residential complex which initially specified only for housing needs to later be developed into commercial activities or mixed functions. Seeing the pattern of commercial activity, Tlogosari Kulon residential area has the centre pattern where its development forms a hierarchy that begins with commercial activity with low service levels, followed by a district-scale business such as supermarkets, pharmacies, and so forth. While at the next level is a service centre offering a high level of goods such as clothing store, bakery, fruit shop and mobile display counters. At the regional level, there are department stores, offices, mosques, and others. If viewed from the scale of its service coverage, Tlogosari Kulon is able to serve from neighbourhood centre, community centre, to regional centre.

Based on the utilization of its space, Tlogosari Kulon is a well-planned residential area and managed by the national housing authority. The presence of commercial activities within housing spaces makes Tlogosari Kulon looks disproportionate due to the development of commercial activities that have a consumer target not only within the local area but also from outside markets. It also highly encourages the growth of commercial activities within the residential space. The availability of education and office facilities inside and around the area has enabled commercial activities to grow rapidly. As with the presence of the university, it encourages the emergence of supporting activities such as private-rent flats, food stalls, laundry, photocopying, and so forth. Hence it makes Tlogosari Kulon widely known as the sub-centre of growth. In addition, online transportation networks have had a huge impact on commercial activities within. With the existence of online taxis, it becomes easier for someone to buy the desired item so that the target of a business is unlimited, which initially prepared only for locals to be spread out because of the online taxis flexibility.

The expansion of commercial activities has also led to a shift in the utilization of housing space. Land-use shifting in Tlogosari Kulon is very voluntary. Some business activities that have a high market demand will last much longer than when it comes to less visited business sites. The low market demand will most likely throw the less-profitable enterprise out of business. So that the shifting term is so relatable because the existing utilization of housing space in Tlogosari Kulon slowly being transformed and can not be shifted back to the previous function. In addition, many mixed functions are dispersionsly sporadic inside the residential complexes. As previously mentioned, the mixed functions scattered within the housing complex are the result of limited business centre provided by the national housing authority while the demand of community needs remain high, so the mixed functions development is quite obvious.

REFERENCES


[1]
Climatic shock and coping mechanisms of a Rural economy- Case of two villages in semi arid region of Karnataka

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Abstract- The rural economy more so the agricultural economy is vulnerable to a no of stressors prime among being the climatic changes leading to high temperature, sporadic rainfall, dry weather conditions among others. There are some crops who withstand the vagaries but some are not, the paper explores through the sustainability and resilience test the strength of lands and crops to with stand climatic shocks. An understanding of the vulnerability faced by rural economy becomes important not only to understand the effects of climatic changes but also effect and to provide remedial measures which needs in form of policy recommendations. An empirical study comprising an extensive primary data collection of two villages were done. The sustainability and resilience of Rampur is extremely low compared to Bableshwar.

Index Terms- Climate, Sustainability, Resilience, North Karnataka, Khariff, Rabi Crop

I. INTRODUCTION

Agriculture is extremely vulnerable to climate change. Higher temperatures eventually reduce yields of desirable crops while encouraging weed and pest. Changes in precipitation patterns increase the likelihood of short-run crop failures and long-run fall in production levels. Climate change is creating winners and losers, not surprisingly, the winners are primarily rich, industrially developed Countries. Adaptation planning has grown into a substantial industry, and is being for instance included in public investment in infrastructure, with countries such as Germany, France and the United Kingdom creating National institutions for adaption planning and implementation. In contrast, adaptation in the world’s poorest countries is largely a matter of self-help -Channing 2012. Furthermore, it is reasonable to expect that farmers in developing countries may be less able to adapt to climate change due to credit constraints or less access to adaptation technology.

India one of the largest economies of the world has been an agrarian economy for a long time, with more than sixty percent of its population depending on its output. Karnataka the eighth largest state in India is no less. The agricultural sector of Karnataka is characterized by vast steppes of drought prone region and sporadic patches of irrigated area. Districts like Bijapur, Bellary, Bagalkot, Koppal, Gadag, Raichur and Chitradurga can be classified as low rainfall districts where average annual rainfall (1998-2010) is less than 650 mm. This leads to severe unemployment in the rural areas. Given to a particular occupation and poverty, the farmers and labourers who are dependent on agriculture find themselves in a precarious position. With this backdrop, a study was done to understand the impact of climatic shock on the coping mechanism of a village economy, where production and distribution takes place but on a small scale.

The sustainability and resilience tests were done using the agricultural yields, cost of production and returns. This was done mainly to understand given climatic shocks whether agricultural land are able to sustain adversities in form of severe drought and whether the farm were resilient to a change mainly in terms of cropping changes, input cost, and changes in output price.

II. STATEMENT OF THE PROBLEM

The village economy unlike an urban economy comprises limited occupations which is unique to the area. Agriculture is the main occupation of the majority of the population in the villages of Karnataka with more than 70% of the population depending on it. Despite the serious efforts to boost agricultural production, the sector fails many a times owing to the growing demand of the increasing population, adverse climatic conditions, decline of productivity of crops and shrinking resource base, especially agricultural land, accelerating land degradation, affect the economic development of many villages in the study area. Though the economic activities are restricted to a very few occupations, the lack of knowledge in identifying and prioritizing activities that have high growth linkages and strong income-enhancing activities impact the economic development. It is seen that many a times long term sustainability of economic growth and its welfare largely depend on the magnitude and strength of inter-sectoral linkages and the manner in which income is distributed. It thus becomes important to identify the drivers in the production, marketing, distribution and consumption channels to trace the drivers of economic development and also to map out the most effective route for enhancing growth and improving livelihoods in rural areas. It has also used economic indicators of sustainability and resilience as indicators to test the impact of climatic shocks on returns of farm lands. In this context it becomes prime
importance to understand and trace the various drivers of growth in a village economy. Village are small rural areas whose main occupation is agrarian. Their main livelihoods depend on agriculture with its vagaries.

III. LITERATURE REVIEW

Global warming has led to severe climatic change through out the universe. A warmer and drier climate could lead to more intense droughts. Rising temperatures associated with climate change will have a detrimental impact on crop production, livestock, fishery and allied sectors. It is predicted that for every 20°C (which has been predicted by 2030) rise in temperature, the GDP will reduce by 5 per cent.

Mutevaka 2009 states there is need to conscientise farmers about climate change and design adaptation strategies that take into cognizance existing local level knowledge and practices on land and water management. There is also need to avail agricultural research results relevant to the small holder farmers and train them on how to use the results to make informed on-farm investment decisions. Melissa 2008, uses annual variation in temperature and precipitation for the past 50 years to examine the impact of climatic changes on economic activity throughout the world. The results indicate that higher temperatures substantially reduce economic growth in poor countries but have little effect in rich countries. Second, higher temperatures appear to reduce growth rates in poor countries, rather than just the level of output. Third, higher temperatures have wide-ranging effects in poor nations, reducing agricultural output, industrial output, and aggregate investment, and increasing political instability.

Elumalai 2011, discusses the trends and patterns in agricultural growth at the national and sub-national levels in India. The analysis of data reveals that the cropping pattern in India has undergone significant changes over time. There is a marked shift from the cultivation of food grains to commercial crops. Among food grains, the area under coarse cereals declined by 13.3 per cent between 1970-71 and 2007-08.

According to Subramanian 2009, the success of the agriculture mainly depends on proper utilization of land and water resources are the two most important natural resources in the development of Agriculture. Water is an essential ingredient for food production. Initially, natural rains provided water supply to agriculture in forest areas. The preliminary analysis shows that water and fertilizer play an important role in agricultural production. But addition of irrigation has not resulted in any increase in overall food grains production. The review of early studies indicate multitudinal impact in the form of low production, high price, poor yield and unemployment leading to poverty. The present study would also find whether climatic changes effect the productivity and other interlinkages of the farming community in the two villages.

IV. OBJECTIVES OF THE STUDY

1. Contribution of the various sectors of the village economy
2. Analyse the impact of climate shocks on the vulnerability of the village economy
3. To document the coping mechanisms followed.

The two villages which was taken up for the study include Bableshwar and Rampur

V. ANALYTICAL FRAMEWORK

Profile of the study area.

The total area of Bableshwar is 7649 hectares the total population is 1528. The villages is highly backward in nature with very poor basic amenities. This is the same scenario which also exist in the surrounding villages. Eighty percent of the farmers cultivate only during the khariff season which is between July and October. Crops cultivated are ground nut, suji, sunflower, sugarcane, horse gram and cotton. The type of soil is generally black soil. The total land area is 2253, population amount to 3608 according to the 2011 census. Male population is 1859 and female is 1749 the main workers are 1097 among them the agricultural worker are 504. The main occupation of the population is agriculture where underemployment plays a predominant role.

A brief description of indicators representing spatial scale of sustainability developed for the study is presented below.

1. Degree of crop heterogeneity on farms:
2. Application of eco-friendly inputs:
3. Ratio of cost of purchased inputs to the total cost of cultivation of the crop
4. Degree of pesticide use:
5. Fertilizer application per unit of cropped area
6. Per cent area under input intensive crops

VI. SUSTAINABILITY

1. Degree of crop heterogeneity on farms: The number of field crops grown per farm was considered to indicate crop heterogeneity. The more the number of crops grown per farm, higher will be the sustainability of agriculture
2. Ratio of cost of purchased inputs to the total cost of cultivation of the crop: If the ratio of cost of purchased inputs (including seeds, farm yard manure, fertilizers, plant protection chemicals, irrigation, hired labour, etc.) to the total cost of cultivation of the crop is lower, such a farming system is said to be relatively more sustainable
3. Per cent area under input intensive crops: The acreage under input intensive crops like paddy, sugarcane etc., per acre of cultivated land was calculated. It was hypothesized that a farming system with lower proportion of area under input intensive crops was more sustainable. The research aimed to use only three of these indicators.
VII. RESILIENCE

The resilience has been viewed in terms of stability of farms to absorb any external shocks and continue the farming business. The resilience test include

1. **Average cash cost per unit of Output**: The cash expenditure incurred for fertilizers, pesticides, hired labour, etc., to produce an unit of output was computed. Assuming this to be true, it can be hypothesised that higher the average cash cost per unit of output, lesser will be the resilience of the farming system in that particular zone.

2. **Sensitivity Analysis**: The sensitivity analysis approach was used to study the extent of reduction in net returns for changes in price of inputs and outputs. For this, a simulation exercise was performed. The prices of inputs and outputs were increased and decreased by 25 per cent each respectively. It was hypothesised that lower the reduction in average net returns upon increase or decrease in input and output prices, higher will be the resilience of that farming situation.

VIII. ANALYSIS AND RESULTS

Table 1 Occupation status in Rampur and Bableshwar.

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Rampur</th>
<th>Bableshwar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labourer</td>
<td>15(4.31)</td>
<td>57(18.4)</td>
</tr>
<tr>
<td>Cattle Rearing</td>
<td>13(3.74)</td>
<td>14(4.5)</td>
</tr>
<tr>
<td>Own land</td>
<td>185(53.16)</td>
<td>238(77)</td>
</tr>
<tr>
<td>Nil</td>
<td>135(38.79)</td>
<td>0(0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>348(100)</td>
<td>309(100)</td>
</tr>
</tbody>
</table>

Occupation is captured in terms of the respondents who are employed in the particular profession. More than fifty percent of the respondents were having own land and cultivating on them, though they were not very successful as far as yield is concerned as the crops were rain fed and that the region was prone to drought conditions. A very small percent of them were labourers working in fields and another four percent of them were into cattle rearing. Three fourth of the respondents in Bableshwar were land owners cultivating on their own land once a year. 18.4 % were agricultural labourers, where as a small percentage comprised of people following cattle rearing.

IX. SUSTAINABILITY AND RESILIENCE OF AGRICULTURAL LAND.

The global warming has its adverse effects on climate changing the pattern of rainfall leading to extreme cyclonic conditions or drought conditions, both affects the farmers in an adverse manner. Certain farm lands and crops are able to sustain the extreme climatic conditions but some are not. The sensitivity analysis is done to find the sustainability and resilience of the lands in the below study area.

The term sustainability referred to as a measure of self reliance of the production system when it depends on the external system for its input. A system which has a greater dependence on external source of inputs and markets and lower level of eco-friendly inputs into agriculture is considered to be more vulnerable and hence less sustainable in the long run and viceversa. This can be relation to the productivity of land also (Heinen quoted in Bell and Morse, 2000). The sustainability explains whether during a adverse conditions the crops are able to sustain their productivity and also if they are resilient to the adverse conditions.

X. INDICATORS OF SUSTAINABILITY

The research aimed to use only three of these indicators I;e

1. **Crop Heterogeneity** - The number of field crops grown per farm was considered to indicate crop heterogeneity.
2. **Per cent area under input intensive crops**: The acreage under input intensive crops like paddy, sugarcane etc., per acre of cultivated land was calculated.
3. **Ratio of cost of purchased inputs to total cost of cultivation**

Table 2 Indicator of Sustainability of Agricultural land

<table>
<thead>
<tr>
<th>SL No</th>
<th>Indicator</th>
<th>Rampur</th>
<th>Bableshwar</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Degree of crop Heterogeneity</td>
<td>.76</td>
<td>.88</td>
</tr>
<tr>
<td>2</td>
<td>Per cent area under input intensive crops</td>
<td>88</td>
<td>76.2</td>
</tr>
<tr>
<td>3</td>
<td>Ratio of cost of purchased inputs to total cost of cultivation</td>
<td>0.89</td>
<td>0.86</td>
</tr>
</tbody>
</table>
The sustainability of agricultural land was studied through different indicators developed for the study. The values of various sustainability indicators for the two sample villages is furnished in Table 2. The indicators reflect physical, economic and environmental aspects of sustainability. It was hypothesized that more the number of crops grown per farm, higher will be the sustainability of agriculture. Since higher crop heterogeneity introduces an element of informal insurance against risk in the farm business. Moreover, from ecological point of view, crop heterogeneity is preferred over monocropping.

It could be observed from the table 2 that the degree of crop heterogeneity was very less in both the villages. It was just twenty four percent in Rampur and only twelve percent in Bableshwar. The reason being though various crops like cotton, sugarcane, wheat and others were grown the percent of their coverage was found to be extremely low in both villages. This mainly due to the high dependence on rainfall and sever drought situation as the villages fall in the semi arid zones. Thus it could be concluded both the villages were more prone to monocropping i.e cultivation of one crop tur dal.

The per cent area under input-intensive crops is another important indicator of sustainability. The percentage of coverage for intensive crop (tur) was 88% in Rampur and 76% in Bableshwar indicating a very low sustainability factor in times of adversity like drought.

The indicator of ratio of cost of purchased inputs to the total cost of cultivation revealed that the input cost for farmers in both the villages was very high. 88% villagers of Rampur depended on external inputs followed very closely by farmers of Bableshwar by 87. The high dependence on the external inputs like the usage of manure or fertilizer indicates a very low sustainability level. The high level of dependence on external inputs was due to low fertility of land and poor yield.

### XI. RESILIENCE

Resilience can be considered as a measure of system stability. It indicates a system's (farm's) ability to absorb disturbances before it vaults from one state to another (Holling quoted in Kooten and Bulte, 2000). The resilience has been viewed in terms of stability of the agricultural lands to absorb any external shocks and continue the farming business. For instance, a lower amount of cash expenditure implies greater degree of resilience since farmers can recover quickly from financial losses if expenditure is lower. In line with this rationale, two indicators have been used to measure the resilience of agricultural lands.

1. Average cash cost per unit of output: The cash expenditure incurred on agricultural inputs like fertilizers, pesticides, hired labour, etc., to produce a unit of output was computed. Generally, the level of cash expenditure per unit of output could be related to risk, for example, in times of adversity, an individual farmer cannot afford to incur huge costs on farming alone as one has to meet the basic requirements first. Assuming this to be true, it can be hypothesised that higher the average cash cost per unit of output, lesser will be the resilience of the farming system in that particular zone.

2. Sensitivity analysis: The sensitivity analysis approach was used to study the extent of reduction in net returns for changes in price of inputs and outputs. For this, a simulation exercise was performed. The prices of inputs and outputs were increased and decreased by 25 per cent each respectively. It was hypothesised that lower the reduction in average net returns upon increase or decrease in input and output prices, higher will be the resilience of that farming situation.

<table>
<thead>
<tr>
<th>Khariff Season</th>
<th>Crop</th>
<th>Average cost</th>
<th>Average returns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tur</td>
<td>27826.47</td>
<td>6825.36</td>
</tr>
<tr>
<td></td>
<td>Sugarcane</td>
<td>108722.9</td>
<td>188566.27</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Cotton</td>
<td>59727.27</td>
<td>77424.24</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>37089.66</td>
<td>23006.90</td>
</tr>
</tbody>
</table>

### Table 3a. Average cost per unit of output (Rampur and Bableshwar)

<table>
<thead>
<tr>
<th>Khariff Season</th>
<th>Crop</th>
<th>Average cost</th>
<th>Average returns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tur</td>
<td>27826.47</td>
<td>34651.84</td>
</tr>
<tr>
<td></td>
<td>Sugarcane</td>
<td>108722.9</td>
<td>297289.16</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Cotton</td>
<td>59727.27</td>
<td>77424.24</td>
</tr>
</tbody>
</table>
One of the indicators of measuring resilience is to compare the average cash cost to net average returns. A comparison between the two villages in the khariff season among the major crops indicate the average cash cost to be high among all crops except sugar cane. In Rampur the average returns for tur is four times less than its cost. The average returns for cotton is three times less than the cost. Sugar cane obtains the average returns which is one half times than its cost.

In Bableshwar it was found that except for tur which occupies more than 76% acreage, the average returns is only one fourth of the average cost. In case of sugar cane returns is almost one half times its cost. A similar trend is found with wheat and cotton. Thus Rampur has a very low resilience with all crops. Though the land under sugarcane has moderate resilience, its acre acreage is found to be very less. The land under bableshwar have a comparatively high resilience except for turdahal.

Table 4a. Sensitivity Analysis-Rampur

<table>
<thead>
<tr>
<th>Crop</th>
<th>Avg Net return</th>
<th>Percentage</th>
<th>Avg Net return</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tur</td>
<td>-7670000</td>
<td>-85.31</td>
<td>7906000</td>
<td>87.94</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>19563750</td>
<td>-2357.08</td>
<td>-7226250</td>
<td>-870.63</td>
</tr>
<tr>
<td>Wheat</td>
<td>-1226250</td>
<td>0</td>
<td>81750</td>
<td>0</td>
</tr>
<tr>
<td>Cotton</td>
<td>-730000</td>
<td>-221.21</td>
<td>547500</td>
<td>165.91</td>
</tr>
<tr>
<td>Total</td>
<td>-29190000</td>
<td>-287.58</td>
<td>1309000</td>
<td>12.90</td>
</tr>
</tbody>
</table>

The effect of changes in market prices (sensitivity analysis) on the profitability of the different crop from both villages under study was examined. A 25 per cent rise in input prices in Rampur resulted in the greatest reduction to negative returns. This was found for almost all crops. The increase in input cost shows no effect on net returns as the yield per acre is below average production, due to many inherent factors like rain fed irrigation and owing to severe drought conditions.

Sensitivity analysis: The sensitivity analysis approach was used to study the extent of reduction in net returns for changes in price of inputs and outputs. For this, a simulation exercise was performed. The prices of inputs and outputs were increased and decreased by 25 per cent each respectively. It was hypothesised that lower the reduction in average net returns upon increase or decrease in input and output prices, higher will be the resilience of that farming situation.

Table 4b. Sensitivity Analysis - Bablesahr

<table>
<thead>
<tr>
<th>Crop</th>
<th>Avg Net return</th>
<th>Percentage</th>
<th>Avg Net return</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tur</td>
<td>55020000</td>
<td>661.30</td>
<td>5040000</td>
<td>60.57</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>28025000</td>
<td>1751.56</td>
<td>-8577000</td>
<td>-536.06</td>
</tr>
<tr>
<td>Wheat</td>
<td>5834250</td>
<td>4167.32</td>
<td>-4786500</td>
<td>-3418.93</td>
</tr>
<tr>
<td>Cotton</td>
<td>7605600</td>
<td>1618.21</td>
<td>-3744600</td>
<td>-796.72</td>
</tr>
<tr>
<td>Total</td>
<td>96484850</td>
<td>911.09</td>
<td>-12068100</td>
<td>-113.96</td>
</tr>
</tbody>
</table>

The sensitivity analysis of market price changes on net returns revealed that the percentage reduction in net income due to rise in input price or fall in output prices by 25 per cent showed that effect of such price variations was very high with the increase input cost for all the crops and with the reduction of output price except for tur which showed decrease by 60%, the rest of the crops in bableshwar once again exhibited negative returns. This could be because of high input cost like purchase of all inputs from outside the village, crops being rain fed as well as crop yield being low owing to severe drought conditions.

3 Per capita Household Expenditure: The ratio directly indicates financial resilience of households. A household (farm) with a lower amount of per capita expenditure is said to possess a greater resilience, because during the times of adversity, the household will be capable of reducing costs. The per capita household expenditure was rs 2790 for Bablesahr with an average family size ranging between five to six members. On the other hand the per capita household expenditure for Rampur was rs 4106 and the family size ranged between 5 to 6 members. Though the per capita expenditure in both the villages is low, Rampur is comparatively lower, thus indicating moderate resilience to economic adversity.
Due to severe drought conditions and poor yield from land it is found that both land owners who are mostly marginal farmers and labourers move out to other places in search of jobs. The above table explains the type of jobs which they take up in migratory places which includes Maharashtra, Bangalore, Bijapur among others. More than half the respondents land up in construction jobs be it private buildings or works sponsored by local government. Thirty percent of them land up in brick or making hallow blocks for buildings. The rest take up petty jobs in agricultural jobs and in laying cables etc.

### Table 5 Coping mechanisms

<table>
<thead>
<tr>
<th>Type of Work (migratory place)</th>
<th>Rampur baleshwar</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Labour</td>
<td>29</td>
<td>5.7</td>
</tr>
<tr>
<td>Bottle Making</td>
<td>1</td>
<td>.1</td>
</tr>
<tr>
<td>Brick Making</td>
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</tr>
<tr>
<td>Cooking</td>
<td>4</td>
<td>.8</td>
</tr>
<tr>
<td>Cable wire work</td>
<td>27</td>
<td>4.5</td>
</tr>
<tr>
<td>Construction sector</td>
<td>251</td>
<td>49.7</td>
</tr>
<tr>
<td>Total</td>
<td>505</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Karnataka state is basically agrarian in nature but most of its land holdings are uneconomical and the farmers are marginal farmers who are highly dependent on rains for their cultivation process. The results of the sustainability test indicate that Rampur has a extremely low sustainability with compared to all crops. Though Baleshwar exhibits the same pattern it has a slightly high sustainability in terms of one crop that is Tur dhal as the area of coverage is huge. The resilience tests indicate poor resilience of both the villages in term of average cost of production and returns and sensitivity of crops towards change in input cost and output price. The percapita expenditure is low in both villages indicating moderate resilience. The coping mechanism for the villagers has taken shape in the form of migration where it is seen closer to eighty percent of them moving out during the nonagricultural season. This calls for policy changes in the form of providing needed financial and knowledge support to farmers so that they continue to cultivate in the Rabi season also which will have a cascading effect on the other sectors.

Sufficient support in the form of inputs and ways to cultivate the crop can also go a long way increasing the yield of crop which is much below the threshold level. Government schemes in the form of employment and training support in real earns to be given to farmers so that they stay in their own villages and improve their local economy than migrating and becoming floating population.

### REFERENCES


### AUTHORS

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Electricity Crisis of Bangladesh and A New Low Cost Electricity Production System to Overcome this Crisis

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Abstract- Electricity is the key factor for gradual development of any country let alone developing country like Bangladesh. The demand for electricity in both households and industries is increasing rapidly with the increase of the population in Bangladesh [11]. Currently, load shedding is common phenomenon, which is causing severe problem for the country and is hindering the progress of economy [6]. There are some key reasons for this ongoing problem such as ever increasing demand for electricity, limited natural resources, lower capacity of electricity generation, and less investment (both private and public) in this sector etc. [1,4]. Electricity crisis needs to be abolished as soon as possible in order to become Bangladesh as a developed country [9]. In this regards, the paper presents a low cost but effective and efficient model (fan with dynamo) for generating electricity which might fulfil the increasing demand in the rural areas, where the electricity from the main grid could not be possible, as well as rest of the country. Firstly, the author discusses the present scenario of electricity production system in Bangladesh and its crisis due to the increasing demand and reduces productivity. Finally, a low cost model for electricity generation to eradicate the gap between demand and supply of electricity is presented.

Index Terms- Electricity crisis, Bangladesh, fan, dynamo

I. INTRODUCTION

In order to develop the economy and to maintain the standard of living of any country, it is very essential to have flawless electricity supply and sufficient production of power using the available national resources. Bangladesh heavily relies on natural gas to generate lion portion of the electricity [6]. Although, the government of Bangladesh is trying to produce electricity using other resources like coal, oil etc. as well as renewable energy such as wind power, bio energy, solar energy, micro hydro, tidal energy and ocean wave etc., the country is way behind to fulfill its increasing demand (not only from Industries but also from households) of electricity. In Bangladesh, a noticeable number of populations if not majority are yet to have access to electricity. Alarmingly, there are some areas of the country where electricity connection might not be possible within next 50 years. Besides, there is only slightly above 10% of the rural areas where there are electricity connection from the national grid [6]. Bangladesh is in deep crisis on producing and supplying electricity and there will be no sign of good news as the reserve of national resources (gas and coal) are decreasing day by day that will in turn hinder the production of electricity in the near future. Therefore, a low cost electricity production system, which is independent of main electricity line as well as this system can be easily install in rural areas, has been proposed in this paper in order to solve the alarming electricity crisis of Bangladesh. In our proposed low cost model, a dynamo is attached with the rod of the fan (both ceiling and table fan) using a belt. The dynamo rotates with the rotation of fan and the rotating dynamo produces electricity, which is being stored in a battery [3]. The stored electricity could be either used to run the same fan from where electricity is producing [In that case, main power line to run the fan is not required afterward] or for powering some other electric devices [10].

II. PRESENT SCENARIO

2.0 Power Sector Review [Bangladesh]

The progress of an economy mostly depends on availability of natural resources and incessant supply of electricity. Bangladesh, an emerging economy, has been experiencing persistent period of electricity crisis that has been hindering the rate of economic development. The country is still at very low level of electrification even if electricity is regarded widely as the main form of energy at both commercial and private scales in Bangladesh [6].

2.1 Power Generation

Currently, there are 111 working power plants in Bangladesh. The grid capacity is 15, 821 MW and per capita electricity generation is as low as 433 kWh.
Currently Bangladesh produces 9507 MW electricity from 111 power plants. However, the current demand (12644 MW) is so high and alarmingly, the demand from both industries and households is constantly increasing day by day.

2.2 Fuel Supply Scenario

From the above statistics, it is clear that natural gas, which is well over 60% of total sources, has been playing a key role as an energy source for generating power till date. However, worryingly, there is no new gas discovery in recent years as well as the natural gas reserve remains uncertain. Therefore, the country is falling in a deep electricity crisis as the main resource to generate electricity is running out steadily.

The government of Bangladesh is looking for alternative resources (such as coal, oil and nuclear) to mitigate the electricity crisis in the near future. It seems like HFO and Furnace oil based electricity production plants are best available alternatives [6]. However, compare to gas based electricity plants oil based plants are heavily expensive to implement. Therefore, it will be only short term solution of persistence electricity crisis [8]. The next available alternative is coal based plants. The present government is trying to establish new coal based electricity plants. However, the initiative has been widely debated as coal based plants are extremely harmful for the environment [5,7].

2.3 Gap between Actual Supply and Demand

Due to the lack of electricity production and ever increasing demand, the gap between projected demand and actual demand served remained very significant. The following figure depicts electricity shortage between 2010 and 2015:

The chart below represents the scenario of steady increment of electricity demand from 2010 to 2017. Although, maximum generation (mw) increase in every year with the increase of demand but the gap between generation and demand remain almost identical.
2.4 Demand Forecast

According to Power System Master Plan (PSMP) -2010, demand forecast for electricity in Bangladesh was made on the basis of GDP growth rate of 7%. The above figure shows the exponential increase of demand from 2017 (12644 MW) to 2030 (33708MW). In order to increase wide access to electricity and sustain economic development, rapid electrical development is essential. The proposed electricity generation model will mitigate the lion portion of the demand especially come from household if the government of Bangladesh sponsor this project during the implementation phase.

III. PROPOSED ELECTRICITY GENERATION MODEL

3.1 Overview of Proposed Model

The following block diagram illustrates the proposed low cost electricity generation model:

![Block diagram of the proposed model]

It can be seen from the above block diagram that
1. Fan gets the power from battery through inverter.
2. Dynamo, which is attached with fan using a belt, produces the power with the rotation of fan.
3. The generated power is saved in the battery with the help of charging controller.

The following figure shows abstract view of the proposed model:

![Abstract view of proposed model]

3.2 Working Mechanism of Proposed Model

From the abstract view of the model, it can be seen that there are two sections
1. Electricity generation
2. Electricity consumption

Electricity generation:
In the electricity generation phase, there are two power sources [main power line and battery] and either one can be used to start the fan. Here, main power line is optional because it does not require as long as we start the fan using other power sources. For example, if we can start the fan using saved battery power then main power line will not be required at all. Even if we use main power line as a redundant connection, it can be used only to start the fan. As long as fan starts rotating, the main connection can be disconnected because fan will be running afterwards using its own power that has already been generated with the help of dynamo.

A dynamo is attached with the fan using a belt. Belt is installed in the moving rod of each device in such a way that dynamo rotates with the rotation of fan. As long as dynamo rotates, electricity is produced in the form of DC. The produced electricity is stored in a battery through charging controller. Here, charging controller is used to protect and prevent the battery for overcharging and overvoltage. So, in this phase, electricity is produced and saved in a battery.
Electricity Consumption:

In this phase, we use the electricity from the battery. The electricity, stored in the battery, is in DC form. Hence, we need to convert it to AC form. In order to do that, we use a 12v-220v inverter to convert 12v DC to 220v AC. Moreover, we require a transformer to supply desired output to various electrical devices shown in the figure above. Here, most interesting thing is that the fan uses the electricity from battery that has been produced by the fan itself with the help of a dynamo. Therefore, in order to get cooling air from the fan, we do not require any external electricity. On top of that, we can power other electronic devices from the generated electricity for free of cost.

3.3 Components Required

To implement the proposed model the following components are required:

- Fan
- Dynamo
- Battery
- Inverter
- Switch
- Charging controller
- Transformer
- Microcontroller
- Resistors
- Capacitors
- Belt

Fan:

It is a device that circulates air for the purpose of cooling. Any kinds (table fan, ceiling fan etc.) of a fan can be used to generate electricity using a dynamo. Here, we have used a table fan for easy installation in a board.

Dynamo:

It produces DC (Direct Current) power with the use of electromagnetism. In other words, dynamo can be used to get electrical energy from mechanical energy. The produced electrical energy can either be used to power the devices straightway or can be stored in a battery for later use.

Charging controller:

A charging controller prevents overvoltage and protects overcharging by limiting the flow of electric current to and from an electric battery. The performance of a battery can be degraded without a charging controller.

LCD display:

LCD is used along with a microcontroller to display different messages on a miniature Liquid Crystal Display (LCD). We have used 2*16 LCD in our implementation, which displays the generated messages in two lines with 16 characters per line.

Battery:

Battery is used to store DC power. Here, we have used a 12v battery made by QUANTA.

Inverter:

An inverter is an electronic circuit or device that changes Direct Current (DC) to Alternate Current (AC). Here, we have used CD4047 inverter to convert 12v (DC) battery power to 220v (AC) supply power for powering the fan or other electronic devices.

Transformer:

Transformer is an electrical device, which transforms, with the help of mutual induction between two windings and without any direct electrical connection, electrical energy from one circuit to another. Here, we have used transformer to supply the desired output.

Microcontroller:

Microcontroller is a highly integrated chip (IC) comprising CPU, RAM, ROM, timers and some I/O ports. It is designed for the purpose of doing a very specific task, for instance, controlling a system. We have used PIC16F73 microcontroller in our model.

3.4 Practical Observations

In order to implement our low cost electricity generation system, we mounted entire components on a black wooden board. We have used a table fan for experimental purpose. The following figure demonstrates pictorially how new proposed model has been implemented in the lab.

In this experiment, numerous types and sizes of the cables have been used. We used the battery that already has some electricity in it. As such, we did not use main power line at all.

As soon as we turned on the switch, microcontroller activated battery to discharge power to output line through
inverter and transformer. We got the power connection for the fan by plug-in power cable to the output line. Fan rotated as a result of power connection and so the dynamo.

Electricity produced by the dynamo and the resulting electricity was regulated charging controller before storing in the battery. And this electricity production and consumption continued until the switch turned off.

Electricity produced by the dynamo and the resulting electricity was regulated charging controller before storing in the battery. And this electricity production and consumption continued until the switch turned off.

Figure: Implementation of proposed model

It can be seen from the LCD screen that the rate of charging (12.74v) the battery is higher the rate of using (12.15v) the power from battery. In such case, fan will be running forever without any external power unless we manually turn the fan off.

Figure: LCD output

IV. CONCLUSION

Electricity production, in comparison to its demand, is very inadequate in Bangladesh. In addition, the natural resources (gas, coal) to produce electricity are running out day by day. So, load shedding is common phenomenon in Bangladesh. Therefore, in this paper, a new model, which does not rely on natural resources to produce and is very easy to setup and also is completely free of cost after installation, is proposed. Prior to present the model in details, the author rigorously investigated the current electricity production scenario and the reasons for electricity crisis in Bangladesh.

In the following section, the author provides the applications, relative advantages and disadvantages of the proposed electricity generation model.

4.1 Applications

Households, schools/ colleges/ universities, hospitals, hostels, and hotels etc. have number of fans equipped and been running by using mail electricity line. As such, they have to pay lots of money for using electricity. However, they can save all expenses on electricity just by replacing main power connection to our low cost model.

Generated electricity through the use of our model can be used to power other electronic devices that are used in households such as cell phone, light bulb, iron, TV, fridge and microwave, and oven etc.

4.2 Advantages

The proposed model can easily be installed anywhere [islands and rural areas in Bangladesh, where main electricity connection is unreachable in next 50 years or so].

Unlike IPS (Instant Power Supply), this model does not require main electricity connection in order to perform.

Uninterrupted power supply unless we manually turned off the fan.

Unlike solar, wind, biogas, geothermal and hydropower applications, the initial cost of this model is negligible. Besides, there is no specific cost of electricity, power plant, and no other fuel cost.

Minimum or no maintenance cost. Once initial set up has been done. The dynamo associated with fan operate efficiently without any expert supervision for long period, which in term save substantial maintenance cost incurred in other form of electricity production systems.

Unlike other electricity production system, Electricity loss due to long transmission line is negligible in this model as the scope of the proposed model span within house/flat/building.

The proposed model for electricity generation is environment friendly as the model does not emit nitrogen oxide (NO₂), mercury (Ag), carbon dioxide (CO₂) or any other particulate hazardous matter into the environment. Hence, the proposed model helps protect and preserve the environment for upcoming generations.

The proposed model for electricity generation is environment friendly as the model does not emit nitrogen oxide (NO₂), mercury (Ag), carbon dioxide (CO₂) or any other particulate hazardous matter into the environment. Hence, the proposed model helps protect and preserve the environment for upcoming generations.

In this model, people ultimately get electricity for free. Firstly, dynamo generates electricity, and then this electricity is stored in a battery. Finally, stored electricity is used for rotating the dynamo through fan.

4.3 Disadvantages

The normal speed of the fan might be slightly affected due to the incorporation of dynamo mechanism.

The production cost of the fan for the proposed model slightly increases. However, it might be negligible in case of economies of scale.
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GREEN SUPPLY CHAIN EVENT ORGANIZER (GSCEO): STRATEGY EVENT ORGANIZER BUSINESS IN JAKARTA

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Abstract- This study aims to analyze the influence of Leadership, Coordination, Commitment supplier, competence and Green Supply Chain on Event Organizer Performance by using a quantitative approach and survey methods. The sample of research used counted 101 people. Data were collected using questionnaires with Likert scale 1-5. The data analysis technique used is GSCA. The results of this study prove that: 1) Leadership, Coordination, Commitment Supplier, Competence and Green Supply Chain directly influence on Event Organizer Performance. 2) Leadership, Coordination, Supplier Commitment, Competence directly influence on Green Supply Chain. 3) Green Supply Chain mediates the influence of Leadership, Coordination, Supplier Commitment and Competence on Event Organizer Performance.

Keywords- Leadership, Coordination, Commitment Supplier, Competence, Green Supply Chain, Performance Event Organizer

INTRODUCTION

Indonesia currently together with other ASEAN members is preparing itself in order to welcome the era of ASEAN Economic Community (MEA) / AEC (ASEAN economic community). With the enactment of mea in the countries joined in the ASEAN countries, it will experience a change in the free flow of goods into the Asian countries, including investment, for example Indonesia received a visit from the king of Saudi Arabia salman bin abdulaziz al saud on the 1st until 9 March 2017 with the agenda to increase bilateral cooperation between the two countries. Furthermore, the visit of Italian president, Sergio Mattarella to Indonesia, bringing a business delegation of 30 people and of course will result in total contract worth approximately usd1,055 billion. From that background, what Indonesia needs to do is how Indonesia as part of the ASEAN community strives to prepare for the quality of self and exploit the 2015 MEA opportunities, and must enhance the capability to compete with other ASEAN member countries so that the fear of losing competitiveness in their own country the implementation of MEA 2015 did not happen (Ida Pujiani, 2014). One of them is in the field of event organizer or called event organizer (event management). The term event is an activity, while the organizer is defined as management, so the definition of event organizer is a management activity or event with the aim of arranging systematically, grouping and arranging so that the purpose and purpose of organizing activities can be done well.

In preparing an event required a series of stages from planning, preparation of activities, funding activities, to the technical procedures of the event. According to statistics released by small business administration (SBA) failure in event organizer management or event management by 47%. Problems often arise in these stages, among others, leadership. A leader is often exposed to complex and complex conditions in an organizer's activities. Complex because in the activity that appears many characters of each individual behavior or employees with different purposes. That's where a leader is required to demonstrate his leadership behavior in bridging between the perceptions of each of the different employees so that a leader can make the right decision. Other issues related to coordination of activities, often in a well-established organization, the parties lacking coordination often lead to misunderstandings that cause chaos to a program or event, such as poor coordination and communication between the event's leaders resulting in the activity itself. Another problem that often arises is in the recruitment of workers who are not in accordance with the technical competencies that must be owned by a team event organizer. Often we encounter company owners and large-oriented corporate leaders to someone because they are deemed to have good working skills, but the reality is often not in accordance with the expected further will have an impact on the performance of the event organizer itself.
Another phenomenon that often becomes a problem is the commitment of suppliers associated with logistics. The ability of suppliers in terms of logistics in an event is very important because the most vital part in the procurement of an event. Often event organizers are considered to be failing because of lack of preparation in terms of logistics, for example suppliers do not provide support for material desired by the organizer of activities such as stereo form material to create decorations, or fresh flowers not in accordance with the desired specifications by the event organizer. So the excess must have a reliable event organizer must have access one of them to the event participants. make the database data base of participants who ever come to the event. Have a path to media either newspaper, TV or other media. An Event Organizer / event management must also have expertise in the execution of the event and the ability to run the project so that there is no problem in the field. Based on the description above, this research proposal focuses on factors that can affect the implementation of green supply chain and its implication to the performance of an event organizer in Jakarta.

LITERATURE REVIEW

Even Organizer

The event organizer definition explained that the event organizer consists of two words in English namely event and organizer. In Indonesian event is event, while organizer is regulator. The literal meaning is very simple ie the party that organizes the event, but if deepened on the activities undertaken will be very complicated because the regulator is not just one person but consists of teams with many members who each oversees a field according to his expertise. The word event also has various meanings ranging from musical art performances, dance arts, exhibitions, sports competitions, seminars, product launches, product promotions, and others (Megananda and Wijaya, 2009: 1).

Leadership

According to Tead; Terry; Hoyt (in Kartono, 2003) Leadership is the activity or art of influencing others to want to cooperate based on the person's ability to guide others in achieving the goals desired group. There are six types of leadership that are widely acknowledged to be the type of autocratic leader, Military type, Paternalistic type, Kharismatic type, Laissez Faire (permissive) type, and Democratic type.

Coordination

Hasibuan (2006: 85) argues that coordination is the activity of directing, integrating, and coordinating the elements of management and the work of subordinates in achieving organizational goals. Coordination is the process of integrating objectives and activities in separate units (departments or functional areas) in an organization to achieve its goals efficiently and effectively (Handoko 2003: 195). Based on the definition can be mentioned that the coordination has the conditions namely: sense of Cooperation means feeling to work together, viewed per section. Rivalry, in large organizations, often held competition between sections, in order to compete with each other. Team Spirit, each other per part must respect each other. And Esprit de Corps, a part of mutual respect will be more excited.

Supplier Commitment

Supplier commitment is as a circumstance in which the supplier sides with a particular company and the purpose of its purpose and its desire to retain membership in the enterprise. According to Stephen P. Robbins it is defined that high employment involvement means favoring the individual's particular job, while high organizational commitment means favoring the organization that recruits the individual (Wikipedia).

Competence

Competence is the basic characteristic of a person who enables them to perform superior performance in their work. According to Trotter in Saifuddin (2004) defines that a competent person is a person who with his skills to do the job easily, quickly, intuitively and very rarely or never make mistakes. Boyatzis in Hutapea and Nuriani Thoha (2008) competence is the capacity that exists in a person who can make the person able to meet what is required by the work in an organization so that the organization is able to achieve the expected results.

Green Supply Chain.

Supply Chain Management is a supply chain covering all activities related to moving goods from the raw material stage to the end user (Zigiaris, 2000, p.2). Others argue that Supply Chain Management is a management of corporate relations networks and between interdependent organizations and business units comprising material suppliers, purchases, production facilities, logistics, marketing and related systems that facilitate forward and reverse material flow, service, finance and information from producers to end customers with the added benefit of adding value, maximizing profits through efficiency, and achieving customer satisfaction. (Naslund, 2010, p.11). Green Supply Chain Management itself is an integration of environmental thinking into supply chain management, including product design, sourcing and selection, manufacturing process, final delivery of products to

Organizational Performance

Performance is a description of the level of achievement of the implementation of tasks within an organization, in an effort to realize the goals, goals, mission, and vision of the organization (Bastian, 2001: 329). Performance concept can be defined as a result of achievement or degree of accomplishment (Rue and byars, 1981 in Keban 1995). This means that, the performance of an organization can be seen from the extent to which the organization can achieve goals based on predetermined goals. Performance is the result of cooperation activities among members or organizational components in order to realize the goals of the organization.

Several previous studies related to leadership, Coordination, supplier commitment and supply chain competitiveness and Event Organizer Performance are Youn (2012) and Hult (2007) research which proves that leadership influences supply chain. Several studies related to supply chain coordination were carried out by Agnetis (2006) and Xue (2005) which proved the importance of a coordination in supply chain. While the research related to the influence of supply chain competence is done by Ellinge (2012) and Thai (2012) stating that competence has an effect on supply chain.

Based on previous theoretical and research studies then the hypothesis proposed is:

H1: Leadership Affects Event Organizer Performance.
H2: Coordination Affects Event Organizer Performance.
H3: Supplier commitment has an effect on Event Organizer Performance.
H4: Competence affects Event Organizer Performance.
H5: Green Supply Chain effect on Event Organizer Performance.
H6: Leadership affects the Green Supply Chain.
H7: Co-ordination affects the Green Supply Chain.
H8: Supply Commitment is influential on Green Supply Chain.
H9: Competence affects the Green Supply Chain.
H10: Leadership to Event Organizer Performance through Green Supply Chain mediation.
H11: Coordination of Event Organizer's Performance through Green Supply Chain mediation.
H12: Supplier Commitment to Event Organizer Performance through Green Supply Chain mediation.
H13: Competency to Event Organizer Performance through Green Supply Chain mediation.

RESEARCH METHODS

This research uses quantitative approach with survey method conducted at the leadership of Event Organizer in Jakarta with total sample counted 101 people. All variables in the study were measured using a Likert scale of 1-5.

RESULTS AND DISCUSSION

Data Analysis used in this research is Generalized Structured Component Analysis (GSCA). The analysis steps are as follows:

1. Testing Measurement Model

There are 3 (three) criteria to assess the measurement model:

a. Convergent validity:

Convergent validity test describes the correlation measure between the reflective indicator score and the latent variable score. For this loading ≥ 0.40 is considered valid.

Testing Results Convergent validity can be seen in Table 1.

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<tr>
<td>4</td>
<td>Competence</td>
<td>(X4.1)</td>
<td>0.809</td>
<td>Valid</td>
</tr>
<tr>
<td></td>
<td>(X4.2)</td>
<td>0.801</td>
<td>Valid</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Green Supply Chain</td>
<td>(Y1.1)</td>
<td>0.669</td>
<td>Valid</td>
</tr>
<tr>
<td></td>
<td>(Y1.2)</td>
<td>0.857</td>
<td>Valid</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Y1.3)</td>
<td>0.669</td>
<td>Valid</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Y1.4)</td>
<td>0.550</td>
<td>Valid</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Event Organizer</td>
<td>(Y2.1)</td>
<td>0.965</td>
<td>Valid</td>
</tr>
<tr>
<td></td>
<td>(Y2.2)</td>
<td>0.977</td>
<td>Valid</td>
<td></td>
</tr>
</tbody>
</table>

Table describes the estimated value at loading in each indicator variable ≥ 0.40 it can be concluded that the variable is valid.

**b. Discriminant validity**

In testing the discriminant validity of an instrument is said to be valid discriminant if √AVE is greater than the correlation coefficient of variables concerned with the others. Discriminant validity test results can be seen in table 2.

Table 2. Test results of Discriminant Validity

<table>
<thead>
<tr>
<th></th>
<th>AVE</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
<th>Y1</th>
<th>Y2</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>0.585</td>
<td>1</td>
<td>0.625 (0.101)*</td>
<td>0.785 (0.072)*</td>
<td>0.606 (0.126)*</td>
<td>0.783 (0.053)*</td>
<td>0.875 (0.030)*</td>
<td>Valid</td>
</tr>
<tr>
<td>X2</td>
<td>0.552</td>
<td>0.625 (0.101)*</td>
<td>1</td>
<td>0.568 (0.119)*</td>
<td>0.574 (0.119)*</td>
<td>0.645 (0.093)*</td>
<td>0.584 (0.101)*</td>
<td>Valid</td>
</tr>
<tr>
<td>X3</td>
<td>0.520</td>
<td>0.785 (0.072)*</td>
<td>0.568 (0.119)*</td>
<td>1</td>
<td>0.599 (0.116)*</td>
<td>0.747 (0.063)*</td>
<td>0.807 (0.067)*</td>
<td>Valid</td>
</tr>
<tr>
<td>X4</td>
<td>0.647</td>
<td>0.606 (0.126)*</td>
<td>0.574 (0.119)*</td>
<td>0.599 (0.116)*</td>
<td>1</td>
<td>0.703 (0.130)*</td>
<td>0.710 (0.125)*</td>
<td>Valid</td>
</tr>
<tr>
<td>Y1</td>
<td>0.538</td>
<td>0.783 (0.053)*</td>
<td>0.645 (0.093)*</td>
<td>0.747 (0.063)*</td>
<td>0.703 (0.130)*</td>
<td>1</td>
<td>0.741 (0.055)*</td>
<td>Valid</td>
</tr>
<tr>
<td>Y2</td>
<td>0.942</td>
<td>0.875 (0.030)*</td>
<td>0.584 (0.101)*</td>
<td>0.807 (0.067)*</td>
<td>0.710 (0.125)*</td>
<td>0.741 (0.055)*</td>
<td>1</td>
<td>Valid</td>
</tr>
</tbody>
</table>

Table 2 explains that in all research variables √AVE is greater than the correlation coefficient between variables concerned with other variables. Thus the research instrument is valid discriminant.

http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7934
c. Internal Consistency:
In testing Internal consistency Reliability of an instrument to be reliable when the alpha value is above 0.60. The results of the research reliability test can be seen in Table 3.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Alpha</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership (X1)</td>
<td>0.644</td>
<td>Reliable</td>
</tr>
<tr>
<td>Coordination (X2)</td>
<td>0.718</td>
<td>Reliable</td>
</tr>
<tr>
<td>Supplier commitment (X3)</td>
<td>0.682</td>
<td>Reliable</td>
</tr>
<tr>
<td>Competence (X4)</td>
<td>0.655</td>
<td>Reliable</td>
</tr>
<tr>
<td>Green Supply Chain (Y1)</td>
<td>0.687</td>
<td>Reliable</td>
</tr>
<tr>
<td>Event Organizer Performance (Y2)</td>
<td>0.939</td>
<td>Reliable</td>
</tr>
</tbody>
</table>

Table 3 shows that all variables yield an alpha value above 0.60 thus it can be concluded that the research instrument has good internal consistency reliability.

2. Evaluation of Goodness-of-fit Structural Model and Overall Model
Result of Analysis with GSCA Method obtained by fit model contained in Table 4

<table>
<thead>
<tr>
<th>MODEL FIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIT</td>
</tr>
<tr>
<td>AFIT</td>
</tr>
<tr>
<td>GFI</td>
</tr>
<tr>
<td>SRMR</td>
</tr>
<tr>
<td>NPAR</td>
</tr>
</tbody>
</table>

The results of the above analysis can be said enough to meet the requirements of Goodness-Of-Fit.

Hypothesis testing
Hypothesis Testing and Coefficient of Direct Effect Line
Testing hypothesis and path coefficient direct influence between variables Leadership, Coordination, commitment, Competence, Green Supply Chain and Performance Event Organizer. Direct impact test can be seen from the value of path coefficient and critical point (CR *) which is significant at α = 0.05. The test results of direct influence between the variables in detail can be seen in table 5.

Table 5. Coefficient of Direct Effect Line and Hypothesis Testing

<table>
<thead>
<tr>
<th>No</th>
<th>Direct Correlation</th>
<th>Path Coef</th>
<th>C.R. (Uji t)</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Leadership (X1) → Green Supply Chain (Y1)</td>
<td>0.351</td>
<td>2.76*</td>
<td>Significant</td>
</tr>
<tr>
<td>2</td>
<td>Leadership (X1) → Event Organizer Performance (Y2)</td>
<td>0.597</td>
<td>4.98*</td>
<td>Significant</td>
</tr>
<tr>
<td>3</td>
<td>Coordination (X2) → Green Supply Chain (Y1)</td>
<td>0.139</td>
<td>2.53*</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>Coordination (X2) ➔ Event Organizer Performance(Y2)</td>
<td>0.037</td>
<td>2.49*</td>
<td>Significant</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------</td>
<td>--------</td>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>5</td>
<td>Supplier commitment (X2) ➔ Green Supply Chain (Y1)</td>
<td>0.229</td>
<td>2.42*</td>
<td>Significant</td>
</tr>
<tr>
<td>6</td>
<td>Supplier commitment (X2) ➔ Event Organizer Performance(Y2)</td>
<td>0.264</td>
<td>2.62*</td>
<td>Significant</td>
</tr>
<tr>
<td>7</td>
<td>Competence(X2) ➔ Green Supply Chain (Y2)</td>
<td>0.274</td>
<td>2.45*</td>
<td>Significant</td>
</tr>
<tr>
<td>8</td>
<td>Competence (X2) ➔ Event Organizer Performance(Y2)</td>
<td>0.280</td>
<td>2.84*</td>
<td>Significant</td>
</tr>
<tr>
<td>9</td>
<td>Green Supply Chain (Y1) ➔ Event Organizer Performance(Y2)</td>
<td>0.097</td>
<td>2.07*</td>
<td>Significant</td>
</tr>
</tbody>
</table>

Note * = significant at α = 0.05

Based on the above analysis the results obtained Hypothesis Testing Research as follows:

**H1: Leadership Affects Event Organizer Performance.**
The results of the analysis indicate that there is empirical evidence that the H1 hypothesis that "Leadership Affects Event Organizer Performance" is accepted. The acquisition of the results of this analysis indicates that good Leadership will affect the Event Organizer's performance improvement.

**H2: Coordination Affects Event Organizer Performance.**
The results of the analysis indicate that there is empirical evidence that H2 hypothesis states that "Coordination effect on Event Organizer Performance" is accepted. The acquisition results of this analysis indicate that good coordination in a team will improve the performance of Event Organizer.

**H3: Supplier commitment has an effect on Event Organizer Performance**
The results of the analysis indicate that there is empirical evidence that H3 hypothesis that "Supply Commitment effect on Event Organizer Performance" is accepted. The acquisition  results of this analysis indicate that the existence of Supplier Commitment will affect the performance of Event Organizer.

**H4: Competence affects Event Organizer Performance**
The results of the analysis indicate that there is empirical evidence that H4 hypothesis states that "Competence effect on Event Organizer Performance" is accepted. Obtaining the results of this analysis shows that good competence in a business will improve the performance of Event Organizer.

**H5: Green Supply Chain effect on Event Organizer Performance**
The results of the analysis indicate that there is empirical evidence that the H5 hypothesis that "Green Supply Chain effect on Event Organizer Performance" is accepted. The acquisition results of this analysis indicate that the existence of Green Supply Chain will affect Event Organizer Performance.

**H6: Leadership affects the Green Supply Chain**
The results of the analysis indicate that there is empirical evidence that the hypothesis H6 which states that "Leadership effect on Green Supply Chain" received. The results of this analysis show that good leadership will improve the effectiveness of Green Supply Chain.

**H7: Co-ordination affects the Green Supply Chain**
The results of the analysis indicate that there is empirical evidence that the H7 hypothesis states that "Co-ordination effect on Green Supply Chain" is accepted. The results of this analysis show that good coordination will improve the effectiveness of Green Supply Chain.

**H8: Supplier commitment has an effect on Green Supply Chain**
The results of the analysis indicate that there is empirical evidence that the H8 hypothesis which states that "Supply Commitment has an effect on Green Supply Chain" is accepted. The acquisition of the results of this analysis indicates that increased Supply Commitment will improve the effectiveness of Green Supply Chain.
H9: Competence affects the Green Supply Chain
The results indicate that there is empirical evidence that the hypothesis H9 which states that "Competence effect on Green Supply Chain" received. The results of this analysis indicate that good competence will improve the effectiveness of Green Supply Chain.

H10: Leadership Affects Event Organizer Performance through Green Supply Chain mediation
The results of the analysis indicate that there is empirical evidence that the H10 hypothesis states that "Leadership directly affects Event Organizer's performance through mediation Green Green Supply Chain mediates the relationship between leadership with Event Organizer Performance.

H11: Coordination Affects Event Organizer Performance through Green Supply Chain mediation
The results of the analysis indicate that there is empirical evidence that the H11 hypothesis states that "Coordination has a direct effect on Event Organizer Performance through Green Supply Chain mediation" is accepted. The results of this analysis show that Green Supply Chain mediates the relationship between coordination management and Green Supply Chain.

H12: Supply Commitment affects Event Organizer Performance through Green Supply Chain mediation.
The results of the analysis indicate that there is empirical evidence that H12 hypothesis states that "Supply Commitment has a direct effect on Event Organizer Performance through Green Supply Chain mediation" is accepted. The results of this analysis show that Green Supply Chain mediates the relationship between Supplier Commitment and Event Organizer Performance.

Examination of Mediation Influence Line Coefficient
In general, the results of the Mediation Path Coefficient test are shown in Table 6.

<table>
<thead>
<tr>
<th>No</th>
<th>Correlation Variables</th>
<th>Mediation variable</th>
<th>Path coefficient</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>1</td>
<td>Leadership (X1) → Event Organizer Performance (Y1)</td>
<td>Green Supply Chain (Y2)</td>
<td>0.597*</td>
<td>0.034</td>
</tr>
<tr>
<td>2</td>
<td>Coordination (X2) → Event Organizer Performance (Y1)</td>
<td>Green Supply Chain (Y2)</td>
<td>0.037*</td>
<td>0.013</td>
</tr>
<tr>
<td>3</td>
<td>Supplier commitment (X3) → Event Organizer Performance (Y1)</td>
<td>Green Supply Chain (Y2)</td>
<td>0.264*</td>
<td>0.022</td>
</tr>
<tr>
<td>4</td>
<td>Competence (X4) → Event Organizer Performance (Y1)</td>
<td>Green Supply Chain (Y2)</td>
<td>0.280*</td>
<td>0.027</td>
</tr>
</tbody>
</table>

Note * = significant at α = 0.05

Based on the above analysis it is proven that the Green Supply Chain variable as the mediation variable in the relationship of leadership path to Event Organizer Performance, Coordination to Event Organizer Performance, Commitment of Supplier to Event Organizer Performance and the relationship of competence path to Event Organizer Performance with Partial Mediation Mediation type.

Line Analysis Model
Based on the analysis conducted, it can be arranged path path model of influence as in Figure 1.
Figure 1 shows the existence of 9 direct influences namely 1) Leadership significant effect on Event Management Performance; 2) Coordination has significant effect on Event Management Performance; 3) Supplier commitment has a significant effect on Event Management Performance; 4) Competence has a significant effect on Event Management Performance; 5) Leadership has significant effect on Green Supply Chain. 7) Coordination has significant effect on Green Supply Chain; 8) Supplier commitment has significant effect on Green Supply Chain; 9) Competence has significant effect on Green Supply Chain. Besides, there are 4 indirect influences, namely: 1) Leadership on Event Organizer Performance through Green Supply Chain; 2) Coordination of Event Organizer Performance through Green Supply Chain. 3) Supply Commitment to Event Organizer Performance through Green Supply Chain and 4) Competence to Event Organizer Performance through Green Supply Chain.

Testing Loading Factor
The loading factor assessment is used to find out the strongest indicator of the variable meter. The highest loading factor value shows the strongest variable gauge indicator that is interpreted as an indicator with the dominant contribution to reflect the variable. The loading factor recapitulation result of each variable indicator is shown in Table 7

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership(X1)</td>
<td></td>
</tr>
<tr>
<td>X1.1 Effective Leadership</td>
<td>0.719</td>
</tr>
<tr>
<td>X1.2 Characteristics of Leadership</td>
<td>0.722</td>
</tr>
<tr>
<td>X1.3 Captainship</td>
<td>0.847 *</td>
</tr>
<tr>
<td>Coordination (X2)</td>
<td></td>
</tr>
<tr>
<td>X2.1 Responsible</td>
<td>0.905 *</td>
</tr>
<tr>
<td>X2.2 Communication</td>
<td>0.760</td>
</tr>
<tr>
<td>X2.3 Participation</td>
<td>0.865</td>
</tr>
<tr>
<td>X2.4 Synchronization</td>
<td>0.656</td>
</tr>
<tr>
<td>Supplier commitment (X2)</td>
<td></td>
</tr>
<tr>
<td>X3.1 Product quality</td>
<td>0.659</td>
</tr>
<tr>
<td>X3.2 Accuracy</td>
<td>0.882 *</td>
</tr>
<tr>
<td>X3.3 Price</td>
<td>0.861</td>
</tr>
<tr>
<td>X3.4 Speed</td>
<td>0.504</td>
</tr>
</tbody>
</table>
### Discussion:

The Influence of Leadership on Event Organizer Performance, Leadership Affects Event Organizer Performance. Leadership is a process or style of a person to influence others so that others are willing to follow what is desired by a leader. Effective leaders generally have the ability to communicate effectively, so that a bit more will be able to stimulate the participation of the people he leads.

The Effect of Coordination on Event Organizer Performance.

Coordination effect on Event Organizer performance which means that the existence of good coordination in the company will affect the improvement of Event Organizer Performance. Coordination is one factor that can improve the performance of employees in implementing the work process event organizer in order to realize the goals and results that have been expected. Coordination can be realized in various ways and the choice of means to realize will have important implications on Event Organizer. This means that the resulting implications provide a dynamic color in the Event Organizer, that is when the leader coordinates no other is the effort to make options or preferred solutions or solutions.

Effect of Supplier Commitment to Event Organizer Performance

Commitment Supplier influence on Event Organizer Performance. This means that good communication in team will improve Event Organizer Performance. The optimal performance of suppliers is expected to reflect the overall performance of the company. Without the commitment of an optimal supplier, it is impossible for the company to perform well. Therefore, the management should be able to improve the performance of suppliers in various ways, one of which is by way of coordination and good communication between the supplier and the event.

Influence Competence to Event Organizer Performance

Competence effect on Event Organizer performance which means that the improvement of Competence can improve Event Organizer Performance. Can be said if the employee has competence in the field then the employee will improve the effective performance. How important the performance for the company so that the development of competency-based employees is one effort to improve performance, because the development of competency-based employees is a form of attention and recognition of the company or leadership to employees who show the ability of work, craft, and compliance and work discipline.

The Effect of Green Supply Chain on Event Organizer Performance

Green Supply Chain effect on Event Organizer performance which means that Green Supply Chain can improve the effectiveness of Event Organizer Performance. The research indicates that GSCM has a direct effect on the performance of corporate event organizers, which is shown by the more friendly the products it produces on the biological environment, the lower production process with waste, and the declining use of natural resources in the production process.

The Effect of Leadership on Green Supply Chain
Leadership affects the Green Supply Chain which means that proper leadership can improve the effectiveness of Green Supply Chain. The research findings indicate that the leadership in the organization under study still needs to be improved optimally so that it will increase the effectiveness in the implementation of Green Supply Chain.

**Effect of Coordination on Green Supply Chain**

Coordination effect on Green Supply Chain. Coordination in the application of green supply chain is very important because with coordination will certainly improve the performance of the unit or division itself. This is significant with the existence of good Coordination will increase the effectiveness of Green Supply Chain.

**The Influence of Supplier Commitment to Green Supply Chain**

Supplier is very influential in the company. In this research, a strong commitment of suppliers to the implementation of green supply chain will show and improve the effectiveness of Green Supply Chain in the company.

**Effect of Competence on Green Supply Chain**

Competence affects the Green Supply Chain which means that high Competence can improve the effectiveness of Green Supply Chain in the company. With the improvement of employee competency will improve the effectiveness in the implementation of Green Supply Chain.

**The Influence of leadership on the performance of event organizer through Green Supply Chain**

The result of research proves that Leadership to Event Organizer Performance through Green Supply Chain is very influential. Appropriate leadership in a work team can affect the Green Supply Chain.

**The Effect of Coordination on Event Organizer Performance through Green Supply Chain**

This research proves the influence of coordination on Event Organizer Performance through Green Supply Chain. Field findings indicate that good coordination within the team will affect the implementation of Green Supply Chain so that it will have an impact on the improvement of Event Organizer Performance.

**The Influence of Supplier Commitment to Event Organizer Performance through Green Supply Chain**

This study proves the influence of Supplier Commitment to Event Organizer Performance through Green Supply Chain. Field findings indicate that a good supply of suppliers in the company will affect the Green Supply Chain which has an impact on improving Event Organizer Performance. The research findings show that Performance Event Organizer in the organization under study is still not optimal and need to be improved on the indicator of quality of work this means cooperation and coordination that internal inter unit or division related to work.

**The Influence of Competence on Event Organizer Performance through Green Supply Chain**

This study proves the influence of competence on Event Organizer Performance through Green Supply Chain. Field findings indicate that good team competence will affect the Green Supply Chain which has an impact on improving Event Organizer Performance. The research findings indicate that Green Supply Chain in the organization under study will greatly affect the competence possessed by the event organizer thus will show the quality and experience of the event organizer company itself.

**CONCLUSION**

1. Specifically the results of this study can be summarized as follows: Leadership has a direct and positive effect on Event Organizer Performance. This means that a Leadership Style that fits the Team's condition can improve the Event Organizer's performance.
2. Coordination has a direct and positive effect on Event Organizer Performance. The results showed that good coordination can improve Event Organizer Performance.
3. Supplier commitment has a direct and positive effect on Event Organizer Performance. Good Supplier commitment in business can influence the improvement of Event Organizer Performance.
4. Competence has a direct and positive effect on Event Organizer Performance. This indicates that good Competencies in the organization can influence improve Event Organizer Performance.
5. Green Supply Chain has no direct and positive impact on Event Organizer Performance. This indicates that the implementation of green supply chain does not improve Event Organizer Performance.
6. Leadership has a direct and positive influence on Green Supply Chain. This means that a Leadership Style that is in accordance with Team conditions can improve the effectiveness of Green Supply Chain.
7. Coordination has direct and positive impact on Green Supply Chain. The results show that good coordination can improve the effectiveness of Green Supply Chain.

8. Commitment Supplier organization directly and positively affect the Green Supply Chain. Optimal communication within the organization is able to influence the improvement of Green Supply Chain effectiveness.

9. Competence has direct and positive impact on Green Supply Chain. This indicates that Competencies owned by employees in the organization can affect the effectiveness of Green Supply Chain.

10. Leadership has a direct effect on Event Organizer Performance through Green Supply Chain mediation. Optimal leadership in the team is needed to improve the quality of Green Supply Chain so as to improve Event Organizer Performance.

11. Coordination has direct effect on Event Organizer Performance through Green Supply Chain mediation. This indicates that proper coordination within a work team will then affect the effectiveness of Green Supply Chain and lead to an increase in Event Organizer Performance.

12. Supplier Commitment directly influence to Event Organizer Performance through Green Supply Chain mediation. High Supplier commitment is needed to improve the quality of Green Supply Chain so as to improve Event Organizer Performance.

13. Competence has a direct effect on Event Organizer Performance through Green Supply Chain mediation. This indicates that the improvement of competence in a company can affect the effectiveness of Green Supply Chain and cause improvement of Event Organizer Performance.

This research provides theoretical implications for the development of Operational Management Sciences and Human Resources, especially in the areas of leadership, Coordination, Supplier Commitment, Competence, Green Supply Chain and Event Organizer Performance.

Limitations in this study are Event Organizer in Jakarta; 2) The instrument used in this study is a closed questionnaire so as not yet fully able to control the honesty and accuracy of the respondent's answer whether in accordance with the actual reality. Based on the weaknesses in this study can be suggested for further research: 1) Further research can examine more about other variables that affect the Green Supply Chain 2) Further research can develop indicators on Green Supply Chain and 3) Further research can conduct research a kind of expanding research area to know the consistency of findings.

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Visual Arrangement to Strengthen The Image of Nonongan Commercial Corridors, Surakarta, Indonesia

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Abstract- Nonongan commercial corridor in Surakarta (Indonesia) has an important role for the city related to its history, position and possesses architectural privileges. The architectural feature of the corridor is the presence of some old buildings that are urban artifacts and potentially become the focal point in the corridor. However, in its development, this corridor is poorly structured so that the image of corridors is less strongly reflected in the lack of visual interrelationships between old buildings and new buildings, the lack of visual quality of old buildings with potential focal points, lack of decoration on the surface of pedestrian ways, and less variation in vegetation. This study aims to strengthen the image of the corridor through the visual arrangement of buildings and road spaces of the Nonongan commercial corridor. The result of the study are identification of existing corridor special character, evaluation of building and street space visual character, and criteria and design concept of visual arrangement. The macro design concept to improve the visual quality of Nonongan commercial corridor are revitalize the old building which potentially become focal point in the corridor, harmonize the visuals of old and new buildings that also function as intercellular linkages by highlighting the characteristics of old buildings and providing different shades to show the distinctive characteristics of intercars in corridors through the design of pedestrian ways and vegetation surfaces.

Index Terms- commercial corridors, strengthen the special character, Surakarta, visual arrangement

I. INTRODUCTION

City in Indonesia often experienced developments leading to fabrication resulting in part of the city area has characteristics that are not different from other parts of the city. Whereas these place characteristics is important to make a space becoming a recognizable place [1]. Characteristic is formed because no two places are the same, because a design or similar design result can not be applied and implemented in two different places, the design must be firm and characteristic [2]. The presence of old buildings and elements of the street space which is an artifact and a reminder of the city's past history is often ignored in the planning and structuring of the area. As a result, the buildings and elements of the road space associated with the history of the city and potentially become a characteristic of the area is prone to disappear, especially in commercial corridors.

One of the commercial corridors that experienced the phenomenon mentioned above is Nonongan commercial corridor in Surakarta, Indonesia. The buildings in the corridor are more dominated by new buildings that are less related to the old buildings. In addition, the old buildings that are artifacts at the same time potentially become the focus of views on the corridors are less preserved and some are destroyed. Pedestrian pathways that should be able to accommodate users and improve visual road spaces are poorly maintained and have not yet accommodated the difflabel user. Vegetation is found only in the median of Yos Sudarso Street, while in the corridor of Dr. Rajiman is only at some point. Nevertheless, the conditions mentioned above make corridors less visually imposing and appear as ordinary shopping areas (less characteristic).

As a commercial corridor strategically positioned and closely related to the history of the city, this corridor should have a strong characteristic. The characteristic should give an impression to the observer that the observer is in a modern commercial corridor with the feel of the past so that the city's history is felt. Therefore, visual arrangement to strengthen the special character of corridors is important to do. This study aims to organize visual buildings and road space (surface pedestrian ways and vegetation) Nonongan commercial corridor to strengthen the image of the corridor. To achieve the study goal, the research objectives are formulated as follows: 1) identify the existing characteristics of commercial corridor Nonongan Surakarta, 2) identify and evaluate the existing visual character of the building and road space, 3) formulate the criteria and macro design concepts of visual arrangement of buildings and street space. Townscape theory [3], visual characters [4], special character and identity [5] [6], linkage [7], and commercial corridors [8] are used as guidelines in accordance with the aims and objectives mentioned above.

This study focuses on the aspects of buildings and road spaces that form the townscape [3]. Building aspect focuses on building facade. While the aspect of road space focus on pedestrian ways and vegetation. Data collected through observation and document studies. Analytical technique used in
this study is synchronic reading and walkthrough analysis which then concluded with character appraisal analysis. Synchronic reading analysis technique is used to obtain the potential of old building with townscape theory approach and component, composition, and elements of old building facade which can be replicated in new building. The walkthrough analysis technique is used to obtain the character and the evaluation of the road space with the approach of townscape theory, the visual character of pedestrian ways, and the visual character of the vegetation [9]. Character appraisal is used to derive the conclusions of the four segment characters in the commercial corridor.

These studies will contribute to the urban design literature by applying the townscape, visual character, linkage, and commercial corridors theory in the visual arrangement of commercial corridors as well as advice for the city government (especially to the city government of Surakarta Indonesia) in arranging the commercial corridor with certain characteristics that distinguish it from other trading corridors.

II. RESEARCH ELABORATIONS

To identify the existing characteristics of the corridor, visual character evaluation, and formulation of design criteria and concepts focuses on the theory of townscape, visual character, image and identity, linkage, trade corridor. This study uses a combination of direct observation and literature study for data acquisition and using synchronic reading, walkthrough analysis, and character appraisal analysis as an analytical technique.

III. RESULTS AND FINDINGS

Based on data collection and analysis, the result are the identification of existing characteristics of the corridor, identification and evaluation of the visual character of the building and the street space, and the criteria and design concept to strengthen visual arrangement of the Nonongan commercial corridor.

A. Existing Characteristics of Corridor

The characteristic of the area is grown by socio-economic-culture of society and formed by sense of time and sense of place [6]. Characteristics of the area can be physical and non-physical form that can be used as a regional identifier. The physical identity that is easily captured by the observer is an object that is used as a reference (point of reference) to the region.

Based on the research, it can be seen that the characteristics of the Nonongan commercial corridor are physically visible from the presence of old buildings in the area. There are four building styles (colonial, Chinese, modern, and postmodern) that form visual corridors, with the dominance of modern and postmodern styles while the colonial and Chinese building styles became a contrasting element and enriched the visual sensation of the corridor. These colonial and Chinese-style buildings are either propelling or pathological elements [10]. Propelling elements means buildings or monuments that are physically present by accommodating different functions, while pathological elements are visually isolated elements. Propelling elements in the corridor are colonial and Chinese buildings functioned as shops, while the pathological element is a colonial house building whose visibility is blocked by street vendors in front of it. While on the street space (path of pedestrian and vegetation) there is no characteristic that makes this corridor is different from other commercial corridor in Surakarta City.

B. The Building Visual Character Evaluation

Based on the analysis, the old building in the corridor (as shown on Fig. 1) has potentially become 1) focal point and incident, 2) focal point and screened vista, 3) focal point and hazard, 4) incident, and 5) incident and hazard in terms of place. The whole old building also potentially as thiness means building has a uniqueness that enriches the visual corridor in terms of content. The old building facade components that can be used as a replication element in new buildings in the corridor to create harmonization are harmonic or glass shaped entrances, symmetrical and recurrent geometric openings, rectangular geometry walls, and ornate balustrades and gevels.

Fig. 1. The Potential of Old Building in the Nonongan Commercial Corridor

An interesting visual character is a dynamic formal character, achieved through a thorough view of a serial vision or continuous that has a visual unit whose dominance has a diversity in an integrated, patterned continuum to form a unique unity [3]. There is an emphasis on diversity in an integrated, patterned continuum of unique unity. Therefore, the building and the street space of the commercial corridor should be dynamic and provide a diverse visual, but remain unity. As an evaluation, there are several things that can be done to improve the visual character of buildings in Nonongan commercial corridor. There are:

1. Strengthening the impression of “here and there” on the corridor in the visual arrangement of the building by:
   - Eliminates visual barriers of potential focal point buildings so that their visibility increases and does not become screened vista.
   - Fixed old building structures that changed so as not to cause hazard.
• Taking into the change of level on the top structure of the building.
• Bring pinpointing to potential buildings and buildings on strategic locations.
2. Strengthening “thisness” in buildings with a focus on improving the quality of detail, strengthening intimacy through facade element games, enhancing entanglement through the protruding features of the building.
3. Creating new building relationships with old buildings through replication of one or more old building components.

C. The Street Space Visual Character Evaluation

Street space on the Nonongan commercial corridor starts from vista in the form of crossroads and ends with another vista. The path along the segment forms an enclosure with the feature of a focused view of the environment covered by buildings on the right and left. Visual impression on the street space is formed from a row of buildings and vegetation on the median road that serves as decoration and shade, while the surface of pedestrian ways has not created a strong visual impression. In terms of place, this road corridor does not yet have a strong marker “here and there”. Otherwise, there is no difference in pedestrian ways motive in front of potential focal point building that serves as truncation and there is less strong punctuation that serves as a marker of prefix and suffix on road space. Meanwhile, when viewed from the aspect of content, street space in the corridor has not a memorable or entanglement element so the impression thisness on the road space is less strong. The presence of vegetation in the median road in one of commercial corridor enriches the visual space of the road in terms of content, but in the other street scape this vegetation element is less give the impression on the content. While the pedestrian ways do not have a special design or pattern that enrich the visual city floor, color and motif surface monoton, and can not accommodate circulation disabilities.

Fig. 2. The Character of Street Space of the Nonongan Commercial Corridor

As mentioned earlier, the building and the street space should be dynamic and provide a diverse visual but remain unity [3]. As evaluation, there are several things that need to be done on the street space of Nonongan commercial corridors. There are:
1. Provide variations on the enclosure by emphasizing “here and there” on the street space in the corridor by:
   • Give different treatment or motives to pedestrian ways in front of focal point building as a form of truncation.
   • Provide clear prefixes and endings on street spaces and pedestrian ways to clarify punctuation.
   • Establish closure by giving visually appealing visual breaks.
2. Strengthening “thisness” of street space by presenting entanglement or memorable uniqueness.
3. Strengthen the function of vegetation as a marker of thisness.

D. Design Criteria and Design Concept To Strengthen Visual Arrangement

Design criteria for visual arrangement are determined based on the general criteria synthesized from the theory and specifically from the results of analysis and evaluation of visual characteristics of buildings and street spaces. The general criteria and design criteria for the visual arrangement of buildings and road spaces of Nonongan commercial corridors are shown in table 1.

Table 1 The Design Criteria for Visual Arrangement Of Nonongan Commercial Corridors

<table>
<thead>
<tr>
<th>Aspect</th>
<th>General Criteria</th>
<th>Design Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building</td>
<td>• The appearance of the building should be interesting in detail and show diversity in an integrated, patterned continuity.</td>
<td>• The need to improve old building structures (potential focal points that have been altered and damaged.</td>
</tr>
<tr>
<td>Sub-Aspect: Building Facade</td>
<td>• Old and new buildings should be united with a unifying element to achieve visual harmonization and continuity.</td>
<td>• The need for pinpointing of potential buildings through the arrangement of light.</td>
</tr>
<tr>
<td></td>
<td>• Commercial buildings should pay attention to openings and visibility to make it easier for observers or visitors to see the goods.</td>
<td>• The need to adjust the dimensions and design signs (sign) on the building by maintaining the legibility of the signs by observers.</td>
</tr>
<tr>
<td></td>
<td>• Commercial buildings at the intersection (node) must pay attention to the geometry, attractive visual, and become unifying</td>
<td>• The need to set the height of the building.</td>
</tr>
<tr>
<td></td>
<td>• Entrances and openings should create</td>
<td>• The need to harmonize old buildings and new buildings with the addition of components or elements of old buildings in new buildings.</td>
</tr>
</tbody>
</table>
### Aspect: General Criteria | Design Criteria
--- | ---
### corridor. | transparency between the indoor and outdoor rooms
  - The need to increase the visibility of trade building facades.
  - The need to organize a corner building through geometry games, heights, materials, interesting visual details, and a unifying corridor at intersections.

### Street Space

**Sub Aspect: Pedestrian Ways**

- Pedestrian ways should have aesthetic and attraction values (pay attention to paving, graphic design, trees or vegetation), fun, safe and accessible especially for disabilities.
- The pedestrian path at the intersection point (node) should be an attractive transition space.

- Pedestrian ways should be designed with attention to user safety and comfort.
- The design of the pedestrian path surface pattern should be designed in accordance with the characteristics highlighted in each segment.
- There should be differences in surface design in front of potential focal point and incident buildings to confirm their existence.
- The pedestrian ways at the intersection (node) should be connecting space that can unite the different surface designs.

### Aspect: Vegetation

Vegetation should lead to visual continuity, being a canopy or shade for pedestrians, creating no problem for building visibility, and serving as a hallmark of the corridor.

- The need to organize vegetation that can be a shaded and planted in line with regular distances to provide good visual continuity.
- The vegetation selection should pay attention to the position, character of the building, and the characteristics highlighted in each segment.
- Vegetation should be a visually appealing element both day and night.

The macro concept of a visual arrangement to image of the Nonongan Surakarta commercial corridor is a commercial corridor with strong old building nuances and different shades formed by pedestrian ways and vegetation in each segment (there are 4 segments in corridor). So when observer enters the corridor, they will feel the unity or harmony formed by the old and new buildings, while if they move from one segment to another, they will feel different nuances caused by the arrangement of vegetation and surface design pedestrian ways. In general, the concept used in each aspect is described as follows.

1. Revitalize the old building (components, composition, and facade of buildings) that suffered damage and degradation in quality. In addition, efforts also made by arrangement of vegetation and space around to improve the visibility to the old building.

2. Adding one or more components of the old building facade in new buildings to improve harmony. Based on the analysis, the old building in the corridor has European (colonial) building characteristic, the dominance of European buildings is also evident in the building elements of Kasunanan Surakarta.

3. Constructing the surface of pedestrian ways by improving the dimensions, materials, and surface design patterns. Surface design patterns of pedestrian ways are tailored to the type of goods traded in each segment.

![Fig.3. The Macro Design Concept of Nonongan Commercial Corridors](image-url)

### IV. CONCLUSION

This research yields some conclusions that are:

1. The characteristics of the Nonongan commercial corridor are physically visible from the presence of old buildings in the area. While on the street space (path of pedestrian and vegetation) there is no characteristic that makes this corridor is different from other commercial corridor in Surakarta City.

2. The old building in the Nonongan commercial corridor potentially become a focal point and incident but some buildings have the potential to be hazard and screened vista. Therefore it is necessary to revitalize to strengthen the potential of the building as the focal point and incident. The addition of one or more old building components to the new building is done to harmonize the new building with the old building.

3. The street space of Nonongan commercial corridor does not have a strong marker “here and there” and has not a memorable or entanglement element. Vegetation and pedestrian ways are less visually reinforcing the corridor.
4. The macro design concept to improve the visual quality of Nonongan commercial corridor is revitalize the old building, harmonize the visuals of old and new buildings that also function as intercellular linkages by highlighting the characteristics of old buildings and providing different shades to show the distinctive characteristics of intercars in corridors through the design of pedestrian ways and vegetation surfaces.

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Commercial Corridor’s Walk-Through Analysis: Determining Place Identity by Physical Component Assessment

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Abstract- Nowadays, many cities, such as in Indonesia are experiencing rapid growth and development, which causes the change toward modernization. Although it has a positive impact, but it’s also encourages homogeneity of city space and buildings, so the more unrecognized the values and uniqueness. To maintain its existence, the city or place must be able to maintain its identity, which is the actualization of the user's identity through the physical environment. Through identity, a region can build interest and attachment to human life in it. One of the strongest factors that affect the establishment of place identity is physical character of a space. This research explores an area that is part of a city artifact with unique characteristics, known as Kampung Cina in the past. Now Kampung Cina’s identity began to fade and turned into a crowded and congested wholesale commercial corridor that caused physical change, so its character as a heritage commercial corridor is hard to recognize. Accordingly, this research attempts to find the physical component of commercial corridors formation and finds the special character of these components by Walkthrough Analysis, where the researcher walks from origin to destination and evaluates the suitability of existing conditions in the study area with predetermined criteria. Corridor’s components that are explored in this research consist of buildings form, figure ground, street space, and pedestrian way.

Index Terms- Corridor Commercial, Physical Component, Place Identity, Walkthrough Analysis.

I. INTRODUCTION

Place identity interpreted where people reflect themselves through the space, so that the existing space conditions reflect the inhabitants [1]. Place identity is a sub-structure of the human self-identity that contains the cognition of the physical world in which an individual lives [2]. In the formation of a space there are three interrelated components that can create its specific identity, (1) the physical component; (2) activities and functions; and (3) the meaning of individuals and groups created through the experience and intentions of the people associated with the place (symbol or meaning) [3].

Fig. 1. Components of Place Identity [4]

One of the most influential components is physical component, which gives the strongest attachment to its inhabitants because every day it becomes a space where people perform their activities and experience their daily lives [5]. One of place identity case can be found in Bongkaran commercial corridor or called by Pasar Kain, Surabaya, Indonesia. The corridor consists of Slompretan Street, Kopi Street, and Bongkaran Street. This area is part of the Surabaya’s city artifacts, which was called Kampung Cina or chinatown [6]. From this cultural heritage area, we can review the journey or values that growth in Surabaya from pre-colonial era until now. In the development of period, with many function changes, the renewal is more focused on the new development that makes the heritage area’s existence be forgotten little by little. This has an impact on the decline of the quality of the area and the fading of identity as a city artifact.

This study focuses on the physical components of the commercial corridors, which are divided into four, buildings form, figure ground, street space, and pedestrian way [7]. One feature of an urban commercial corridor is marked by its role as the main passage for vehicles within the city. This corridor form starts from commercial areas to urban centers in the form of office building complexes and trade service centers formed along corridors, along with solid activity conditions.

In this study, buildings form define as faces or looks and forms of buildings that exist along the corridor. The face
and shape of the building is the overall footprint of a corridor that able to realize its identity and image. Things that look from this sub-aspect are scale, proportion, style of architecture / style, accents, and building rhythm [8]. Figure ground define as land use relationships of the buildings’s mass and open spaces, consisting of two main elements, built area (urban solid) and open space area (urban void). These elements form a dense cavity pattern of urban space that clearly shows the urban space structure. Street space define as roadway movement of vehicles equipped, parking area, street furniture, signage, and vegetation arrangements that blend into the environment, and pedestrian way define as a pedestrian area in a shopping center that create connections between one store to another, and allows viewing to open areas where other activities are located.

II. METHODOLOGY

This research is included in descriptive research with qualitative strategic. Descriptive research is a research that aims to make description in a systematic, factual, and accurate about the facts and the characteristics of a particular population or region [9], where the aim of this study is defining the characteristic of physical component that form Bongkaran area’s identity as corridor commercial.

Initial phase of this physical component analysis is survey and assessment of physical setting with walkthrough analysis. Walkthrough Analysis is an assessment of urban quality that’s done by walking through the area with the observation and see the impression which felt along the way, through recording or taking of pictures existing. In this technique used graphical methods, especially for the observation at the time of the object [10]. This technique can help establish the level of the design problem so as to generate design criteria. Assessment is done through observation and interpretation by researchers.

Observation processes is done by taking pictures in serial and linear. Serial view is a technique used to describe sequential views in one direction / one path to obtain clarity information of physical components composed from the starting point (focal point building) to end point of movement, in other words is a visualization tool that gives the user a chance to interact and provide clarity of movement along certain paths. Whereas, Linierside View is a technique used to describe the atmosphere of an area through the path that explain how the pedestrians move forward, and looking towards the right and left side to enjoy and see the front view of building.

The steps of this analysis are:
- Direct observation of physical aspect in study area using walkthrough technique.
- Analyze evaluatively the suitability of existing conditions in the study area with the general criteria of literature review based on observation.
- Elaboration of evaluation results per segment to get the general character of the region.

III. DISCUSSION AND RESULTS

This research is explore Bongkaran’s physical component by three corridors as samples. These are Slompretan Street, Bongkaran Street, and Kopi Street.

There is the results:

1. Slompretan Street

Buildings Form. The building series consists of 1-3 floors. Old and new buildings have balance proportion, where they has a Chinese-style with colonial and ‘nisantara’ style combination, seen in the use of large dimensions column, flat and saddle roof style, and large opening elements.

Buildings rhythm is less harmonious. There are many buildings that have changed, whether color, some material, the adding of new elements, even there a total change, it is widely seen in the office or bank so that bring contrast in this segment.

Building series in this segment have unique facade with usage of various colors folding doors in each store, iron or wooden trellis in each opening such as doors, windows, and
vents. Buildings’s basic color disturbed by store signage or
banners that covering the facade. Some stores present a solid
and lighless impression from outside, that make visitors can’t
see through and not interest to visit it.

In this segment there are 2 buildings that have potential
as focal point:

1. Building 1 (fr.10) has a neo-classical style (indische
empire style), which is shown by repetition of opening
elements, columns, and towers. The changes seen in the
original color of the building. The symmetrical shape of the
building gives a formal impression. The building has good
visual clarity because there is no object that obstructs the
observation and its location which is at the end of the segment.
The tower elements in the object add the uniqueness and
visual strength of the building. The object has a monumental
scale because of the significant altitude difference compared
to the building on the left of the right.

Building 2 (fr.4) is Bong Market. On visual aspect, this
building is not prominent, but Bong Market has the potential
as a center of attractions and crowds in Bongkaran area. Bong
market entrance is an alley, where the inside of Pasar Bong
has a courtyard that shown the one characterististic of Chinese
building.

Figure ground. The solid elements are dominate this
segment, caused by many buildings that look crowded. There
are some void which is quite extensive, potentially as open
space. Buildings frontage of this segment is not synchronized.
This led of other activities such as street vendors, stalls and
stockpiles in.

Street space, This segmen has one way system, with 5-
6 meters street space. The buildings setback are 0-1.5 meters.
Active trading activities make this segment feels narrow and
uncomfortable.

The roads have asphalt material with enclosed drainage
that border of cement or paving material. This segment has
lack of greenery, that only trees at the beginning and the end
of segment. There are on street and off street parking area
which is dominated by motorcycle, car, and truck. Also seen
some pedicab base, especially around Pasar Bong.

Pedestrian way, There is no pedestrian path in this
segment, so the pedestrian must use the road or building
setback area. The building that maintains the arcade element
were on frame 1st-7th. Arcade is functioned for pile the stuffs
up and some used by street vendors as seen in frame 1st, so it
does not work optimally.

2. Bongkaran Street

Buildings Form, Building series in this segment has a
massive scale with a height of 2-4 floors. The buildings are
dominate by Chinese-style with colonial and ‘nusantara’ style
combination stores, seen in the use of large dimensions
column, flat and saddle roof style. The existence of this
uniformity make a good rhythm of the building series in this
segment.

Openings or other elements have square geometry that
present a solid impression. There are many buildings that have
been renovated with the use of glass and metal materials, so
that present a modern appearace. The new and old building
scale and height are aligned, so make a harmonious building
series. The buildings’s scale same as the road, too, so that
present the normal scale for users.

Despite having fairly wide openings, some stores
present a solid and lighless impression, so that seems closed to
visitors. This indicates a lack of transparency element in the
building.

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Building 1 (fr. 9) has a combination of Chinese and colonial style, with massive scale and thick walls. The building has a smooth texture with white plaster walls. The building has good visual clarity because there is no visual obstruction, but it has a very close proximity to the road so that the observer can not see the whole building and it’s the factor that can eliminate the special impression on the building.

Building 2 has a normal scale with a unique style, which is a mixture of Chinese and Nusantara architecture style. The building has contrast colors, ie orange and green. Its deep jutting position makes it invisible in serial view. Somehow, this inward position gives a strong look and feel for the observer.

Figure ground. Solid elements dominate this segment, with rows of large-dimensional buildings. There are some void, which is quite extensive and potentially as open space or off street parking area.

Frontage buildings are aligned enough that show the harmonious building series, with contrast at some point. This trigger the other activities such as street vendors, stalls and stockpiles use that void area.

Street space. This segment has one way system, 6-8 meters street space, and 1-2 meters area as building setback. The road space is wide enough so many pickup or large vehicles choose to pass this way. The road has asphalt material with closed drainage. There are on street and off street parking area in this corridor and the street furnitures neither complete nor maintained well. The lighting element are available only at some point on a considerable distance.

Pedestrian way, There is no pedestrian path in this segment, too, so that the pedestrians use the side of the road and the terrace section of building. There is an arcade element along the buildings series but does not function as well as a circulation area, because it is used to pile the store’s stuff up or as parking area. The arcade element is formed by the space below the 2nd floor.

3. Kopi Street

Buildings Form. This segment is the shortest in this area. The building series are consist of two stories building. Building form in Kopi Street has an unchanging typology from the colonial era. The renewal just done by repainting and material changing of some elements.

The building series have folding door, which is the typical of shophouse buildings in various colors. This creates a harmonious proportion of the building form. The building series have a balanced rhythm with flat roofs typology and repeated square’s opening elements.

With the function as fabric or carpet stall, many stores are displaying and piling the wares in front of their building, thus affecting the appearance of building facades, too. The building series on the left and right side have the equal building setback that present a good serial vision. Besides that, the narrow road and two stories building of this segment cause a unbalancing scale for user. There is no building with potential as focal point in this segment.

Figure ground. Solid elements are dominate this segment. From the figure ground’s map below we can see that the building in this segment has a massive size which is divided for the existing activity, then.
Void elements are formed by building setback, which in the existing are functioned as on street parking area.

**Street space**. This segment has one way system, with 4-5 meters street space. Active trading activities make this segment feels too narrow. There is not many greening elements in this segment. On street parking area is dominated this segment. This street space is used for loading activity, too, which trigger a traffic jammed and make this road comfortless. Besides that, there is no street furniture in this commercial corridor.

**Pedestrian way**. This segment has no pedestrian paths, so pedestrians must use the same area as the vehicle path. There is an interconnected arcade, which has 1 meter width, but this area is used to place the store stuff, so the arcade element not functionalized well.

**IV. CONCLUSION**

The results of this research are place identity of Bongkaran area as commercial corridor that be observed by its physical component with walkthrough technique, which are:

- The building series of Bongkaran area are formed by the combination style of colonial buildings, Tionghoa, and Nusantara, that make an interesting corridor impression.
- There are many heritage buildings that are changed in appearance with contemporary style, thus disrupting the alignment in the form of buildings series and make it lost its uniqueness.
- Many buildings have the potential as a focal point of the region but have not been optimally processed in their appearance or function, so this area does not have a strong element as landmark in each segment.
- The figure ground is dominate by solid element, where void are not functionalized well, so that create the impression of a dense area.
- The building series has a parallel frontage, so it has the potential to form a good serial vision in each segment.
- Street space is more narrowed by the use of roads for loading and unloading process, street vendors, and on street parking area.
- The boundaries between buildings and the street space are unclear and seem to mingle. Bongkaran area has no pedestrian way, complete and arranged street furniture so prevent more activities, such as recreation, strolling, and window shopping.
- The corridors in the Bongkaran area have an arcade element as a potential unique commercial area, but not yet maximally utilized (not as a circular space).

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**REFERENCES**


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Eco-Industrial Estate Strategy Application for Conventional Industrial Estate

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Abstract - Several previous researches state that industrial estate tends to negatively impact its surroundings, both to its natural environment and its social impact to people around the area. Previously, an eco-industrial park / estate (EIE) concept that could be a solution to the common problem of a conventional industrial estate has already exist. However, the concept is still rarely applied. Surabaya Industrial Estate Rungkut (SIER), an industrial estate that has been operating for more than 44 years, would be better to start applying EIE concept. The following research was conducted at SIER, which is arguably the largest and the best well-known industrial estate in Indonesia, especially in East Java. Despite this, SIER still has a chance to be optimized and developed by applying EIE concept. The research was conducted with the aim of knowing: whether EIE concept can be applied to SIER, the application of EIE strategy, and how to determine the most suitable alternative application of EIE concept that could be applied to SIER’s development. The method used in this research is qualitative and quantitative approach, using descriptive analysis techniques, AHP techniques (analytical hierarchy process), and descriptive statistics. The results show that in the application of EIE concept to SIER, the prioritized criteria that has to be applied would be effective management with the sub-criteria of inter-company cooperation in product (productive networking). Whereas, the most appropriate EIE implementation strategy would be to apply alternative green industrial park models to SIER by applying the appropriate building-code.

Index Terms - Building-code, Eco-Industrial Estate, Green Industrial Park, Product Networking, SIER.

I. INTRODUCTION

Surabaya had always been prioritizing the application of environmentally-oriented concepts in every part of the city. The city is supposed to be a green city in 2020 [1]. However, its industrial estate hasn’t been showing any evidence of support. All of the industrial estates in Surabaya are still conventional, thus, the concept of eco-industrial park/estate (EIP/EIE) were not applied. The industrial estate holds a rather important role which could produce a tremendous impact, especially a negative impact to the environment [2][3]. The application of eco-industrial park/estate (EIP/EIE) could be a solution to the common problems of the conventional industrial estate.

Eco-industrial estate (EIE) or more commonly known as eco-industrial park (EIP) is a set of industries (producers of products / services) and businesses located within an area aimed at improving environmental, economic, social and environmental management capabilities as well as the resources generated from an area [4][5]. The difference between a conventional industrial estate and an industrial estate that applies the concept of eco-industrial estate in energy usage as well as other effectively (cost) is relatively large and significant [6]. By applying the concept of eco-industrial estate, many advantages are gained so that industrial estate can become more optimal.

Surabaya Industrial Estate Rungkut (SIER) is an existing industrial estate that will be used as the study case of this research. SIER is a conventional industrial estate that had applied several eco-friendly concepts on its complex [7] but still has an opportunity to be developed more by applying the concept of eco-industrial estate (EIE). Departing from the background that had been described, the purpose of this research is: to determine the characteristics and potential opportunities that affect the development of SIER in becoming EIE, to discover the criteria and the sub-criteria priority in applying the concept of EIE to SIER, and to decide the most suitable alternative strategy of the EIE concept application to SIER.

II. METHODOLOGY

The method used in this research is a combination of qualitative and quantitative methods. In this research case studies are conducted along with field observations and literature studies of both conventional industrial estate and industrial estate that had implemented the EIE concept. This research is then followed by data collection, data analysis, and interpretation of the analysis results to obtain information that will be processed to be taken as a conclusion.

A. Analytical Technique

In the research conducted, there are three research objectives. To achieve each goal, different analysis techniques are used.

1) Qualitative Analysis and Quantitative Statistic Descriptive.
Conducted to determine the characteristics, potential opportunities and problems that affect the development of existing industrial estate (SIER). This would then help in establishing whether EIE concept can be applied to SIER. In the first phase, a case study and descriptive analysis were conducted to find out the criteria and sub-criteria for applying EIE concepts that were used as variables from the research.

2) Analytical Hierarchy Process (AHP).

Conducted to determine the order of priority criteria and sub-criteria from the most important to the least important in the application of EIE concept to SIER. The application of EIE strategy will be based on this order. The analytical hierarchy process technique is used as a tool for decision analysis with many criteria and also involves many variables of choice (Saaty, 2000) [8]. This technique has three main principles: the principle of hierarchy, the principle of priority setting, and the principle of logical consistency.

3) Descriptive Statistics.

Conducted to determine the suitability of the criteria and sub-criteria with some alternative models of EIE implementation and determine the most suitable alternative model to be applied in SIER. Using descriptive statistics techniques, the description of the answers of the respondents will be explained based on the frequency or the number of respondents who answered the surveys from a score of 1 to 3.

III. DISCUSSION AND RESULT

A. EIE Criteria and Sub-criteria (Research Variables)

The variables in this research are EIE criteria and sub-criteria like shown in the Table 1. Criteria and sub-criteria are syntheses of fundamental principles and criterias in developing an EIE with the main theory of EIE that implements principles according to Lowe (2001) [5]. Subsequent surveys were carried out in the field to prove and to match the theory sites in the case study area mentioned and to conduct a descriptive analysis.

Table 1: Research Variables

<table>
<thead>
<tr>
<th>No</th>
<th>Criteria</th>
<th>Sub-Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Integration with nature</td>
<td>Low adverse impact on the environment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Application of green design concepts</td>
</tr>
<tr>
<td>2</td>
<td>Energy and water system</td>
<td>Suppress energy consumption</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Efficiency in energy utilization in the region (recycling and reuse)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use of water treatment system</td>
</tr>
<tr>
<td>3</td>
<td>Material and waste management</td>
<td>Optimal use of all materials (sorting, reuse, recycle)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pollution prevention</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minimize the use of toxic materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Material / regional waste</td>
</tr>
<tr>
<td>No</td>
<td>Criteria</td>
<td>Sub-Criteria</td>
</tr>
<tr>
<td>----</td>
<td>----------------------------------------------</td>
<td>-------------------------------------------------------------------</td>
</tr>
<tr>
<td>4</td>
<td>Sustainable design and construction</td>
<td>Optimized the use of more efficient resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmentally sensitive construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use renewable and recyclable resources</td>
</tr>
</tbody>
</table>

| 5  | Effective management                         | Cooperation between companies in the region                       |
|    |                                              | Application of advanced                                          |

**B. Ranking the Criteria and Sub-criteria.**

In computing the vectors of criteria and sub-criteria weights in the development of SIER towards EIE, the first step taken is to develop a hierarchy of conventional industrial estate development (Figure 2).

![Figure 2: Hierarchy of Conventional Estate Development](image)

This is then will be followed by doing interviews and distributing questionnaires to 7 respondents that had been chosen for weighting calculations with several steps, which are: normalization, summing the results of normalization, divide the number of each criteria and sub-criteria (comparison), and consistency test. The result of ranking is as shown by Table 2.
Table II: Overall Priority Weight Value on Criteria and Sub-criteria

<table>
<thead>
<tr>
<th>No</th>
<th>Criteria and Sub-Criteria</th>
<th>Weight Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Effective management</td>
<td>0.397</td>
</tr>
<tr>
<td></td>
<td>a Cooperation between companies in the region</td>
<td>0.179</td>
</tr>
<tr>
<td></td>
<td>b Application of advanced technology at the facility</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>c Use of shared services and services</td>
<td>0.088</td>
</tr>
<tr>
<td>2</td>
<td>Integration with surrounding communities</td>
<td>0.165</td>
</tr>
<tr>
<td></td>
<td>a Benefit the economic development of the surrounding community</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>b Provide training to the surrounding community</td>
<td>0.075</td>
</tr>
<tr>
<td>3</td>
<td>Sustainable design and construction</td>
<td>0.161</td>
</tr>
<tr>
<td></td>
<td>a Environmentally sensitive construction</td>
<td>0.063</td>
</tr>
<tr>
<td></td>
<td>b Optimize the use of more efficient resources</td>
<td>0.034</td>
</tr>
<tr>
<td></td>
<td>c Low maintenance</td>
<td>0.033</td>
</tr>
<tr>
<td></td>
<td>d Use renewable and recyclable resources</td>
<td>0.031</td>
</tr>
<tr>
<td>4</td>
<td>Material and waste management</td>
<td>0.137</td>
</tr>
<tr>
<td></td>
<td>a Implementation of concept cleaner production</td>
<td>0.045</td>
</tr>
<tr>
<td></td>
<td>b Pollution prevention</td>
<td>0.038</td>
</tr>
<tr>
<td></td>
<td>c Optimal use of all materials (sorting, reuse, recycle)</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td>d Minimize the use of toxic materials</td>
<td>0.022</td>
</tr>
<tr>
<td></td>
<td>e Material / regional waste exchange</td>
<td>0.008</td>
</tr>
<tr>
<td>5</td>
<td>Integration with nature</td>
<td>0.091</td>
</tr>
<tr>
<td></td>
<td>a Application of green design concepts</td>
<td>0.056</td>
</tr>
<tr>
<td></td>
<td>b Application of green design concepts</td>
<td>0.035</td>
</tr>
<tr>
<td>6</td>
<td>Energy and water system</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>a Efficiency in energy utilization in the region (recycling and reuse)</td>
<td>0.022</td>
</tr>
<tr>
<td></td>
<td>b Use of water treatment system</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>c Suppress energy consumption</td>
<td>0.008</td>
</tr>
</tbody>
</table>

C. Alternative Model

There are four predefined model alternatives that are a tangible form of applying the EIE concept to some pre-existing industrial estate [10]. The four models are: green industrial park, by-product exchange, integrated EIP, and industrial symbiosis. To determine/come up with the most suitable alternative model to be applied to SIER, descriptive statistical technique is used. At this stage, the description of the answers to the sub-criteria compliance to the alternative model will be explained based on the frequency or the number of respondents who answered the surveys from the score of 1 to 3, the calculation of the average of each variable, and the category of categorized average values. The rules used in categorizing are:

Class interval = \( \text{Highest value} - \text{lowest value} \)

Information:

The highest value is 3, the lowest value is 1, the number of classes is 3.

From the formula above, obtained the value of class interval as shown by Table 3.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 – 0.7</td>
<td>Not appropriate</td>
</tr>
<tr>
<td>0.8 – 1.5</td>
<td>Appropriate/corresponding</td>
</tr>
<tr>
<td>1.5 – 3.0</td>
<td>Very appropriate</td>
</tr>
</tbody>
</table>

Description of the respondents’ answers to the alternative models of eco-industrial estate application which is the result of the respondent's answer on each variable (sub-criteria) to the alternative model indicates that alternative 1 is the most suitable green industrial park to be applied to SIER. According to the respondents, almost all sub-criteria determined are appropriate for this alternative.

The definition of a green industrial park is a group of companies / industries that have a shared commitment and goal to realize an industrial area that produces clean products (eco-friendly) and contributes significantly to the development of sustainable industries. In industrial zones, every company / industry applies production cleaning technology, processes a lot of the waste that they produce and / or undertakes efforts to reduce greenhouse gas emissions within the area where they operate. In the production process each industry prioritizes sustainable efficiency and effectiveness of resource use, uses environmentally friendly materials, minimizes waste, uses low energy and utilizes energy as efficiently as possible by reducing, recycling, and reusing.
D. Strategy of Application Eco-Industrial Estate to SIER

In applying EIE to SIER, the most important priority criterion or criteria to be applied is effective management, whereas the criteria considered as the least important is the criteria of the water energy system. The most important priority sub-criteria is inter-company cooperation, while the least important sub-criteria is to reduce energy consumption.

Strategy of applying alternative 1 (green industrial park) at SIER at this time can be done by applying building code stipulation for all existing building, such as:
1) Application of green design concept in building
2) Environmentally sensitive construction
3) Easy to manage and maintain (low maintenance)

with the following objectives:
1) Minimize negative impacts on the environment
2) Emphasis on energy consumption
3) Efficiency in energy utilization in the region
4) Optimize the use of more efficient resources

In addition to the establishment of building code to realize an ideal green industrial park, every production process and operation of the the factory in the complex should also be encouraged and expected to:
1) Optimize the use of all materials (sorting, reuse, recycle)
2) Minimize the use of toxic materials for the purpose of pollution prevention
3) Apply the concept of cleaner production (net production)
4) Use renewable and recyclable resources
5) Benefit the economic development of the surrounding community
6) Provide training (training) to the surrounding community

IV. CONCLUSION

The conducted research shows that EIE concept can be applied to SIER. Based on the result of weighting the responses of the decision makers of SIER management, it had been stated that in the application of EIE concept strategy to the conventional industrial estate (SIER) the prioritized criteria that has to be applied would be effective management. Whereas, the criteria considered as the least important is the criteria of the water energy system. The most important priority sub-criteria is inter-company cooperation, while the least important sub-criteria is to reduce energy consumption.

Based on the result of data processing of conformity criteria and sub-criteria with alternative models of applying eco-industrial estate using descriptive statistic, a conclusion could be drawn that the most suitable alternative to be applied to SIER is the application of the green industrial park model.

REFERENCES


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A Preliminary investigation on milk quality in Ampara District of Sri Lanka

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Abstract: The present study was carried out to investigate the factors affecting keeping quality of raw milk in lactating cows in Ampara District of Sri Lanka. In this study, a total of 110 raw milk samples were randomly collected from 7 milk chilling centers and details on milking practices were collected from the farmers through structured questionnaire and interview. Milk samples were collected aseptically from milk cans and dispatched to laboratory for keeping quality test. Result showed that 42% of the collected milk from farmers had poor keeping quality. The buffalo milk showed a significantly poor keeping quality (p < 0.05) compared to that of cow milk. Also the poor keeping quality was higher in milk collected from plastic milk containers (76.1%) compared to that of metallic containers (37.8%). Other factors that significantly contributed to poor keeping quality were presence of contaminants (73.5%), milk from cow in late lactation (63.1%), higher fat percentage in milk (66.6%), the time interval between milking to chilling (92.8%) and poor hygienic practices (76.4%).

Keywords: Cow milk, keeping quality

1. INTRODUCTION

Livestock is growing agricultural subsectors in many developing countries. In Sri Lanka, livestock sector contributes 0.8% to total GDP (Central Bank of Sri Lanka 2015). It is basically from expansion and increased dairy and/or poultry production within the country (Livestock Statistical bulletin 2015). Therefore, milk production has played an important role in livestock production of the country. Livestock is an integral part of the agricultural economy in Sri Lanka and enhances food security, reduction of malnutrition and poverty. Dairy farming has been identified as the priority area for investment and development in the livestock many developing countries (Birthal et al. 2002). At present, Milk production increased by 12.1 percent to 374 million liters in 2015 compared to the growth of 1.4 percent recorded in the previous year, owing to favorable producer prices for milk and growing demand for raw milk from large milk collectors with the increased capacity of milk factories (Central Bank of Sri Lanka 2015). Ampara District of Sri Lanka which has total cattle and milking cow population of 95,140 and 25,350, respectively (Central Bank of Sri Lanka 2015) and daily cow milk production is 31,140 liters which is a high milk production District in Eastern Province of Sri Lanka (Central Bank of Sri Lanka 2015). However, dairy farmers are facing many challenges to maintain the quality of milk production in most of the areas, including this district of the country due to various reasons (Deshapriya et al. 2004 & 2007, Abeygunawardana et al. 2017).

Milk quality is affected by hygienic practices, time between milking to chilling, types of milk collection utensil and foreign materials present in milk (Marshall 1992). Milk is the most easily contaminated and perishable commodity as it is an ideal medium for bacterial growth. Hence, the employment of hygienic practices right from milking at the farm level to the factory is essential (Kurwijila 2006). The keeping quality of milk is a function of on-farm hygiene and the milk handling practices. Milk produced by the farmers often goes bad since husbandry practices are at household level and milk quality is always compromised. Therefore, the causes of high bacterial load in milk and the factors affecting the clean milk production have to be addressed in Ampara District of Sri Lanka.

Proper hygienic condition is an essential that can reduces the chances of spoilage thus reducing the magnitude of milk losses to the farmer (Holloway et al. 2000). Planning for improved production, advisors and extension workers need to help farmers in ways that will be technically feasible, socially acceptable and economically viable in reducing milk spoilage and milk loss. The report from this study therefore will work as basis for improving milk quality and reduce the chances of milk spoilage and loss thus profitability of the dairy enterprise & enhanced incomes for farmer with improved livelihood in rural community of this area.

In this context, the objective of this study was to determine the keeping quality and identify the associated factors with keeping quality of raw milk in lactating cows which can directly affect the quality of raw milk received to milk chilling centers from dairy farmers and to provide appropriate pathway to enhance milk quality through facilitating clean milk production in Ampara District of Sri Lanka.

2. MATERIALS AND METHODS

2.1. Study area

The study was carried out in Ampara District, Eastern Province of Sri Lanka. Ampara District located at 7°05'N latitude 81°45'E longitude and the elevation is 7.65 m above sea level. Land area of Ampara District is 4,415 km² and mean temperature, annual rainfall and relative humidity were 28.4°C, 1,973.7mm and 89%, respectively.

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2.2. Sample collection
In this study, 110 milk samples were randomly collected from dairy farmers from 7 milk chilling centers in Ampara District. A pre-tested questionnaire was used to collect the information on farmers to find out the associated factors, in relation to poor keeping quality of raw milk.

2.3. Information from farmers
Data were collected from farmers on management aspects, herd sizes, housing systems, farming system, feeding system, milking system, milking frequency, hygiene practices; types of milking equipment, induction of milk flow, source of water, hygiene of milking and washing methods of milking parlor and floor type of the shed. Information on cows such as breed, age, parity, stage of lactation, infected quarters, milk production and diseases were collected from the interview.

2.4. The Alcohol Test
The test was done by mixing equal amounts (2ml) of milk and 68% of ethanol solution in Petridish. If coagulation/clotting were formed, that milk sample was categorized as alcohol positive. If milk was not formed the coagulation/clotting that treat as alcohol negative.

2.5 Resazurin test.
10 ml milk was taken into a sterile test tube. Then, 1 ml of resazurin solution was added and tube stoppered. Then, the dye was gently mixed into the milk and marked the tube before the incubation in a water bath with 37ºC up to 5-7 min. Then, the test tube was placed in a Loxi bond comparator with resazurin disk and compared it calorimetrically with a test tube containing 10 ml milk of the same sample without the dye (Nixon et al. 1945).

2.6 Determination of Fat (The Gerber method)
In the Gerber method, 10 ml of Con. Sulphuric acid was added to the butyrometer. Then, 10.94 ml of well mixed milk was added by using 10.94ml of pipette. After, 1ml of Amyl alcohol was added and inserted stopper. Finally, the butyrometer was shaken carefully until the curd dissolved. The butyrometer was placed in the water bath at 65ºC and kept it there until a set was ready for centrifuging. The butyrometer was placed in the centrifuge with the stem (scale) pointing towards the center of the centrifuge. Then, centrifuge was rotated for 4 min, at 1100 rpm. After, the butyrometer was removed from the centrifuge and put the butyrometer in a water bath maintained at 65ºC for 3 min. Then, the final reading was taken and noted as percentage (Kleyen et al. 2001).

2.7 Determination of Solids Not-Fat (SNF)
The milk sample was mixed gently and poured it gently into a 300ml of measuring cylinder. The lactometer was sung slowly into the milk. Then, the last Lactometer degree (ºL) was read and recorded just above the surface of the milk. If the temperature of the milk was different from the calibration temperature(Calibration temperature of lactometer was 20ºC) of the lactometer, the temperature correction was calculated for each ºC above the calibration temperature was added 0.2ºL; for each ºC below calibration temperature was subtracted 0.2 ºL from the recorded lactometer reading.

CLR
SNF % =-------- + 0.22 F + 0.72
4
CLR = Corrected lactometer Reading, F= Fat content in milk

2.8 Data analysis
The association between the keeping quality of raw milk and risk factors such as hygiene practices, breeds, types of milking equipment, milk fat percentage, foreign materials, duration after milking to chilling, adulteration and stage of lactation were statistically analyzed in logistic regression model using statistics package for social science (SPSS version 20.0) software. All the risk factors were explained in odds ratio (OR) value which mean an odds ratio is a measure of association between an exposure and an outcome. P values less than 0.05 were considered the level of significance of the result.

3. RESULTS AND DISCUSSIONS
The present study was conducted using the details of 110 dairy farmers. Around 42 % of milk from farmers was positive to alcohol and resazurin test. If both alcohol and resazurin result was positive, that indicated the poor keeping quality of milk. The frequency and percentages of different factors that affect the keeping quality are shown in Table 1.

When the factors associated with keeping quality of milk was analyzed, only seven variables significantly (P< 0.05) associated with keeping quality of milk in binary logistic regression analysis. Poor milk quality was relatively higher in buffalo milk as explained in odds ratio (OR) value 24.3 based on the cattle breed milk (Table 2). Further, factors such as stage of lactation, types of equipment, duration after milking, fat percentage, hygienic practices and foreign materials associated with keeping quality test analysis.

Table 1: Frequency and percentage of different factors

<table>
<thead>
<tr>
<th>Factors</th>
<th>No. of animals</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td>67</td>
<td>60.9</td>
</tr>
<tr>
<td>Buffalo</td>
<td>43</td>
<td>39.1</td>
</tr>
<tr>
<td>Stage of lactation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late stage</td>
<td>38</td>
<td>34.5</td>
</tr>
<tr>
<td>Mid stage</td>
<td>51</td>
<td>46.4</td>
</tr>
<tr>
<td>Early stage</td>
<td>21</td>
<td>19.1</td>
</tr>
<tr>
<td>Types of equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastic</td>
<td>42</td>
<td>38.2</td>
</tr>
<tr>
<td>Metallic</td>
<td>68</td>
<td>61.8</td>
</tr>
<tr>
<td>Foreign materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>53</td>
<td>48.2</td>
</tr>
<tr>
<td>Not present</td>
<td>57</td>
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</tr>
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<td>Time duration</td>
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<tr>
<td>0-1 hr</td>
<td>17</td>
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<td>1-2 hr</td>
<td>50</td>
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</tr>
<tr>
<td>2-3 hr</td>
<td>21</td>
<td>19.1</td>
</tr>
<tr>
<td>&gt; 3 hr</td>
<td>22</td>
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</tr>
<tr>
<td>Fat percentage</td>
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<td></td>
</tr>
<tr>
<td>2- 4</td>
<td>25</td>
<td>22.7</td>
</tr>
<tr>
<td>4- 6</td>
<td>53</td>
<td>48.2</td>
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<td>6- 8</td>
<td>32</td>
<td>29.1</td>
</tr>
<tr>
<td>Hygiene</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>51</td>
<td>46.4</td>
</tr>
<tr>
<td>Good</td>
<td>59</td>
<td>53.6</td>
</tr>
</tbody>
</table>

Table 2: Binary logistic regression analysis of potential risk factors for keeping quality of milk

http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7938
High at late stage of lactation (Islam et al. 2012, Alemu et al. in similar studies that poor keeping quality of milk could be to stage of lactation (Cerbulis et al. 1975). It has been reported 2). The fat, lactose and protein contents of milk vary according to stage of lactation of cows showed in Figure 2. The lactation stage was categorized into early, mid and late lactation based on the milk can increase spoilage of milk thus reduce the keeping quality (Fox 1995, Kurwijila 1989). The keeping quality was poorest (73.5%, OR 16.5) when foreign materials present in milk (Figure 4, Table 2). It is reported that poorly constructed milking sheds, wind blows with dust particles, pieces of straw and feed materials that may land in milk as foreign particles (Kurwijila1989). In addition, dirty milking places tend to breed flies which may fall in milk as foreign materials causing contamination and spoilage. The soil serves as primary source of foreign matter in milk introducing microorganisms and spores in resting stages which receive nutrients for growth and multiply to increase in numbers to cause milk spoilage (Mbabazi 2005)

Highest level poor keeping quality (92.8%) was found in milk when held more than three hours at ambient temperature before chilling (Figure 5). In terms of OR value for long duration after milking was 10.2 times more than short duration after milking (Table 2).Usually, raw milk should contain less than 5,000 bacteria per milliliter of milk, but these bacteria multiply and deteriorate the milk with time under favorable conditions. It is stated that Just after milking, milk should be transported to chilling centers within short time duration which is very important because less time lead for less bacterial count and good quality raw milk. (Lore et al. 2005, Deshapriya et al, 2004 & 2007, Weerasinghe et al. 2017). Further, lowering the temperature of milk preferably to chilling temperature, the microbial quality can be improved. Therefore, holding the milk at ambient temperature increases microbial population in a tropical climate present in Sri Lanka.

The quality was very poor (66.6%, OR 15.4) in milk when the fat content is high when compared to low fat milk (Figure 6, Table 2). Fox (1995) reported that if fat percentage of milk is high that may spoil quickly.

Figure 7 shows the effect of hygienic practices on the keeping quality of milk. As shown, the highest prevalence of poor keeping quality was recorded in poor hygiene (76.4%, OR 24.5) and lowest was recorded in good hygiene (11.9%) (Table 2). This factor was considered based on the animal, environmental and good milking practices. If milking was done by hand without washing and disinfecting the hand, pathogenic microbes which are in hand as normal residents can be transmitted into uninfected quarter, leading to intra-mammary infections and thus poor keeping quality (Shittu et al.2012). Therefore, it has been recommended that using disinfectant hands before hand milking, can reduce the transmission of pathogenic microorganisms from cow to milk and human to milk (Sharma N. 2010).

Of the 43 buffalo milk samples, 29 samples (67.4%) were positive to keeping quality test and of the 67 cattle milk samples, 14 (20.8%) were positive to keeping quality test (Figure 1). Buffalo milk had more chances for poor keeping quality than cattle milk in terms of OR value. The OR value for buffalo milk was 24.3 times more than cattle milk (Table 2). Fox (1995) reported that if fat percentage of milk is high when compared to low fat milk (Figure 6, Table 2). TheAssociation between keeping quality of milk and stage of lactation of cows showed in Figure 2. The lactation stage was categorized into early, mid and late lactation based on the lactation stage. Result indicated that, the highest poor keeping quality was recorded in a late stage of lactation (63.1%) and the lowest was in early lactation (33.3%). Mid and late lactation had more chances for poor keeping quality in terms of OR value, which was expressed for mid and late lactation of cows were 3.5 and 7.4 times more than early stage of lactation (Table 2). The fat, lactose and protein contents of milk vary according to stage of lactation (Cerbulis et al. 1975). It has been reported in similar studies that poor keeping quality of milk could be high at late stage of lactation (Islam et al. 2012, Alemu et al. 2013).
CONCLUSION
Overall poor keeping quality of milk in lactating cows in Ampara District of Sri Lanka is 42%. This finding is also in line with other published data where the milk quality is comparatively poor. It is found that the poor keeping quality of milk is associated with several factors; including stage of lactation, time duration between milking to chilling; types of equipment, presence of foreign materials, fat content and hygienic milking practices. Therefore there is urgent need of addressing the all steps in milk value chain within the country to upgrade the quality of raw milk. It is utmost important to educate specially the small farmers on clean milk production procedure. It could also be suggestive to impose hygienic quality based payments rather than only compositional quality based payments to encourage farmers to produce good quality milk.
Acknowledgement
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Desirable Factors Contributing to the Leading Performance of Public Secondary School Teachers in Cordillera Administrative Region-Luzon, Philippines

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Abstract-Global trends indicate that the future performance of Generation Z and Millennial students is the reflection of the teaching performance of the current educators who have been equipped with innovative skills to address the rapid changing needs and demands of the 21st Century learners. Basically, a teacher who is performing well has been considered an asset in the academe; hence what makes the teacher display such quality needs to be investigated. Thus, the research aimed to determine the extent of contribution of the different desirable factors contributing to the leading performance of Public Secondary School Teachers in the Cordillera Administrative Region (CAR) Luzon, Philippines as perceived by the teachers and school administrators. The study was conducted in various provinces of CAR, Northern Philippines where the floated questionnaires had been answered by 1,000 respondents. The null hypothesis had been tested using the t-Test to compare significant differences of means between the two groups of respondents. The findings of the study had indicated that the extent of contribution of the desirable factors contributing to the leading performance of Public Secondary School Teachers as perceived by the teachers had a very much contribution as shown by the total average weighted mean of 4.26. The extent of contribution of the desirable factors contributing to the leading performance of Public Secondary School Teachers as perceived by administrators also had a very much contribution considering the total average weighted mean of 4.29 based on the perceptions of school administrators. There was no significant difference between the perceptions of teachers and administrators on the desirable factors contributing to the leading performance of Public Secondary School Teachers (t comp=1.079; t 0.05 44df=2.017). Based on the aforementioned findings, it could be inferred that the desirable factors had a significant effect in sustaining the excellent performance of teachers who are the front-liners in educating the minds, limbs and hearts of human resources who are the hope in combatting the challenges brought about by the Fourth Industrial Revolution known as Education 4.0.

Index Terms- Teacher Performance, Contribution, Desirable Factors, Public School

I. INTRODUCTION

Best teachers beget best students, best students beget best workers, best workers beget best society and best society leads to success, peace, prosperity, joy, contentment and comfort.

It is interesting to note that with the demands of achieving quality education and trend on global competitiveness, the Philippine Educational System has strengthened its programs specifically on Faculty and Student Development. The Department of Education (DepED) in collaboration with the Commission on Higher Education (CHED), Technical Education and Skills Development Authority (TESDA) and in partnership with other agencies of the country and even abroad, Public School Teachers have been undergoing massive trainings and have been encouraged through scholarship grants to enroll in graduate studies for continuous professional growth for career advancement and enrich their technical expertise in various fields to address the needs and demands of the 21st Century learners. Besides, not only the teachers in Private Schools have been provided with opportunities for Teacher Exchange Programs nationally and internationally but also the teachers in Public Schools have begun to shine proving their efficiency, effectiveness and productivity in their own respective fields of discipline.

Indeed, high performing teachers have great contributions in the creation of wholesome environment. According to Haramain (2006) dissertation paper concerning the performance level of Public Secondary School Teachers in CAR, there have been several factors that contributed to the high performance level of teachers. These are person-related factors, school-related factors, student-related and community-related factors. Among the person-related factors include high intellectual and scholastic qualities; good
preparation to Teacher Education; competitive salary; relevant educational qualification; effective philosophical methodology; favorable home life; good health, professional and personal character and family background; job stability; long years in service; as well as adequate and relevant trainings. On the other hand, school-related factors include: suitable educational curriculum; school environment suitable to teaching-learning; relevant school system and effective managerial skills of the administrator; successful and sufficient administration of In-Service Trainings (INSET); adequate and suitable school equipment or facilities; and strong faculty coordination. Moreover, student-related factors include moderate number of students in the classroom; active involvement of students in academic, co-curricular and extra-curricular activities; healthy, responsible and bright learners; and strong educational foundation of students. Likewise, community-related factors include the strong cooperation and support of parents, religious organizations and community in school affairs; responsible community leaders; and favorable community environment.

Scrubbing the contributions of the desirable factors leading to the high performance level of Public Secondary School Teachers has been found out to be of significance because the said factors shall serve as reference to guide teachers in maintaining their outstanding performance while they may also serve as inspirations to their colleagues, their family and the community. The study aimed to investigate the extent of contributions of the desirable factors contributing to the leading performance of Public Secondary School Teachers as perceived by the teachers themselves and the school administrators and to find out the significant difference between the perceptions of the two groups of respondents. Thus, this paper hypothesized that there is no significant difference between the perceptions of administrators and teachers on the extent of contribution of the different desirable factors contributing to the high performance level of Public Secondary School Teachers and that the paper formulated an assumption that the administrators and teachers have the same perceptions on the extent of contribution of the different desirable factors contributing to the high performance level of Public Secondary School Teachers.

Literature Review

The Global demands of quality education as emphasized by Graham (2009) in his article, Factors Contributing to Improved Teaching Performance, focused upon the quality and scholarship of teaching in relation to educational and faculty development had been marked by top three factors leading to improvement such as active learning, teaching-learning interactions and clear expectations or learning outcomes. In Southeastern United States of America, a study revealed that there had been 12 factors as predictors of overall teaching effectiveness like on the teachers’ attributes on clarity of teaching instructions and instructional materials, manner of answering students’ inquiry, professional ethics of dealing with students, knowledge and preparation on the subject matter, and the balance between teaching and research (Tangco, 1997). In Pakistan, factors that contributed to the improvement of teachers’ performance particularly in rural Punjab based on the research of Bairs (2004) had been focused not only on teaching effectiveness but also on the quality of support received by the school teachers from the community organizations resulted to the enhancement of their trainings and motivation.

Public Secondary School Teachers in CAR, Philippines have become more competitive as evidenced by their high performance in instruction, research, innovation, community involvement, and production according to the latest survey revealed by the Department of Education (DepEd) in the region. Based on research findings, public school teachers have displayed competence in the delivery of instruction which have been influenced by several factors namely: person-related factors, school-related factors, student-related factors, and community-related factors.

Person-Related Factors

The findings of the study conducted by Akinsolu (2010) regarding Public Secondary School Teachers in a sample of Local Government Areas (LGA) of Osun State in Nigeria showed that teachers’ qualifications, experience and teacher-student ratio had been significantly related to students’ academic performance. Also, according to Moore (n.d.) personal self-efficacy which is a future-oriented belief about the level of competence a person expects to display in a given situation has found out to have adverse effect on teachers’ performance. When applied to teaching, this self-efficacy factor is generally known as Personal Teaching Efficacy (PTE). Teachers with a high level of PTE have confidence that they have adequate training or experience to develop strategies for overcoming obstacles to student learning.

Sison (1995) mentioned that person-related factors have been one of the contributory elements in the performance of teachers. Among these factors are the intellectual and the scholastic qualities possessed by teachers. Another is the income level. The pay that an employer receives from his employer is the primary reason for his being on his job. An employee works for a living hence his pay provides him with a strong motivation to perform his job efficiently, effectively and productively. Also, Tangco (1997) emphasized that the teachers’ educational qualifications or attainment could influence their performance. The more the level of education achieved by a particular teacher, the higher the level of his performance. The teachers’ philosophy in education specifically his instructional methodology likewise influences his job performance. If he has relevant educational philosophy, the greater effect of this to his excellent performance. Based on research findings in CAR-Luzon, Philippines, the way teachers prepared themselves to teaching influences their work performance. Teachers had been found out to have achieved the peak of thorough preparation to Teacher Education. Imbuido (1999) also had conducted a study on the degree of effectiveness of the strategies used in improving teachers’ methodology had been effective. Also, the author cited that teachers’ home life has been found out to be much influential to their performance including their behavior such as their mood in school. Teachers with happy and satisfied family have manifested successful performance in dealing with their work. Health, character and family background are another factors in contributing to the performance of teachers. Obviously, health is the wealth of teachers in carrying out their obligations. It is their tool to combat forces

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Research Questions

1. What is the extent of contribution of the different desirable factors contributing to the high performance level of Public Secondary School Teachers in the Cordillera Administrative Region, Luzon-Philippines as perceived by the teachers?

2. What is the extent of contribution of the different desirable factors contributing to the high performance level of Public Secondary School Teachers in the Cordillera Administrative Region, Philippines as perceived by school administrators?

3. Is there a significant difference between the perceptions of school administrators and the teachers on the extent of contribution of the different desirable factors contributing to the high performance level of teachers?


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II. METHODOLOGY

The study used the descriptive-normative survey. It subjected for the modification or description of some extent the performance level of Public Secondary School Teachers in CAR-Luzon, Philippines. This study used the collection of data through the constructed questionnaire checklist in order to test the hypothesis formulated. The comparative treatment of data was utilized to prove the null hypothesis. Hence, this study has been normative in design because it statistically treated the data gathered using an established formula.

The locale of the study was in CAR located in the Northern part of Luzon, Philippines composed of nineteen tribes of ethno linguistic groups. However, other dialects commonly spoken in the region are Ilocano, Tagalog, Pampaguano, and Pangasenenses. Hence, this study involved 850 Secondary School Teachers and 150 Secondary School Administrators in the public sector or a total of 1,000 respondents. The distribution of the number of respondents was in every school division.

In this particular study, the tool used in collecting data was the questionnaire in order to arrive to the maximum perceptions of the 1,000 respondents. The questionnaire used specifically the fixed alternative or closed-ended questions as a form of restructured type of data-gathering tool, in which the respondent simply had been required to select one or more of the specific categories provided by the researcher. The items in the questionnaire were actually based on the specific questions that were formulated for the study. The questionnaire was composed of two parts. The first part dealt with the profile of the respondents and the second part dealt with the main inquiry of the study consisting of two categories in providing information on the: (1) extent of contribution of the desirable factors contributing to the leading performance of teachers in Public Secondary Schools in CAR and (2) the perceptions of teachers and administrators on these.

As far as validation and administration of the questionnaire had been concerned, the author of this paper constructed the questionnaire and allowed the panelists to check it carefully. Then, the questionnaire was administered to 30 teachers who were not part of the research. The respondents answered all the items correctly thus, the questionnaire was finalized. The researcher asked the assistance of some people concerned for the floating of said questionnaire after it was approved valid for administration. Ninety percent of the questionnaire checklists had been efficiently floated and retrieved.

The Likert-type of point scale has been used to quantify the perceptions of the respondents.

The extent of contribution of the desirable factors contributing to the leading performance of Public Secondary School Teachers in CAR as perceived by the teachers and administrators was quantified and interpreted as follows:

<table>
<thead>
<tr>
<th>Relative Value</th>
<th>Statistical Limit</th>
<th>Verbal Description</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4.21-5.00</td>
<td>Very Much Contribution</td>
<td>VMC</td>
</tr>
<tr>
<td>4</td>
<td>3.21-4.20</td>
<td>Much Contribution</td>
<td>MC</td>
</tr>
<tr>
<td>3</td>
<td>2.61-3.40</td>
<td>Moderate Contribution</td>
<td>MoC</td>
</tr>
<tr>
<td>2</td>
<td>1.81-2.60</td>
<td>Little Contribution</td>
<td>LC</td>
</tr>
<tr>
<td>1</td>
<td>1.00-1.80</td>
<td>No Contribution</td>
<td>NC</td>
</tr>
</tbody>
</table>

Statistical treatment of data

In view on the statistical treatment of data, the average weighted mean, frequency and percentage were used in presenting the descriptive statistics. In the computation of the weighted mean, the following formula was used:

\[ X = \frac{\sum Wi fi}{\sum fi} \]

Where:

\[ X = \text{weighted mean} \]
\[ Wi fi = \text{the summation of the weighted frequencies} \]
\[ fi = \text{the summation of observations} \]

The pre-tested questionnaire checklists had been floated to the respondents. The data had been gathered, tabulated, analyzed and presented in tabular forms.

The null hypothesis was tested using the t-Test. This was used to compare significant differences of means between the two groups of respondents.

The statistical tool used in this study was the t-Test intended for independent or uncorrelated data since two independent groups were compared. This has the following formula:

\[ t = \frac{X1 - X2}{\sqrt{S^2/n1 + S^2/n2}} \]

Where:

\[ X = \text{mean} \]
\[ n = \text{number of cases} \]
\[ S^2 = \text{standard error} \]

\[ S^2 = \frac{\sum X^2 - (\sum X)^2/n1}{n1} + \sum X1 - \sum X2^2 - \frac{(\sum X2)^2}{n2} \]
III. FINDINGS AND DISCUSSIONS

Table 1
Contribution of Desirable Factors to the High Performance of Public Secondary School Teachers in the Cordillera Administrative Region – Luzon, Philippines as Perceived by the Teachers
N=850

<table>
<thead>
<tr>
<th>Extent of Contribution</th>
<th>Desirable Factors</th>
<th>VMC (5)</th>
<th>MC (4)</th>
<th>MoC (3)</th>
<th>LC (2)</th>
<th>NC (1)</th>
<th>WP</th>
<th>WM</th>
<th>DE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Person-Related Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. High intellectual and scholastic qualities</td>
<td>340 (1700)</td>
<td>416 (1664)</td>
<td>92 (276)</td>
<td>0 (0)</td>
<td>2 (2)</td>
<td>3642</td>
<td>4.24</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td>2. Good preparation to Teacher Education</td>
<td>405 (2025)</td>
<td>382 (1528)</td>
<td>53 (159)</td>
<td>5 (10)</td>
<td>5 (5)</td>
<td>3727</td>
<td>4.38</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td>3. Competitive salary/Good income level</td>
<td>355 (1775)</td>
<td>319 (1276)</td>
<td>150 (450)</td>
<td>19 (38)</td>
<td>7 (7)</td>
<td>3546</td>
<td>4.17</td>
<td>MC</td>
<td></td>
</tr>
<tr>
<td>4. Relevant educational qualification</td>
<td>357 (1785)</td>
<td>403 (1612)</td>
<td>77 (231)</td>
<td>7 (14)</td>
<td>6 (6)</td>
<td>3648</td>
<td>4.29</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td>5. Effective philosophical method/methodology</td>
<td>294 (1470)</td>
<td>421 (1684)</td>
<td>122 (366)</td>
<td>13 (26)</td>
<td>0 (0)</td>
<td>3546</td>
<td>4.17</td>
<td>MC</td>
<td></td>
</tr>
<tr>
<td>6. Favorable home life</td>
<td>306 (1530)</td>
<td>391 (1564)</td>
<td>135 (405)</td>
<td>12 (24)</td>
<td>6 (6)</td>
<td>3529</td>
<td>4.15</td>
<td>MC</td>
<td></td>
</tr>
<tr>
<td>7. Good health, professional and personal character and family background</td>
<td>423 (2115)</td>
<td>367 (1468)</td>
<td>48 (144)</td>
<td>8 (16)</td>
<td>4 (4)</td>
<td>3747</td>
<td>4.41</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td>8. Job stability/Job contentment</td>
<td>378 (1890)</td>
<td>343 (1372)</td>
<td>108 (324)</td>
<td>15 (30)</td>
<td>6 (6)</td>
<td>3622</td>
<td>4.26</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td>9. Long years in service</td>
<td>234 (1170)</td>
<td>410 (1640)</td>
<td>161 (483)</td>
<td>37 (74)</td>
<td>8 (8)</td>
<td>3375</td>
<td>3.97</td>
<td>MC</td>
<td></td>
</tr>
<tr>
<td>10. Adequate and relevant trainings</td>
<td>401 (2005)</td>
<td>333 (1332)</td>
<td>93 (279)</td>
<td>14 (28)</td>
<td>9 (9)</td>
<td>3653</td>
<td>4.30</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td><strong>B. School-Related Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Suitable educational curriculum</td>
<td>341 (1705)</td>
<td>384 (1536)</td>
<td>104 (312)</td>
<td>15 (30)</td>
<td>6 (6)</td>
<td>3589</td>
<td>4.22</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td>2. School environment conducive to teaching-learning</td>
<td>400 (2000)</td>
<td>331 (1324)</td>
<td>98 (294)</td>
<td>15 (30)</td>
<td>6 (6)</td>
<td>3654</td>
<td>4.30</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td>3. Relevant school system and effective managerial skills of the administrator</td>
<td>404 (2020)</td>
<td>327 (1308)</td>
<td>93 (279)</td>
<td>22 (44)</td>
<td>4 (4)</td>
<td>3655</td>
<td>4.30</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td>4. Successful and sufficient administration of In-Service Trainings</td>
<td>342 (1710)</td>
<td>384 (1536)</td>
<td>109 (327)</td>
<td>9 (18)</td>
<td>6 (6)</td>
<td>3597</td>
<td>4.23</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td>5. Adequate and suitable school equipment/facilities</td>
<td>397 (1985)</td>
<td>303 (1212)</td>
<td>124 (372)</td>
<td>19 (38)</td>
<td>7 (7)</td>
<td>3614</td>
<td>4.25</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td>6. Strong faculty coordination</td>
<td>378 (1890)</td>
<td>356 (1424)</td>
<td>97 (291)</td>
<td>19 (38)</td>
<td>0 (0)</td>
<td>3643</td>
<td>4.29</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td><strong>C. Student-Related Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Moderate number of students in the classroom</td>
<td>432 (2160)</td>
<td>284 (1136)</td>
<td>97 (291)</td>
<td>28 (56)</td>
<td>9 (9)</td>
<td>3652</td>
<td>4.30</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td>2. Active involvement of students in academic, co-curricular and extra-curricular activities</td>
<td>403 (2015)</td>
<td>350 (1400)</td>
<td>82 (246)</td>
<td>12 (24)</td>
<td>3 (3)</td>
<td>3688</td>
<td>4.34</td>
<td>VMC</td>
<td></td>
</tr>
<tr>
<td>3. Healthy, responsible and bright learners</td>
<td>361</td>
<td>348</td>
<td>126</td>
<td>11</td>
<td>4</td>
<td>3601</td>
<td>4.24</td>
<td>VMC</td>
<td></td>
</tr>
</tbody>
</table>

\[ n1 + n2 - 2 \]
The findings implied that the extent of contribution of the desirable factors contributing to the high performance level of Public Secondary School Teachers in CAR was of very much contribution. Therefore, the teachers, administrators, government officials, Department of Education or DepEd supervisors, parents, and the students must consider these factors so that appropriate adjustments would be applied.
Moreover, since the teachers had been greatly benefited from the desirable factors leading to their high performance, they should try all effective means to be constantly qualified in order to become deserving teachers in the field of education. They should actively get involved in all activities in the name of their profession and join collectively in the spirit of professionalism, hope, confidence, optimism, and love. In this view, there are seven characteristics of a good Undergraduate Education according to Global Description such as encourage contact between students and faculty, develop reciprocity and cooperation among students, encourage active learning, give prompt feedback, emphasize time on task, communicate high expectation, and respect diverse talents and ways of learning. Thus, good teaching strategies improve learning while technology can facilitate good teaching strategies.

Table 2
Contribution of the Desirable Factors to the High Performance Level of Public Secondary School Teachers in the Cordillera Administrative Region – Luzon, Philippines as Perceived by the School Administrators

N=150

<table>
<thead>
<tr>
<th>Desirable Factors</th>
<th>Extent of Contribution</th>
<th>VMC</th>
<th>MC</th>
<th>MoC</th>
<th>LC</th>
<th>NC</th>
<th>WP</th>
<th>WM</th>
<th>DE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Person-Related Factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1. High intellectual and scholastic qualities</td>
<td>61 (305)</td>
<td>78</td>
<td>10</td>
<td>0</td>
<td>1</td>
<td>648</td>
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</tr>
<tr>
<td>2. Good preparation to Teacher Education</td>
<td>69 (345)</td>
<td>73</td>
<td>7</td>
<td>0</td>
<td>1</td>
<td>659</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Competitive salary/Good income level</td>
<td>59 (295)</td>
<td>69</td>
<td>16</td>
<td>5</td>
<td>1</td>
<td>630</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4. Relevant educational qualification</td>
<td>67 (335)</td>
<td>75</td>
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<td>1</td>
<td>657</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5. Effective philosophical method/methodology</td>
<td>58 (290)</td>
<td>77</td>
<td>12</td>
<td>2</td>
<td>1</td>
<td>639</td>
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<tr>
<td>6. Favorable home life</td>
<td>57 (285)</td>
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<tr>
<td>7. Good health, professional and personal character and family background</td>
<td>71 (355)</td>
<td>67</td>
<td>9</td>
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<td>655</td>
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</tr>
<tr>
<td>8. Job stability/Job contentment</td>
<td>61 (305)</td>
<td>74</td>
<td>10</td>
<td>4</td>
<td>1</td>
<td>640</td>
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<tr>
<td>9. Long years in service</td>
<td>43 (215)</td>
<td>57</td>
<td>43</td>
<td>6</td>
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<td>585</td>
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<tr>
<td>10. Adequate and relevant trainings</td>
<td>68 (340)</td>
<td>68</td>
<td>6</td>
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<td></td>
<td>649</td>
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<tr>
<td>B. School-Related Factors</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Suitable educational curriculum</td>
<td>63 (315)</td>
<td>71</td>
<td>14</td>
<td>1</td>
<td>1</td>
<td>644</td>
<td></td>
<td></td>
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<tr>
<td>2. School environment conducive to teaching-learning</td>
<td>72 (360)</td>
<td>63</td>
<td>13</td>
<td>1</td>
<td>1</td>
<td>654</td>
<td></td>
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<tr>
<td>3. Relevant school system and effective managerial skills of the administrator</td>
<td>71 (355)</td>
<td>67</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td>655</td>
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<td></td>
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</tr>
<tr>
<td>4. Successful and sufficient administration of In-Service Trainings</td>
<td>67 (335)</td>
<td>67</td>
<td>13</td>
<td>2</td>
<td>1</td>
<td>647</td>
<td></td>
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</tr>
<tr>
<td>5. Adequate and suitable school equipment/facilities</td>
<td>63 (315)</td>
<td>70</td>
<td>14</td>
<td>2</td>
<td>1</td>
<td>642</td>
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<td>6. Strong faculty coordination</td>
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<td>4</td>
<td>0</td>
<td>654</td>
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<tr>
<td>C. Student-Related Factors</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1. Moderate number of students in the classroom</td>
<td>65 (325)</td>
<td>65</td>
<td>12</td>
<td>5</td>
<td>3</td>
<td>634</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Active involvement of students in academic, co-curricular and extra-curricular activities</td>
<td>66 (330)</td>
<td>68</td>
<td>12</td>
<td>2</td>
<td></td>
<td>644</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7939
related and finally person-related factors.

As a whole, person-related factors had an average weighted mean of 4.27 or very much contribution; school-related factors, 4.30 or very much contribution; student-related factors, 4.29 or very much contribution; and favorable community environment, 4.27 or very much contribution. As reflected on the table, the extent of contribution of the desirable factors contributing to the high performance of Public Secondary School Teachers as it was shown by the computed weighted mean and descriptive equivalents were indicated namely: under person-related factors, high intellectual and scholastic qualities had a weighted mean of 4.32 or very much contribution; good preparation to teacher education 4.39 or very much contribution; competitive salary or good income level, 4.20 or much contribution; relevant educational qualification, 4.38 or very much contribution; effective philosophical method or methodology, 4.26 or very much contribution; favorable home life, 4.25 or very much contribution; good health, professional and personal character, and family background, 4.37 or very much contribution; job stability or job contentment, 4.27 or very much contribution; long years in service, 3.90 or much contribution; and adequate and relevant trainings, 4.33 or very much contribution. Under school-related factors namely: suitable educational curriculum had a weighted mean of 4.29 or very much contribution; school environment conducive to teaching-learning, 4.36 or very much contribution; relevant school system and effective managerial skills of the administrator, 4.37 or very much contribution; successful and sufficient administration of In-Service Trainings, 4.31 or very much contribution; adequate and suitable school equipment and facilities 4.28 or very much contribution; and strong faculty coordination, 4.36 or very much contribution. Under student-related factors, moderate number of students in the classroom had a weighted mean of 4.23 or very much contribution; healthy, responsible and bright learners, 4.31 or very much contribution; and favorable community environment, 4.27 or very much contribution. Community-related factors: strong cooperation and support of parents, religious organizations and community in school affairs, 4.33 or very much contribution; responsible community leaders, 4.30 or very much contribution; active involvement of students in academic, co-curricular and extra-curricular activities, 4.29 or very much contribution; healthy, responsible and bright learners, 4.31 or very much contribution; and adequate and relevant trainings, 4.33 or very much contribution. Community-related factors: strong cooperation and support of parents, religious organizations and community in school affairs, 4.33 or very much contribution; responsible community leaders, 4.30 or very much contribution; and favorable community environment, 4.27 or very much contribution.

As a whole, person-related factors had an average weighted mean of 4.27 or very much contribution; school-related factors, 4.30 or very much contribution; student-related factors, 4.29 or very much contribution; and community-related factors, 4.30 or very much contribution. School-related factors garnered the highest average weighted mean followed by community-related then student-related and finally person-related factors. The table further revealed that the extent of contribution of the desirable factors contributing to the performance level of public secondary school teachers in CAR was 4.29 or very much contribution as revealed by the total average weighted mean and descriptive equivalent.

The findings implied that the extent of contribution of the desirable factors contributing to the high performance level of teachers in public secondary level was of very much contribution. These factors either intrinsic or extrinsic should be well scrutinized by all people concerned particularly the educators, parents, and the community in order to meet the needs and demands of teachers who are considered as the molders of the society. Moreover, the stated desirable factors should be met and their immediate provisions for the teachers are indispensable. School administrators have a big impact on these, through their concern, motivation, and unbiased actions, teachers’ performance would be monitored and constantly improved.

Table 2 presents the level of contribution of desirable factors contributing to the high performance of public secondary school teachers in CAR- Luzon, Philippines as perceived by the school administrators.

As reflected on the table, the extent of contribution of the desirable factors contributing to the high performance of Public Secondary School Teachers as it was shown by the computed weighted mean and descriptive equivalents were indicated namely: under person-related factors, high intellectual and scholastic qualities had a weighted mean of 4.32 or very much contribution; good preparation to teacher education 4.39 or very much contribution; competitive salary or good income level, 4.20 or much contribution; relevant educational qualification, 4.38 or very much contribution; effective philosophical method or methodology, 4.26 or very much contribution; favorable home life, 4.25 or very much contribution; good health, professional and personal character, and family background, 4.37 or very much contribution; job stability or job contentment, 4.27 or very much contribution; long years in service, 3.90 or much contribution; and adequate and relevant trainings, 4.33 or very much contribution. Under school-related factors namely: suitable educational curriculum had a weighted mean of 4.29 or very much contribution; school environment conducive to teaching-learning, 4.36 or very much contribution; relevant school system and effective managerial skills of the administrator, 4.37 or very much contribution; successful and sufficient administration of In-Service Trainings, 4.31 or very much contribution; adequate and suitable school equipment and facilities 4.28 or very much contribution; and strong faculty coordination, 4.36 or very much contribution. Under student-related factors, moderate number of students in the classroom had a weighted mean of 4.23 or very much contribution; healthy, responsible and bright learners, 4.31 or very much contribution; and favorable community environment, 4.27 or very much contribution.

As a whole, person-related factors had an average weighted mean of 4.27 or very much contribution; school-related factors, 4.30 or very much contribution; student-related factors, 4.29 or very much contribution; and community-related factors, 4.30 or very much contribution. School-related factors garnered the highest average weighted mean followed by community-related then student-related and finally person-related factors. The table further revealed that the extent of contribution of the desirable factors contributing to the performance level of public secondary school teachers in CAR was 4.29 or very much contribution as revealed by the total average weighted mean and descriptive equivalent.

The findings implied that the extent of contribution of the desirable factors contributing to the high performance level of teachers in public secondary level was of very much contribution. These factors either intrinsic or extrinsic should be well scrutinized by all people concerned particularly the educators, parents, and the community in order to meet the needs and demands of teachers who are considered as the molders of the society. Moreover, the stated desirable factors should be met and their immediate provisions for the teachers are indispensable. School administrators have a big impact on these, through their concern, motivation, and unbiased actions, teachers’ performance would be monitored and constantly improved.

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### Table 3
Comparison of Perceptions Between the Teachers and Administrators on the Contribution of Desirable Factors to the High Performance Level of Public Secondary School Teachers in the Cordillera Administrative Region – Luzon, Philippines

<table>
<thead>
<tr>
<th>N=850 Teachers</th>
<th>N=150 Administrators</th>
<th>1000 Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Desirable Factors</strong></td>
<td><strong>Extent of Contribution</strong></td>
<td><strong>Combined</strong></td>
</tr>
<tr>
<td></td>
<td>Teachers</td>
<td>Administrators</td>
</tr>
<tr>
<td><strong>A. Person-Related Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. High intellectual and scholastic qualities</td>
<td>4.28</td>
<td>VMC</td>
</tr>
<tr>
<td>2. Good preparation to Teacher Education</td>
<td>4.38</td>
<td>VMC</td>
</tr>
<tr>
<td>3. Competitive salary/Good income level</td>
<td>4.17</td>
<td>MC</td>
</tr>
<tr>
<td>4. Relevant educational qualification</td>
<td>4.29</td>
<td>VMC</td>
</tr>
<tr>
<td>5. Effective philosophical method/methodology</td>
<td>4.17</td>
<td>MC</td>
</tr>
<tr>
<td>6. Favorable home life</td>
<td>4.15</td>
<td>MC</td>
</tr>
<tr>
<td>7. Good health, professional and personal character and family background</td>
<td>4.41</td>
<td>VMC</td>
</tr>
<tr>
<td>8. Job stability/Job contentment</td>
<td>4.26</td>
<td>VMC</td>
</tr>
<tr>
<td>9. Long years in service</td>
<td>3.97</td>
<td>MC</td>
</tr>
<tr>
<td>10. Adequate and relevant trainings</td>
<td>4.30</td>
<td>VMC</td>
</tr>
<tr>
<td><strong>B. School-Related Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Suitable educational curriculum</td>
<td>4.22</td>
<td>VMC</td>
</tr>
<tr>
<td>2. School environment conducive to teaching-learning</td>
<td>4.30</td>
<td>VMC</td>
</tr>
<tr>
<td>3. Relevant school system and effective managerial skills of the administrator</td>
<td>4.30</td>
<td>VMC</td>
</tr>
<tr>
<td>4. Successful and sufficient administration of In-Service Trainings</td>
<td>4.23</td>
<td>VMC</td>
</tr>
<tr>
<td>5. Adequate and suitable school equipment/facilities</td>
<td>4.25</td>
<td>VMC</td>
</tr>
<tr>
<td>6. Strong faculty coordination</td>
<td>4.29</td>
<td>VMC</td>
</tr>
<tr>
<td><strong>C. Student-Related Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Moderate number of students in the classroom</td>
<td>4.30</td>
<td>VMC</td>
</tr>
<tr>
<td>2. Active involvement of students in academic, co-curricular and extra-curricular activities</td>
<td>4.34</td>
<td>VMC</td>
</tr>
<tr>
<td>3. Healthy, responsible and bright learners</td>
<td>4.24</td>
<td>VMC</td>
</tr>
<tr>
<td>4. Strong educational foundation of students</td>
<td>4.28</td>
<td>VMC</td>
</tr>
<tr>
<td><strong>D. Community-Related Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Strong cooperation and support of parents, religious organizations and community in school affairs</td>
<td>4.36</td>
<td>VMC</td>
</tr>
<tr>
<td>2. Responsible community leaders</td>
<td>4.26</td>
<td>VMC</td>
</tr>
<tr>
<td>3. Favorable community environment</td>
<td>4.26</td>
<td>VMC</td>
</tr>
<tr>
<td><strong>Total Average Weighted Mean</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( t_{comp} = 1.079 \)  
\( t, 0.05, 44df=2.017 \)  
Decision: Accept Null Hypothesis

### Table 3a
Computation for the Value of T for Table 3

<table>
<thead>
<tr>
<th>Desirable Factors</th>
<th>Extent of Contribution</th>
<th>Teachers</th>
<th>Administrators</th>
<th>D</th>
<th>( D^2 )</th>
</tr>
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<tr>
<td><strong>A. Person-Related Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. High intellectual and scholastic qualities</td>
<td></td>
<td>4.28</td>
<td>4.32</td>
<td>-0.04</td>
<td>0.0016</td>
</tr>
<tr>
<td>2. Good preparation to Teacher Education</td>
<td></td>
<td>4.38</td>
<td>4.39</td>
<td>-0.01</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7939  
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<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
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<td>3. Competitive salary/Good income level</td>
<td>4.17</td>
<td>0.20</td>
<td>-0.03</td>
<td>0.0009</td>
<td></td>
</tr>
<tr>
<td>4. Relevant educational qualification</td>
<td>4.29</td>
<td>0.38</td>
<td>-0.09</td>
<td>0.0081</td>
<td></td>
</tr>
<tr>
<td>5. Effective philosophical method/methodology</td>
<td>4.17</td>
<td>0.26</td>
<td>-0.09</td>
<td>0.0081</td>
<td></td>
</tr>
<tr>
<td>6. Favorable home life</td>
<td>4.15</td>
<td>0.25</td>
<td>-0.10</td>
<td>0.0100</td>
<td></td>
</tr>
<tr>
<td>7. Good health, professional and personal character and family background</td>
<td>4.41</td>
<td>0.37</td>
<td>0.04</td>
<td>0.0016</td>
<td></td>
</tr>
<tr>
<td>8. Job stability/Job contentment</td>
<td>4.26</td>
<td>0.27</td>
<td>-0.01</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td>9. Long years in service</td>
<td>3.97</td>
<td>0.90</td>
<td>0.07</td>
<td>0.0049</td>
<td></td>
</tr>
<tr>
<td>10. Adequate and relevant trainings</td>
<td>4.30</td>
<td>0.33</td>
<td>-0.03</td>
<td>0.0009</td>
<td></td>
</tr>
<tr>
<td>B. School-Related Factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Suitable educational curriculum</td>
<td>4.22</td>
<td>0.29</td>
<td>-0.07</td>
<td>0.0049</td>
<td></td>
</tr>
<tr>
<td>2. School environment conducive to teaching-learning</td>
<td>4.30</td>
<td>0.36</td>
<td>-0.06</td>
<td>0.0036</td>
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<td>3. Relevant school system and effective managerial skills of the administrator</td>
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<td>-0.07</td>
<td>0.0049</td>
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<td>4. Successful and sufficient administration of In-Service Trainings</td>
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<td>-0.08</td>
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<td>5. Adequate and suitable school equipment/facilities</td>
<td>4.25</td>
<td>0.28</td>
<td>-0.03</td>
<td>0.0009</td>
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<tr>
<td>6. Strong faculty coordination</td>
<td>4.29</td>
<td>0.36</td>
<td>-0.07</td>
<td>0.0049</td>
<td></td>
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<tr>
<td>C. Student-Related Factors</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1. Moderate number of students in the classroom</td>
<td>4.30</td>
<td>0.23</td>
<td>0.07</td>
<td>0.0049</td>
<td></td>
</tr>
<tr>
<td>2. Active involvement of students in academic, co-curricular and extra-curricular activities</td>
<td>4.34</td>
<td>0.29</td>
<td>0.05</td>
<td>0.0025</td>
<td></td>
</tr>
<tr>
<td>3. Healthy, responsible and bright learners</td>
<td>4.24</td>
<td>0.31</td>
<td>-0.07</td>
<td>0.0049</td>
<td></td>
</tr>
<tr>
<td>4. Strong educational foundation of students</td>
<td>4.28</td>
<td>0.31</td>
<td>-0.03</td>
<td>0.0009</td>
<td></td>
</tr>
<tr>
<td>D. Community-Related Factors</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Strong cooperation and support of parents, religious organizations and community in school affairs</td>
<td>4.36</td>
<td>0.33</td>
<td>0.03</td>
<td>0.0009</td>
<td></td>
</tr>
<tr>
<td>2. Responsible community leaders</td>
<td>4.26</td>
<td>0.30</td>
<td>-0.04</td>
<td>0.0009</td>
<td></td>
</tr>
<tr>
<td>3. Favorable community environment</td>
<td>4.26</td>
<td>0.27</td>
<td>-0.01</td>
<td>0.0001</td>
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</tr>
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<td>Total Average Weighted Mean</td>
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<td>4.29</td>
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<tr>
<td>Summation</td>
<td></td>
<td></td>
<td>-0.67</td>
<td>0.0777</td>
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</table>

\[
t_{\text{comp}} = \frac{4.26-4.29}{\sqrt{0.17766087 + 0.213295652} + (1/23+1/23)}
\]

\[
t_{\text{comp}} = \frac{4.26-4.29}{\sqrt{0.290956526} + (1/23+1/23)}
\]

\[
t_{\text{comp}} = \frac{0.03}{\sqrt{0.290956526} + (1/23+1/23)}
\]

\[
t_{\text{comp}} = \frac{0.03}{0.17766087 + 0.004347824}
\]

\[
t_{\text{comp}} = \frac{0.03}{0.182008704}
\]

\[
t_{\text{comp}} = 1.079
\]

\[
t_{(0.05, 44df)} = 2.017
\]

Result: Not Significant

Decision: Accept Ho
Table 3 presents the comparison of perceptions between the teachers and administrators on the extent of contribution of the desirable factors contributing to the leading performance of public secondary school teachers in CAR.

The table showed that the perceptions of the two groups of respondents had a slight variation. Teachers perceived that the most important factors to be prioritized were both the student and community-related factors while on the part of the administrators; they were the school-related factors. However, to determine whether there was a significant difference, this was subjugated to the t-Test. As a result, the computation conceded a value of 1.079 as indicated in Table 3a which was lesser than the tabular t value of 2.017 at 0.05 level of confidence with a degree of freedom of 44. This emphasized that there was no significant difference between the responses of the two groups. Therefore the null hypothesis stating that, there is no significant difference between the perceptions of teachers and administrators on the extent of contribution of desirable factors contributing to the high performance of Public Secondary School Teachers in CAR was accepted.

The findings indicated that the extent of contribution of desirable factors to the high performance level of teachers was of very much contribution. This further implied that the said factors played an important part on the lives and profession of teachers. Their level of performance had been correlated with the said desirable factors. Therefore, teachers should try their best to avail on these desirable factors. They should not cease in enhancing their level of performance whatever challenges or obstacles they encounter. They should always remember that their job is coupled with competition, thus they should keep upgrading themselves to be competent not only in the locality but throughout the nation and even entire the globe. If this would happen, they would produce best students leading to best workers contributing to nation building and prosperity, making the world a better place to live in.

IV. CONCLUSION

Both the teachers and the administrators perceived that the extent of contribution of the desirable factors contributing to the high performance level of Public Secondary School Teachers in CAR was of very much contribution as it was supported by the total average weighted mean of (4.26) on the part of the teachers and (4.29) on the administrators’ decision. Hence, there was no significant difference between the perceptions of teachers and administrators on the extent of contribution of the different desirable factors contributing to the high performance level of Public Secondary School Teachers as manifested by the computed t value of 1.079 which is lesser than the tabular value of 2.017 at 0.05 level of significance for 44 degrees of freedom. Therefore the null hypothesis, which states that there is no significant difference between the perceptions of teachers and administrators on the extent of contribution of the different desirable factors contributing to the performance level of Public Secondary School Teachers in CAR was accepted. In this view, it is hereby recommended that the desirable factors for the leading performance of Public Secondary School Teachers should be acquired, strengthened and sustained by the teachers in collaboration with the stakeholders concerned through constant self-improvement and struggle for efficiency, effectiveness and productivity. Likewise, it is suggested that further studies may be conducted not only focusing on the desirable factors but also on undesirable factors affecting the performance of teachers.

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AUTHOR

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A Study on the Impact of Psychological Capital on Organizational Commitment of Staff Employees: With Special Reference to a Sugar Manufacturing Company in Sri Lanka

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Abstract - Organizational commitment is the key to increase organizational performance with the ultimate purpose of achieving its goals and objectives. The current study was aimed at investigating the impact of Psychological capital on organizational commitment of staff employees of a sugar manufacturing company in Sri Lanka. Since Staff employees were selected as the population and population size is 81. The sample size of the study was 66 and convenience sampling method was followed. Data were collected through standard questionnaires and a multiple regression was performed to investigate the impacts of the variables interested. Organizational commitment acted as the dependent variable where self-efficacy, optimism, hope and resilience were the predictors of the study. The current study brought evidence to a significant positive impact of optimism, hope and resilience on organizational commitment and no any impact of self-efficacy on organizational commitment.

Index Terms - Hope, Optimism, Organizational Commitment, Self-efficacy, Resilience

INTRODUCTION

Considering about the total current production of the sugar industry of the country, it is just 6% and still behind the expected production even with the new physical resources for a longer time period. Therefore it is clear that there is an issue with the human resources who are utilizing the other resources. According to the executives of the sugar industry, sugar industry was unable to achieve their internal targets due to human resource problems and finally it effects to increase the import cost of Sri Lanka. According to the executives, this sugar company is a giant production company in Sri Lanka and which provides a considerable self-sufficiency to the country by contributing to fulfill 6% sugar requirement of the country. Even though there are some issues in this production company specially related to the human resources. The researcher was able to observe few symptoms of such a verse issue like sleeping, eating, engaging in private phone conversations for hours, blaming others. Accordingly, the researcher found that there is an issue with the commitment of the staff employees.

In addition to the above observations, the researcher conducted a preliminary survey to prove the issue with 30 staff employees of this sugar manufacturing company by using Convenience sampling technique.

According to the responses provided by the particular 30 respondents, actual commitment level is 3.8. Expected commitment level is considered as 4.0 as the researcher used the seven point likert scale. Therefore, it is obvious that there is a gap between expected and actual commitment level in the year 2016. Further through exploring the literature, the researcher identified that dimensions of psychological capital impact on the commitment level of the employees. [2] reported that psychological capital is about individuals’ motivational tendencies attain through hope, self-efficacy, optimism and resilience. Moreover psychological Capital is one of important factors of solving human capital related issues [3]. Accordingly, following hypotheses were developed.

- **H1A** - Self-efficacy positively impacts on Organizational Commitment of staff employees of the sugar manufacturing company.
- **H1B** - Optimism positively impacts on Organizational Commitment of staff employees of the sugar manufacturing company.
- **H1C** - Hope positively impacts on Organizational Commitment of staff employees of the sugar manufacturing company.
- **H1D** - Resilience positively impacts on Organizational Commitment of staff employees of the sugar manufacturing company.

Finally the aim of the study is to find out, weather there is any
positive impact of self-efficacy, hope, optimism & resilience on organizational commitment of staff employees.

MATERIALS AND METHODS

Sri Lanka has to accelerate the production of Sugar in the country. It is obvious that committed employee carder is a major requirement to achieve particular target of the country as productivity depends on the committed workforce. Because of this importance, it is needed to observe the behaviours of the employees of sugar Industry. There is no any previous study to solve the issue and there is a vacuum to be filled by doing this kind of study. Further the researcher developed following conceptual framework.

**Figure: 1**

Conceptual Framework

This study is a quantitative study based on positivistic paradigm and use the deductive reasoning approach to test the already developed hypothesis.

The aim of this study is to explain the relationship between psychological capital and organizational commitment as well as to show the impact of each and every dimension of psychological capital on organizational commitment. Cross-sectional time horizon is used as the time horizon and Survey strategy is the research strategy. Also, the unit of analysis of this study is the individual as the researcher wants to find out the organizational commitment of employees. Convenience sampling technique is used to collect the data. The number of population is 81 and based on that sample was 66 [1].

Finally, this research study is also required both primary & secondary data.

RESULTS AND FINDINGS

The output coefficient table is as follows.

**Table: 1**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coefficient</th>
<th>P Value (significant value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>1.445</td>
<td>0.000</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>0.028</td>
<td>0.725</td>
</tr>
<tr>
<td>Optimism</td>
<td>0.168</td>
<td>0.024</td>
</tr>
<tr>
<td>Hope</td>
<td>0.156</td>
<td>0.033</td>
</tr>
<tr>
<td>Resilience</td>
<td>0.179</td>
<td>0.024</td>
</tr>
</tbody>
</table>

Source: Survey Data

The researcher has discovered that there is no any significant effect from self-efficacy on organizational commitment under the 95% confidence level since output p value (0.725) is greater than critical p value. The $\beta_1$ value of Self-efficacy is 0.024, even though there is no any impact of Self-efficacy on organizational Commitment as the associated p value is not significant.

According to the results, Optimism positively impact on Organizational Commitment ($\beta_2 = 0.168$) since output p value (0.024) is below the critical p value. Therefore, the results are statistically significant under the 95% confidence level (p < 0.05) and H1B was accepted.

When considering the regression analysis, it is clear that hope positively impacts on organizational commitment (Hope $\beta_3 = 0.156$) since p value (0.033) is significant under the 95% confidence level and H1C was accepted.

The findings of the study justified that, resilience positively impacts on Organizational Commitment (Resilience $\beta_4 = 0.179$) and this is statistically significant under the 95% confidence level.

Based on above results the researcher developed following fitted regression line.

$$E \left( \text{Organizational Commitment} \middle/ (\text{Optimism} \quad \text{Hope} \quad \text{Resilience}) \right) = 1.445 + 0.168 \text{Optimism} + 0.156 \text{Hope} + 0.179 \text{Resilience}$$

The determination of Organizational Commitment can be explained through this regression equation line. Regression coefficients of the fitted regression line can be explained as follows.

According to regression equation Constant or the $\beta_0$ is 1.445. This emphasize that, it is expected to get 1.445 organizational commitment, when there is no effect of any variable. As far as, 0.168 is the regression coefficient of Optimism. Which means that, organizational commitment can be increased by 0.168 units, if Optimism increasing by 1 unit while keeping other factors as constants. In the same manner, organizational commitment can be increased by 0.156 units, if hope increase by 1 unit while keeping other factors as constants as the regression coefficient of hope takes 0.156. Finally, resilience shows 0.179 of regression coefficient. Therefore, it can be concluded that organizational commitment can be increased by 0.179 units of when resilience increase by 1 unit while keeping other factors as constants.

Finally, it can be concluded that resilience make the highest impact towards the organizational commitment of staff employees of LSCPL, Sevanagala.

CONCLUSIONS

The study concluded that optimism, hope and resilience are significantly positively impact on OC and self-efficacy was not found to be impact on OC with special reference to the staff employees of this sugar manufacturing company. Hence, the researcher has successfully achieved three objectives of the study. According to the findings of this study, if this organization can pay the attention and take necessary action to upgrade the optimism, hope and resilience of staff employees, they will be able to maintain a committed work force for the organization.
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An Analytical Study on Influencing Factors of Tea Production in Assam

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Abstract: India was the largest tea producing country in the world till 2006. But due to steady growth of production of China at a rate of 8.8 percent per year since 2001, India’s position has been pushed to 2nd place in 2006. The growth of production as well as export of tea has shown a disappointing trend with respect to other leading tea producing countries namely China in the recent years. India produces 945.97 million kgs in 2005 having contribution 27.36 percent of world production share in that year 2005 and was leading tea producing country in the World. After slipping the position to second in the year 2006, the production increases to 1208 million kg in the year 2015 with 23 percent share of world tea production and still remain in the 2nd position. Now China is the leading producer and Kenya is the leading exporting country in the world. Since Assam alone produces more than 52 percent of the national production, it is required to increase its production and productivity level to regain India’s global position. The tea produce in Assam are among the finest across the globe. The climate of the region helps in producing tasty tea. In this context, a details analytical study of factors affecting tea production in Assam has been undertaken. Data collected from the field was analysed by SPSS software. Factor analysis was carried out to get the reduced number of variables which affect tea production in Assam.

Key Words: Tea Production, Productivity, SPSS, Factor Analysis.

I. Introduction

Tea industry of India is one of the oldest industries in India having 180 years old history. The East India Company after losing its monopoly in China in 1832 has taken up cultivation of Tea in India (Assam) in 1834. The credit for creating India’s vast tea empire goes to the British, who discovered tea in India. The first commercial batch of Tea ever produced outside of China came from Assam in 1839. The first tea garden in India was opened by British at Lakhimpur district of Assam in 1835. The first commercial batch of tea ever produced in Assam arrived at England in 1838. Subsequently tea gardens were opened for cultivation of tea plants in the different districts of Assam. These gardens were managed under different companies. The oldest tea company in India “The Assam Company” was accordingly formed in England in 1839 with a capital of Rs. 5 lakh. Still this company is in operation and managing several tea gardens. Since then, tea continues to be the most popular drink in India. From official conferences to railway station, tea (chai) remains the favorite hot beverage among Indians (almost 85% of the total households in the country consume about 81% of the total tea produced.

This sector is crucial to Indian economy. The Tea Industry is one of the oldest organized firm sectors with a large network of tea producers, retailers, distributors, auctioneers, exporters and employees. India is one of the world’s largest producer and consumer of tea, which accounts for 27 percent of the world production and around 12 percent of the world tea export. Tea export from India,
estimated at Rs 17.31 billion during financial year 2006, accounting for 0.4 percent of country’s export in value terms, ranks as the fourth-largest agro export item from India. The industry employs around 1.27 million people at the plantation work and that of 2 million indirectly of which 50 percent are women workers (second largest employer in the organized sector after Indian Railway). In India, there are about 1700 processing units engaged in tea production; while around 1686 big (more than 100 hectares) planters with an output of 1200 Mkg. Besides, as an agro-based industry, the development of plantation industry has contributed greatly towards rural development and urbanization of remote hilly areas by optimum use of land, opening up road and other communication network in those areas.

Tea is commercially cultivated in 16 states of India viz, Assam, West Bengal, Tamil Nadu, Kerala, Karnataka, Tripura, Uttarakhand, Himachal Pradesh, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Odisha and Bihar. Out of which Assam, West Bengal, Tamil Nadu and Kerala are accounted for more than 95% of the total tea production in India. About 78% of the country’s total area under plantation is located in North East India. The tea originating from Darjeeling, Assam and Nilgiris are well known for their distinctive quality worldwide. The tea production in India includes small and big growers. Small tea growers are economically and socially susceptible in India as they are mostly marginal farmers. In India, tea production was first started in Assam in the year 1835. Since then, tea has been cultivating in the most of the parts of Assam and turned as single largest industry in terms of employment. Assam occupied unique place in India by producing 52 of the national production having plantation area of about 3.22 Lakh hectares which is more than half of the country’s total area under tea.

Table:1. Tea at a glance: as on the year 2015

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Tea Production in world</td>
<td>5304MKg</td>
</tr>
<tr>
<td>02</td>
<td>Tea Consumption by tea producing countries itself</td>
<td>4999MKg</td>
</tr>
<tr>
<td>03</td>
<td>Tea export in world</td>
<td>1801MKg</td>
</tr>
<tr>
<td>04</td>
<td>Highest tea producing country</td>
<td>China (2278 Mkg)</td>
</tr>
<tr>
<td>05</td>
<td>Highest tea exporter country</td>
<td>Kenya (450 Mkg)</td>
</tr>
<tr>
<td>06</td>
<td>Tea Production in India</td>
<td>1207 Mkg</td>
</tr>
<tr>
<td>07</td>
<td>Tea Consumption in India</td>
<td>948MKg</td>
</tr>
<tr>
<td>08</td>
<td>Tea Export from India</td>
<td>234MKg</td>
</tr>
<tr>
<td>09</td>
<td>No. of tea producing states in India</td>
<td>16</td>
</tr>
<tr>
<td>10</td>
<td>No. of big tea estates in India (size more than 10.12 Ha)</td>
<td>1686</td>
</tr>
<tr>
<td>11</td>
<td>No. of Small Tea Growers in India (size less than 10.12 Ha)</td>
<td>157504</td>
</tr>
<tr>
<td>12</td>
<td>Highest tea producing state in India</td>
<td>Assam</td>
</tr>
<tr>
<td>13</td>
<td>Tea Production in Assam</td>
<td>653MKg</td>
</tr>
<tr>
<td>14</td>
<td>No. of big Tea Estates in Assam</td>
<td>761</td>
</tr>
<tr>
<td>15</td>
<td>No. of Small Tea Growers in Assam</td>
<td>83880</td>
</tr>
</tbody>
</table>

Source: ITC report 2016 and Tea Board of India report 2016

II. Objective of the Study:

a) To find the present scenario of tea production in Assam in context to national scenario.

b) To find factors affecting tea production in Assam.

III. Review of Literature:

Mann (1907) and Harison (1965) were of the opinion that, for the growth of tea plant, the climatic conditions as to air, moisture and temperature within the soil climate, are very essential. Apart from ideal climate, the proper drainage, very deep cultivation, deep
trenching, green cropping and mulching etc. are important at the beginning of a tea plant which allow the roots to develop in a healthy and vigorous manner for raising of crop productivity. 

**Basu and Sharma (1969)** observed the low average yield in the plains of West Bengal, North bank, South bank and Cachar districts and find that, despite considerable improvements in agro-chemical techniques, the average yield is not going to increase at significant rate. Thus, it declines during the last two decades. With a view to finding out the possible reasons for low yields as well as its downward tendency, once the tea plant attains the age of 25 years it stabilizes its yield. They come to the conclusion that the plant age and kind of tea plant uprooting and replanting soil and soil management, infilling and management, shade and drainage are the main factors for increasing the yield rate.

**Grice (1971)**, made an experiment between the shade and the cultivation of tea and showed how per hectare yield under different degree of shade is affected by nitrogen, soil type and age of tree. The physical factors of tea gardens are equally important which vary yield pattern. In this connection, there are numerous studies.

**Chakravartee (1971)** tried to show how the pattern of crop distribution obtains from unpruned tea and pruned tea affect the yield of tea. They tried to relate the seasonal change in the direction of movement of photosynthesis from the maintenance leaves of unpruned bushes and suggested that pruning is important operations, which decides the productivity of tea bushes. The following inferences can be drawn from their studies: (a) the October is the earliest possible month to commence resting of tea bushes prior to pruning. (b) the resting earlier than October does not help in building up starch reserve in the roots as the photosynthesis from the maintenance leaf canopy are still moving upward. (c) Considering all these factors, December and January are to be ideal months for pruning tea bushes in North-East India.

**Biswas (1981)** tried to study all these factors on experimental basis, which are based on 16 to 18 years of data of monthly yield, rainfall and related data, which were collected from the tea estates of N.E. India.

**Biswas and Chakravarti (1992)** opined that balanced fertilizer use for tea is an important measure for increasing productivity. While studying the Nitrogen-Phosphate-Potassium (NPK) manuring in mature tea, using yield-fertilizer relationship, they found that annual application of balanced dose of NPK is needed to maximize the productivity level. For sustaining a yield of about 23 q/ha in different regions, generally a dose of nitrogen in the range of 100-140 kg/ha, phosphate between 20-50 kg/ha and potash between 80-140 kg/ha would be required.

**Sinha, et. al. (1992)** found that application of elemental sulphur 20-40 kg/h increased significantly during three years of experimentation in tea estates in N. E. India. They suggested that sulphur should be introduced as a routine fertilizer input particularly in cases where SOA (ammonium sulphate) is not applied.

**Borbora, Baruah and Kar (1994)** emphasizes on mechanical plucking to maintain the plucking round during peak cropping season, which coincides with higher absenteeism of pluckers, to check the plucking cost and to provide an mechanical aid for increasing plucker's productivity, to harvest the increased production economically and, thereby, maintain the profitability of tea industry in long run. Maximum gain in quality of tea can be observed with an increasing proportion of "two-and-a-bud" shoots in harvest during fast growing period and fast fermenting clone. However, equal proportions of both 'three-and-a-bud' and 'two-and-a-bud shoots' yield during the early and mid seasons and in the medium or low fermenting clones. During the late season, maximum gain in yield with minimum reduction in quality can be obtained in increasing the proportion of "three-and-a-bud" shoots in harvest.

**Chakravartee, Biswas and Bordoloi (1994)** observed the adverse effect of unscientific pruning was observed when they attempted to evaluate the effects of pruning cycle of different lengths, both in plains and hills. They came to conclusion that for sustaining both crop and quality of tea, repeated adoption of pruning cycles of 3-4 years length may not sustain high productivity without due care to
age, vigour and bush frame and 3 years cycle help sustaining productivity better than 4 years cycle. Plucking standard has a direct bearing on yield and quality of tea.

Barman (1994) try to explain how density of shade influences and physiology in the metabolic processes for higher yield in the studies entitled 'Influence of Shade on Physical Parameters in Tea'. They come to the conclusion that shade reduces the leaf temperature from full sun - 30% - 50% - 70% shade by 1 °C in each case and the higher reduction of leaf temperature was found with 70% shade. They also observe that shade influences the plants to retain more water for higher turbidity of cells and the water potential is higher in shaded than unshaded conditions. However, these studies do not cover all the aspects of ecological factors, which are more responsible for the higher productivity and yield. As it is seen, climate has been changing and most of the areas taken for the present study area suffer from flood during rainy season. In the present section of review, it may be said that most of the studies are area specific and based on some particular parameters of physical factors of land, which may not be applicable to all the areas, which results in negligence of integrated approach. After reviewing the concerned literature on ecological and physiographical factors of tea cultivation in Assam, it may be concluded that the underground water, terrain conditions and climatic factors especially rainfall and temperature are major factors which influence the production and productivity of tea. The proper drainage and tree shades are the common activities in the tea-farms to stabilize the effects of such physical factors and to regulate the growth of tea plants.

V. Research Methodology:

Research Approach:
The study is explorative, descriptive, and analytical and survey based in nature. The study based both primary and secondary data.

Data Collection: Both primary and secondary data have been collected for the purpose of the study. Primary data was collected through structured questionnaire. To get personal views and in depth details, interview with managers of sample tea estates have been done. Secondary data was collected from related literature published in books, journals, reports, statesman, bulletins, tea statistics and the reports of respective sample tea estates.

Sampling Procedure:

a) Universe of the study: Exhaustive list of Tea Estates/Gardens of Assam registered with Tea Board of India having a size of more than 10.12 hectare taken as the universe of the study. The total number of tea estates as per aforesaid criteria i.e. plantation size above 10.12 hectare in Assam registered with Tea Board of India is 761. Hence the universe for this study is 761(GOA; 2015).

b) Sampling Method: Universe for this study is spread in different geographical location of Assam. Most of the tea estates are located in the far flanged area. Considering these facts, researcher used judgment sampling method for the study.

c) Sample Size:

i) 10% of sampled Tea estates selected through judgment sampling method to meet the objectives of the study. Hence, total sample size is 76. Two respondents taken from each sampled tea estates namely one as General Manager/Manager/ Asst. Manager/Deputy Manager wherever is applicable and another as factory manager. Hence, total size of respondents is 152 (76 tea estates X 2). Data collected through structured questionnaires in five point Likert scale indicated most important to not important indicating the intensity of the variables.

Data Analysis:
Statistical tools like (i) Linear Growth Rate Analysis (ii) Trend Analysis (iii) Correlation Analysis (iv) Factor Analysis and statistical software SPSS were used by the researcher.

VI. Data Analysis and Findings:
A. Present scenario of tea production in Assam:

An attempt is made to examine the present scenario of tea production in Assam in context to nation. It is initiated with estimation of index numbers of tea production of Assam and national tea production using these indices an attempt is made to find the pattern of growth.

Table: 4. Index numbers of Tea Production of Assam and India

(Base year 2006=100)

<table>
<thead>
<tr>
<th>Year</th>
<th>Assam</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>2007</td>
<td>102</td>
<td>100</td>
</tr>
<tr>
<td>2008</td>
<td>97</td>
<td>100</td>
</tr>
<tr>
<td>2009</td>
<td>99</td>
<td>100</td>
</tr>
<tr>
<td>2010</td>
<td>96</td>
<td>98</td>
</tr>
<tr>
<td>2011</td>
<td>101</td>
<td>101</td>
</tr>
<tr>
<td>2012</td>
<td>117</td>
<td>115</td>
</tr>
<tr>
<td>2013</td>
<td>125</td>
<td>122</td>
</tr>
<tr>
<td>2014</td>
<td>121</td>
<td>121</td>
</tr>
<tr>
<td>2015</td>
<td>130</td>
<td>125</td>
</tr>
</tbody>
</table>

Source: Computed from Tea board of India Reports

Figure 1. Production of Assam vis-à-vis India

The figure 1 shows the prediction using trend projection model of tea production of Assam vis-à-vis India. A constat flat curve observed for both Assam as well as India during the period 2006 to 2011. In the year 2012, tea production of assam increases with respect to the previous year 2011 and hence the curve gone toward upward direction. Same pattern also observed for the production curve of India in the year 2012. In the year 2013, the curve of Assam gone upward further indicating ineraese in tea production in compare to the previous year 2012. Here also similar pattern shown by the curve of India with an inarasing trend with respect to the corresponding previous year. In the year 2014, tea production of Assam decreases as indicated by the slop of the curve and same slope reflected in the tea production of India for the 2014. The tea production of Assam again inarases in the year 2015 as
reflected from the slope of the curve, in the same year tea production of India also increases. Thus it is observed that the trend of tea production of India is completely influenced by the tea production in Assam.

Table: 5. Growth Rate Analysis:

<table>
<thead>
<tr>
<th>Production (in Mkg)</th>
<th>Year</th>
<th>Percentage of Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2006</td>
<td>2015</td>
</tr>
<tr>
<td>Assam</td>
<td>502.04</td>
<td>652.95</td>
</tr>
<tr>
<td>India</td>
<td>967.71</td>
<td>1207.23</td>
</tr>
</tbody>
</table>

Source: Calculated by the researcher from Tea Board of India report.

Growth of tea production in Assam and India during the period 2006-2015 were calculated by using simple percentage. It is observed from the analysis that the growth rate of Assam is 30% and that of India is 24.75%. The growth rate of Assam is higher is due to increase in number Small Tea Growers in Assam during the period.

Correlation Analysis using SPSS software:

Table 6: Correlation table of Tea production in Assam and Tea Production in India

<table>
<thead>
<tr>
<th>Production of Tea in Assam</th>
<th>Pearson Correlation</th>
<th>Production of Tea in India</th>
<th>Pearson Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sig. (2-tailed)</td>
<td>1</td>
<td>.990**</td>
<td>1</td>
</tr>
<tr>
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**. Correlation is significant at the 0.01 level (2-tailed).

Correlation Table 6 shows that there is a strong positive Pearson correlation (R=.990) between production of tea in Assam and production of tea in India. The ANOVA test shows that the production of tea in Assam (p=.000 < .01) is statistically significant in relation to production of tea in Assam. A simple regression was fitted and the equation thus obtained is as follows:

Production of tea in India = 152.009 + 1.639 production in Assam

B. Factors affecting tea production in Assam:

The researcher identified the factors affecting tea production in Assam on the basis of established literature. A tabular form structured questioner in English language prepared with twenty seven identified variables to collect field data from respondents of the sampled tea estates. Five point Likert scale indicated most important (score =4) to not important (score =0) used to find the strength of the variables. Data collected from 76 tea estates of different district of Assam; taking one respondent as tea General Manager/Manager/Asst. Manager and another from Factory Manager with total 152 respondents. Data have been compiled in the excel sheet and then transfer to SPSS software for analysis. The factor analysis carried out by SPSS software and factors were extracted by principal component analysis method.

Table: 7. KMO and Bartlett's Test

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | .600 |
### Bartlett's Test of Sphericity

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### Table: 8. Total Variance Explained

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Extraction Method: Principal Component Analysis.

Table: 9. Rotated Component Matrix

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Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 13 iterations.

Result of the analysis comprises with Correlation, KMO and Bartlett's Test, Total Variance Explained, Rotated Component Matrix and Component Transformation Matrix. Correlation table shows the well relation amongst all the variables under consideration. It can be revealed from KMO and Bartlett’s Test that the KMO value is .6 and the analysis is significant at .01 level. There are eleven factors extracted by using Principal component analysis and Kaiser Normalization method. The factor loading .4 is taken as threshold limit and hence factor loaded with .4 and above has been extracted. The Eigen value of these eleven factors is greater than one and total cumulative percentage of Rotation Sums of Squared Loadings of these factors is 72% indicating good acceptability of result. The components are renamed as follows:

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<th>Component 7 (FAC7)</th>
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</tr>
<tr>
<td>Component 6 (FAC6)</td>
<td>Environment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It is observed from the Table 8 that the extracted component 1 which is renamed as “Material” has the highest loading 13.59 percent amongst all eleven components. Hence the material has the highest influence in the tea production in Assam. The component 2 that is renamed as Technology has loading 10.02 percent followed by “Weather Condition” loaded by 8.05 percent. The other components which are renamed as Variety of Tea, Soil type, Environment, Input Cost, Infrastructure, Energy, Rainfall and Welfare are loaded by 6.85 percent, 6.16 percent, 5.86 percent, 4.98 percent, 4.38 percent, 4.25 percent, 4.01 percent and 3.84 percent respectively.

V. Conclusion:
The growth of production of tea production in Assam, which is the backbone of the economy of state as well as largest employment generator, are not up to the mark. It is observed from the study that the growth of tea production in Assam is at par with the tea production of India. The production growth rate of tea in Assam as well as India was almost nil during the last decade. The growth rate of tea production in Assam started increasing from the year 2010 and similar pattern seen for the national production also. As Assam contributing more than fifty percent of national production, the trend of annual national production directly depends on the trend of annual tea production in Assam. The correlation analysis shows a strong positive correlation between the tea production in Assam and the tea production of India. The most of the big tea planters have been withdrawing plantation as these companies are mainly emphasizing on packaging and marketing of tea using their own brand. The situation has been improving since 2010 in both state as well as national level due to increase in the number of Small Tea Growers (STG). In Assam, unemployed youth took tea production in small scale basis as their livelihood options and number of Small Tea Growers increases considerably in the upper Assam districts. Different factors that influence the tea production of Assam have been indentified from the field survey. Twenty seven different identified variables were deduced to eleven variables through factor analysis using principal component analysis method. Materials influence highest in the tea production of Assam followed by technology, weather condition. Variety of tea, soil condition and rainfall came as individual variables which effect tea production in Assam. Proper application and supply of material will enhance the tea production in Assam. Most of the workers of tea estates engage in plantation and plucking process. It is observed during the field visit that the most of the tea estates are suffering from the shortage of daily worker engage in plantation area. Some of the govt. scheme like MGNREGA influencing negatively in the tea production in Assam. The daily worker to be engaged by the tea estates are interested to work under such Govt. scheme instated of working in tea estates which leads to the worker crises. The interval of harvesting of tea leaf increase due to worker crises and hence the tea production as well as quality of tea decreases. To overcome such worker crises, new technology on tea plantation to be adopted for enhancing tea production in Assam.

Reference:


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Factors Influencing Rental Office Selections (Case Studies: Class A Rental Offices Multifunction in Surabaya)

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Abstract-The high growth of rental offices in Surabaya had not been directly proportional to the level of occupancy. The developers role were very important in providing rental offices for business activities, but the developers only paid attention on the location factor while the tenant preference was ignored. According to the tenants location was not the only important factor. There are other factors considered in choosing a rental offices such as accessibility, environment, building exteriors, building interiors, facilities and services, as well as finance and lease. This research aimed to determine the main factors that influence the choosing of a rental office from the tenants point of view. The tenant of class A rental office multifunction in Surabaya was as the population because it had the best specification among other classes. The sampling technique used was simple random sampling. This research was a positivism study that uses quantitative research strategies and factor analysis techniques. Finding showed that there were three most important factors in the selection of rental office. They were, in a sequence, "physical building", "accessibility" and "facilities and services".

Index Terms- Preference, Real Estate, Rental Offices, Tenants

INTRODUCTION

Growth of rental offices in the major cities in Indonesia began to increase due to higher land prices and limited land in the down town (in Kompas news report in 2017). Rental offices in Jakarta increased in the number of supply in 2016. It was recorded 5.3 million m². In Bandung, the rental office supply index increased 11.03% in 2015. Similarly, in other cities, Medan, Tangerang, Semarang and Makassar, according to Coldwell Banker Indonesia, the growth also increased from the year of 2015 to the second quarter of 2016. The amount of rental office supply was increasing, but not for the number of its demands.

Surabaya has the largest rental office growth in terms of supply and demand compared to other big cities in Indonesia. According to Bank Indonesia's survey on Commercial Property Developments report in Indonesia in the fourth quarter of 2016, Surabaya is proven to have an annual growth of the index of commercial property supply, especially for rental office of 22.65% and demand index of 9.21%. Although the growth of supply and demand for rental offices in Surabaya is the highest among other cities, the occupancy rate decreases, similarly with other big cities. According to a survey of property consultants Jones Lang LaSalle in 2017, the decline was dominated by class B and C rental offices, while for class A did not decrease. The decrease in occupancy occurred early in 2016 due to the sluggish economic impact. Rental office prices are also increasingly expensive due to an increase in construction costs.

However, many tenants are not concerned about the high rental rates because there are other factors they consider in choosing a rental office. Tenants who do not question the high rental price due to the tenants trust in the image of the developer and the strategic location of the rental office. On the contrary, according to Kompas news, the developers only care about building in certain strategic locations and their office spaces are rented, while the corporate preferences as tenants are not noticed.

From the above facts, it is hypothized that location is not the most important factor in choosing a rental office. There are several other factors that companies consider in making decision to inhabit the office [1][2]. These factors are building characteristics, facilities, proximity to business associates, cost, tenant stability, space flexibility, lighting and ventilation as well as free from air and sound pollution [3]. Meanwhile, according to Celka (2011), rental terms and conditions are the main factors followed by location, accessibility, building characteristics, building features, equipment completeness and other supporting factors [4].

The existence of various other factors in the selection of rental offices should be considered since the tenants no longer see the office as a basic need, but a choice. This tendency towards preferred choices is called preference [5]. A good-sized tenant will be more likely to choose to occupy a better office according to the available level of office class. Therefore, the developer must know the factors that the tenant considers in the selection of the rental office in order that the rental office developed in accordance with the tenants preferences.

The purpose of this research is to determine the main factors that affect the tenants in choosing a rental office. This research is important because there are still many rental offices that have not been developed in accordance with the tenants preferences.
preferences, where the developer only prioritizes the location factor and has not considered the tenants preference. In addition, this research is also important because the lack of research on rental offices seen from preferences tenant and real estate knowledge. For real estate market analysis, recognizing and understanding the factors of selecting a rental office is very important for the developer to ensure that the rental office supply developed can fit the tenants preferences.

II. RESEARCH ELABORATIONS

2.1. Rental Office

Moekijat (1977) stated that office is a place used to carry out administrative works that aim to provide communication and recording services [6]. According to Marlin (2008), rental office is a group of offices in a single building resulting from a rapid economic growth in major cities, such as industry, building and construction, trade and banking [7]. It can be concluded that the rental office is a building in which there are rooms rented completely with furnished facilities and services for accommodating as well as supporting the office functions, such as business activities and administrative works.

Kyle and Baird (1995) said that office space is divided into Class A, B, C or D, based on the guidelines issued by the building owners and Managers Association International as well as using the rules of the Building Owners and Managers Association (BOMA International) conducted a survey of market conditions in each semester [8]. Although building classes vary from one city to the other, it is usually determined by three main factors, i.e. building age, location, level of occupancy, and the cost of the rent.

2.2. Factors Influencing Rental Offices Selections

To meet their needs, the tenants will select where the rental offices they will choose. According to Newmark and Thompson (1977), human needs have levels, if the most basic needs have been met, people will try to meet other needs [9]. The need to have an office is a basic requirement for tenant companies. These needs may progress to a level of four or five depend on the tenant company, where a good-tenant company will move to occupy the better offices according to the level of office class available from class D to the best class A. If the tenant company has been able to occupy the rental office with the best class, the tenant company has reached the highest level of the hierarchy of its needs and will have a desire to always fulfill their desire. This desire is called preference.

Preferences are a tendency towards something or prefer choice [5]. Porteous in Nursusandhari (2009) defined preferences as the consumers inclination in making decisions to choose something they prefer over others [10]. The usual preference between one consumer and another consumer is not the same, so it can be used as a reference of the plan of something based on the desire or participation from consumers. The consumer preference in selecting rental office are surely varied. There are influences from inside and outside of the company which come into consideration in assessing the factors of the rental office selection. The relation to perception, the consumer preference in selecting rental office is a selection towards the stimulus that is affected by the varied factors in selecting the rental office. While the process of understanding the stimulus is called perception [11].

The selection of rental office can be seen from the behavior of the tenant, the role and influence given by the developers property, as well as the influence from the perception of a tenant [12][13][14][15]. According to Atmosudirdjo (1982), there were some factors that were noted and taken into consideration on selecting the office, such as offices neighborhood, proximity to the general office buildings, rental office cost, traversed by public transportations (accessibility), proximity with the labor market, at the center of financial activity (location), close to the government building, as well as the level of security [16]. According to Moekijat (1989), the factors which are considered in determining the location of the office is location, feasibility, financial, and physical condition [17]. While Terry in Gie (2000) said the factors that are taken into consideration in selecting the office is the character of the building, building facilities, the proximity of the office with other companies, cost, stability of tenants, the flexibility of space, lighting and ventilation as well as free air pollution and noise [3]. According to Quible (1996), there are three determining factors of office location, financial factors, operational factors and factors of employees [18]. According to Celka (2011), determinants of preference in selecting tenants of a residential tenancy office location, rental terms and conditions, accessibility, building characteristics, completeness, thoroughness of building equipment and other factors [4]. By adopting the appropriate factors with the issues that will be examined in the context of the selection of office space rent, a summary of the various factors which have been mentioned will help focusing on a number of factors which will be selected. Some of the factors used in this research including the location, accessibility, environment, building exteriors, building interiors, facilities and services as well as finance and rent. Such seven factors elucidated with some parameter on each factor.

2.3. Consumers Decision Making

According to Kotler (1999), there are stages in decision making by consumers before making a transaction or purchase, namely the introduction of needs, information search, alternative evaluation, purchasing decisions, and post-purchase evaluation [19]. Meanwhile, according to Pompian (2006), decision-making is based on collecting all available options, taking notes and estimating events, listing information related to objects and ranking consecrations of each action taken [20]. Most individuals cannot describe the problems they face, so affecting the processing of information and affecting the decision-making they must take. On the other hand, the average individual will choose something based on subjectivity and their underlying preferences and judgments though less than ideal. Some studies have argued that there are limitations of rational assumptions in the behavior of decision making in the property market. Research by McMaster and Watkins (2000); Leishman and Watkins (2004) and Wyatt (1999) have supported the assertion that the role and behavior of real estate actors in markets differ and do not have fully perfect information about markets [21][22][23]. So many factors in choosing a rental office that can be chosen from, ultimately the tenants will be limited to behave rationally and simply decide to choose according to his choice.

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2.4. Method
This research applies positivism paradigm with quantitative method. Its population is tenant of class A rental office multifunction in Surabaya. Class A rental offices multifunction are selected for having the highest specifications of any other office class and it is assured that all class A rental offices have met the most superior international standards in design, construction, facility and service management, price, age of the building and located at the center of main activities. In addition, the occupancy rate of the class A rental office in Surabaya also did not decrease compared to other classes. Based on the secondary data from property consultant, it is known that the number of class A rental office multifunction in Surabaya is six, but only four rental office buildings can be researched. So the population of tenants contained in the four rental offices is 230 tenants. From the four class A rental offices multifunction that can be researched, which is permitted to be surveyed, only three rental office with the following distribution:

![Location of Each Case Study Building in Surabaya](image)

Table 1. Rental Office Profile

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Location</th>
<th>Land Area</th>
<th>Building Area</th>
<th>Development</th>
<th>Tenants</th>
<th>Occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>East Surabaya</td>
<td>4.700 m²</td>
<td>16.850 m²</td>
<td>1995</td>
<td>90</td>
<td>78%</td>
</tr>
<tr>
<td>2</td>
<td>East Surabaya</td>
<td>4.104 m²</td>
<td>31.067 m²</td>
<td>2000</td>
<td>65</td>
<td>90%</td>
</tr>
<tr>
<td>3</td>
<td>West Surabaya</td>
<td>8.000 m²</td>
<td>18.920 m²</td>
<td>2010</td>
<td>30</td>
<td>90%</td>
</tr>
</tbody>
</table>

Source: Author, 2018

The sampling technique uses simple random sampling. Based on the calculation of the formula, the number of 146 samples of tenants is obtained.

The data collection technique is started from literary review to get the factors of rental office selection. There are seven variable factors and some parameters used in this research, that is:

Table 2. Variabel dan Parameter Faktor-Faktor Pemilihan Kantor Sewa

<table>
<thead>
<tr>
<th>Factors</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Image and prestige of the location; Visibility and address of prestigious office building; Locations in CBD</td>
</tr>
<tr>
<td>Accessibility</td>
<td>Access to public transportation; Access to government offices; Access to mall, restaurant, hotel; Access to recreational and sports facilities; Access to administrative facilities &amp; financial transactions; Access to customers and business partners</td>
</tr>
</tbody>
</table>
After obtaining the seven factors and several parameters, the distribution of questionnaires are then carried out for the tenants of the office with some questions in accordance with each parameter. The parameters are questioned by Likert scale by generating the answers with a score of 1 (strongly disagree) to score 6 (strongly agree) and furthermore the scores can be further analyzed.

After the data were collected, the data were analyzed using factor analysis aimed at simplifying the diverse parameters of the research variables, where they were not well identified [24]. This method is chosen because it can know the factors of selection of the building and its reputation is good; New building age; Large building; The luxurious exterior design of the building; Landscape design and greenery. In the final stages, the distribution of questionnaires are then carried out for the tenants of the office with some questions in accordance with each parameter. The parameters are questioned by Likert scale by generating the answers with a score of 1 (strongly disagree) to score 6 (strongly agree) and furthermore the scores can be further analyzed. Furthermore, the parameters to be a member of that factor are clarified with the greatest value through the Rotated Component Matrix test to see whether the factors are related to each other. In the final stages, the interpretation of the factors formed by making new naming is done if there are new factors formed. In addition, the order of grouping factors based on the value of % of variance and the loading factor value of the final result of factor analysis will be known. The greater the value of % of variance, the greater the factor gives effect. As for the loading factor value, if the whole parameter has a loading factor value above 0.5, all parameters are considered to have strong enough validation to explain the latent construct.

### III. RESULTS OF FINDING

Result from the factor analysis show the following:

<table>
<thead>
<tr>
<th>Factors</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>The low air pollution level; The low ambient noise level; Safe neighbourhood (low crime)</td>
</tr>
<tr>
<td>Building exteriors</td>
<td>Name of the famous building and its reputation is good; New building age; Large building; The luxurious exterior design of the building; Landscape design and greenery</td>
</tr>
<tr>
<td>Building interiors</td>
<td>Flexibility of arranging space; Lighting &amp; contingency in office building; Layout arrangement and circulation of office building</td>
</tr>
<tr>
<td>Facilities and Services</td>
<td>Parking area extensive and adequate; Communication and internet facilities; Access to in the building (elevator and stairs); The presence of good security, hygiene and fire protection facilities; Available for activities support room facilities; Responsive building management</td>
</tr>
<tr>
<td>Finance and Lease</td>
<td>Low rental rates; Flexibility of rental rules; Low cost of management and service</td>
</tr>
</tbody>
</table>

Source: Author, 2018

<table>
<thead>
<tr>
<th>Factors</th>
<th>Parameters</th>
<th>Loading Factor</th>
<th>% of Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Factor 1) Physical Building</td>
<td>The luxurious exterior design of the building</td>
<td>0.786</td>
<td>29.401</td>
</tr>
<tr>
<td></td>
<td>Landscape design and greenery</td>
<td>0.780</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large building</td>
<td>0.695</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Building orientation is right</td>
<td>0.650</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Name of the famous building and its reputation is good</td>
<td>0.564</td>
<td></td>
</tr>
<tr>
<td></td>
<td>New building age</td>
<td>0.550</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Access to public transportation</td>
<td>0.508</td>
<td></td>
</tr>
<tr>
<td>(Factor 2) Accessibility</td>
<td>Access to government offices</td>
<td>0.817</td>
<td>10.829</td>
</tr>
<tr>
<td></td>
<td>Access to mall, restaurant and hotel</td>
<td>0.789</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Access to recreational and sports facilities</td>
<td>0.746</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Access to administrative facilities and financial transactions</td>
<td>0.738</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Access to customers and business partners</td>
<td>0.596</td>
<td></td>
</tr>
<tr>
<td>(Factor 3) Facilities and Services</td>
<td>The presence of good security, hygiene and fire protection facilities</td>
<td>0.791</td>
<td>8.211</td>
</tr>
<tr>
<td></td>
<td>Access to in the building (elevator and stairs)</td>
<td>0.736</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Available for activities support room facilities</td>
<td>0.644</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communication and internet facilities</td>
<td>0.544</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Responsive building management</td>
<td>0.528</td>
<td></td>
</tr>
<tr>
<td>(Factor 4) Environment</td>
<td>The low ambient noise level</td>
<td>0.847</td>
<td>5.809</td>
</tr>
<tr>
<td></td>
<td>The low air pollution level</td>
<td>0.785</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Safe neighbourhood (low crime)</td>
<td>0.777</td>
<td></td>
</tr>
<tr>
<td>(Factor 5) Interior and Parking</td>
<td>Flexibility of arranging space</td>
<td>0.765</td>
<td>5.355</td>
</tr>
<tr>
<td></td>
<td>Layout arrangement and circulation of office building</td>
<td>0.745</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lighting and contingency in office building</td>
<td>0.652</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parking area extensive and adequate</td>
<td>0.646</td>
<td></td>
</tr>
</tbody>
</table>
Table 3: Factors, Parameters, Loading Factor, and % of Variance

<table>
<thead>
<tr>
<th>Factors</th>
<th>Parameters</th>
<th>Loading Factor</th>
<th>% of Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Factor 6) Location</td>
<td>Visibility and address of prestigious office building</td>
<td>0.787</td>
<td>4.470</td>
</tr>
<tr>
<td></td>
<td>Image and prestige of the location</td>
<td>0.745</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Locations in CBD</td>
<td>0.681</td>
<td></td>
</tr>
<tr>
<td>(Factor 7) Finance and Lease</td>
<td>Low cost of management and service</td>
<td>0.753</td>
<td>4.009</td>
</tr>
<tr>
<td></td>
<td>Low rental rates</td>
<td>0.741</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flexibility of rental rules</td>
<td>0.720</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author, 2018

Based on the table 3, the seven factors that have different correlation values are formed. The number of the seven factors formed through factor analysis is the same as the amount grouped based on the literature review but there are only four factors where the addition and subtraction parameters occurred after the rotation factor so that the interpretation with a new name is required. Factor 1 which initially consists of only 6 parameters, finally after the factor analysis adds "access to transportation facilities" parameters, in which that parameter is originally located at factor 2. Similarly, factor 5 which originally consisted of only 3 parameters finally after the factor analysis adds, the "parking area extensive and adequate", in which the parameters are originally located at factor 3. While factor 4, factor 6 and factor 7 did not change after the factor analysis. So there is a change of name on factor 1 into physical buildings and factor 5 into the interior and parking due to the addition of parameters within the factor.

Factor 1 "physical building" is the most influential factor compared to other factors. This is showed by the amount of data diversity or the total variance of 29.401% of the total of the seven groups of factors generated. While the parameter of "the low ambient noise level " is considered the strongest to explain the latent construct because it has the highest loading factor value of all the parameters, i.e. equal to 0.847.

The result of factor analysis shows that the physical buildings factor becomes the most influential factor in choosing rental office by tenants. The strongest parameters of the physical buildings factor to explain its latent construct is the luxurious exterior design of the building. This is not in accordance with Adnan and Daud (2010) research, where the buildings factor has the lowest weight in the two sectors of the business field and is not a top priority in the three sectors of the business field researched [25]. This results are also the contradiction to Adnan et als (2009) research, where design and space aspects are not given high priority by various tenant stakeholders [26]. However, in this research it is possible that the luxurious exterior design of the building becomes the primary choice in the physical buildings factor because the selected office building is a class A rental office, in which they generally have international standards that superior in design [27].

The location factor in this research only become the fifth consideration in the selection of rental office by tenant. This is not in accordance to researches by Dent and White (1998), Goddard (1973), Daniel (1991), Wyatt (1999), Coffey dan Shearmur (2002) and the neo classical theory of property which put the location factor (commercial center for agglomeration) as an important factor which was not applied in this study [28][29][30][23][31]. This research agree to Higgins (2000) dan Sing (2004) that location is not a top choice of tenants and is also reinforced by the perspective of decision-making behavior by Leishman dan Watkins (2004) which expressed the importance of factors other than rent and location [1][2][22].

The location factor is not the primary choice in this research with the assumption that the location of a class A rental offices has been considered in depth by the developers with certain conditions so that the location of class A rental offices is more superior than rental office of class below it. However, the positioning and development rule of the premier rental offices is unlikely to be far from the main center of a city, so this criterion is not the main criterion by tenants. Tenants choose "building physics" as the most important factor because tenants of class A rental offices are dominated by large corporations. It means that the large firms with strong capital tend to choose a class A rental office with high rent to get a positive value from a rental office building image that can give the company the better impression to customers as well as business partners. It can affect the level of confidence of the customers and business partners getting higher and promising better business potential. In addition, the tenant chooses a class A rental offices is due to the facilities and services than the class below so that the employees will feel comfortable in doing office activities on a daily basis.

IV. CONCLUSION

The selection of rental offices for each tenant company has different considerations and preferences. Result from the formation of joint factors influencing the preference of selection of class A rental office multi function in Surabaya, concluded that there are three main factors that preferred of the tenant i.e. "physical building", "accessibility" and "facility and service". Location factors that are only a major consideration of the developer and include the most important factors in the neo classical theory of property are not applicable in this research. Physical building factors become the most influential factor in the selection of rental offices by tenants. This research proves that the location factor is not the only main factor that tenants consider in choosing a rental office, but there are other factors besides the location factor in the selection of rental offices.

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REFERENCES


Identification of Waste Management Application in Kelurahan Jambangan, Surabaya

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Abstract - Kelurahan Jambangan is one of the urban villages located in Jambangan District, Surabaya City. Residents of Jambangan Urban Village are accustomed to managing waste through garbage bank, composting, recycling and implementing 3R (Reduce, Reuse, Recycle). But there is still waste that is often found in PDU (Recycling Center) Jambangan which until now has not been recycled optimally. If the processing and segregation of garbage at the household level is maximal, then this type will already be sorted in the garbage bank and taken to collectors, not through the recycling center. Seeing this, waste management in Kelurahan Jambangan such as garbage bank, recycling of garbage, and composting in Kelurahan Jambangan need to be studied deeper and optimized handling of garbage management for better future.

Keywords - Garbage, Waste Management, Kelurahan Jambangan, Optimization of Waste Management, 3R.

I. INTRODUCTION

The agenda of the SDG’s (Sustainable Development Goals) one of the goals of the 12th environment pillar is 'responsible production and consumption' - ensuring sustainable consumption and production patterns. One of the indicators contained in the objective is to reduce waste production through 3 R, namely: Reduce, Reuse, and Recycle. Efficient management of shared use of natural resources, and the way communities dispose of toxic waste and pollutants are important targets for achieving this goal. In addition, encouraging industries, businesses, and consumers to recycle and reduce waste is just as important, as it also supports developing countries to move toward a more sustainable consumption pattern by 2030. (United Nation Development Programme, 2015).

Kelurahan Jambangan is one of the urban villages located in Jambangan District, Surabaya City. Residents in Kelurahan Jambangan are accustomed to managing waste through waste bank, composting, recycling and other 3R (Reuse, Reduce, Recycle) activities. However, there are 2 types of waste that are still often found in PDU Jambangan which until now has not been recycled optimally, namely plastic waste and plastic bottles that should have been sorted in the household. His side within a day still receive a large trolley for plastic crackle and half a trolley for plastic bottles. In fact, if the processing and segregation of garbage at the household level is maximal, then this type will already be sorted in the garbage bank and taken to collectors, not through the recycling center.

Characteristics of each of these activities need to be studied in more depth and optimized if there are still not optimal handling. The intended optimization is from each of these activities that need to be improved or added facilities. He hoped the waste processing in Jambangan Village could be better. Particularly in shaping the mindset of citizens to care for the environment at home. (Coordinator of PDU Jambangan, Waskito, 2017)

Based on the above background, waste management in Kelurahan Jambangan such as garbage bank, recycling of garbage, and composting in Kelurahan Jambangan need to be studied deeper and optimized handling of waste management for better future. The expected result is Kelurahan Jambangan can be better in the future with optimization that provides benefits in terms of environmental hygiene and other positive activities.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

2.1 Waste management

Based on Law No. 18 of 2008 on Waste Management, waste management is defined as a systematic, holistic and continuous activity that includes waste reduction and waste management. Management of household waste and household waste consist of:

a. Waste reduction; and
b. Handling garbage

In Government Regulation no. 81 of 2012 on Waste Management of Household and Garbage of Household Garbage, it is said that everyone is obliged to reduce waste and waste management.

Figure 1.1 Waste Management Diagram

Source: Undang-Undang No. 18 Tahun 2008 about Waste Management
2.1.1 Waste Reduction

Principle 3R is in line with waste management which focuses on reducing waste from its source. Ministry of Public Works (2007) [4] explains that the 3R principle can be described as follows:

1. The first principle
Reduce or waste reduction, ie efforts to reduce waste generation in the source environment and can even be done before the waste is generated. Each source can make a waste reduction effort by changing the consumptive lifestyle, ie the habitual change from the wasteful and generating lots of waste to be efficient / efficient and produce little waste.

2. The second principle
Reuse means reusing materials or materials in order not to be waste (without going through the processing), such as using paper back and forth, reusing bottles for water, etc. Thus reuse will extend the life of the goods through the care and reuse of the goods directly.

3. The third principle
Recycle which means recycle a useless material into another material or new item after going through the processing. Some rubbish can be recycled directly by the community by using simple technology and tools, such as treating the remnants of patchwork into quilts, duster, doormat, etc., or kitchen waste in the form of food scraps to be used as compost.

2.1.2 Handling garbage
Based on Undang-Undang No. 18 of 2008 on Waste Management[5], waste handling activities include:

a) Separation in the form of grouping and segregation of waste in accordance with the type, quantity, and / or trash nature;
b) Collection in the form of taking and removing waste from waste sources to temporary shelters (TPS) or integrated waste treatment plant (TPST);
c) Transportation in the form of carrying waste from the source and / or from temporary waste collection or from the integrated waste processing site to the final processing site;
d) Processing in the form of changing the characteristics, composition, and amount of waste; and / or
e) The final processing of waste in the form of return of waste and / or residue of previous processing to the environment media safely.

III. RESULT

In this research, the approach used is using Rationalistic approach, that is by looking at field conditions (eksisiting) and see the literature from several sources. The rationalistic-qualitative method is a method with the researcher acting as the main instrument, the research is done by in-depth interview process and detailed cross and repeated to be able to know the development of area, environment and possible changes. (Moehadjir 1996)[6]

The type of research used in this study using qualitative. Qualitative method is a research procedure that produces descriptive data in the form of written words and oral from the people and behavior observed (Moleong, 2007)[7]

Jambangan Subdistrict is divided into 4 sub-districts, namely; Pagesangan urban village, Kebonsari urban village, Kelurahan Jambangan, and Kelurahan Karah. The study area of the researcher is located in Jambangan Village which is included in one of the sub-districts in Jambangan Sub-district, Surabaya, South Surabaya, has a height of 7 meters above sea level. Area of Jambangan Village 7.8 Ha. Here are the administrative boundaries of Kelurahan Jambangan, namely:

- North : Kelurahan Karah
- East : Kelurahan Ketintang
- South : Kelurahan Kebonsari
- West : Kecamatan Karang Pilang

Figure 1.3 Environment around the house of residents in Jambangan Village
Source: Personal Document, 2018

Figure 1.3 is a neighborhood disekitr house in the Village Jambangan, there are plants and private gardens planted by residents of Jambangan Village for reforestation around the residential neighborhood. Its function is as green open spaces and aesthetics that can be used as a medicinal plant. Then, there are also various types of bins that have been distinguished according to each type that is placed in front of residents around the house. The types are blue barrels, organic waste; red barrels are residual waste (food waste), yellow barrels are recycled waste, green barrels are residual waste; and the black barrel is B3 waste (Hazardous Toxic Material).
In analyzing the characteristics affecting waste management in Jambangan used Content Analysis analysis techniques. Content Analysis Technique in this research is conducted based on the activities and related roles in influencing the optimization of waste management in Jambangan. To know each opinion from each public figure then conducted interview to respondent related by using Snowballing Sampling.

The process of this analysis is:

1. Unitizing or publishing steps. Leveraging is an attempt to retrieve proper data with research interests that include text, images, and other data that can be further observed.

2. Stages Sampling or simplifying the research by limiting the observations that summarize all types of existing units.

3. Stages of coding or encoding where bridging between text that has been diunitkan with researchers, between the different images and what people see in it, or between a separate observation and the situation of stakeholders' understanding.

4. Reducing Stages and simplification of data. In this stage the coding procedure used is semantical content analyses that is classify the signs based on the meaning they have.

5. Inferring stages or understanding of each unit of analysis, to see the tendency of influence, whether influential or otherwise. So it can bridge in the characterization of unit characteristics, so it can be concluded the consensus.

6. Narrating stages of abstraction from the analysis. At this stage will generate answers from research questions, understanding the data against each analysis, to see the tendency of its influence.

### Table 1.1 Variable Coding in Interview Transcript Performance that affects the Optimization of Waste Management in the Jambangan

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Code No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bank Garbage Activities</td>
<td>(1.1) To publish the role of Garbage Bank in each RW</td>
</tr>
<tr>
<td>2</td>
<td>Composting Activities</td>
<td>(2.1) Published the role of Composting Activities in the community</td>
</tr>
<tr>
<td>3</td>
<td>Recycling Activities</td>
<td>(3.1) Published the role of Recycling Activities in the community</td>
</tr>
</tbody>
</table>

The results of the Content Analysis process found that activities that affect the optimization of waste management in Kelurahan Jambangan based on the results of stakeholder interviews are as follows:

**A. Bank Garbage Activities**

- Implementation of Garbage Bank
  
  The way stakeholders invite the community is to socialize to the community through PKK and then there with the environment cadres in each RW. After that formed the board, then there are parts treasurer, weighing, sorting, recording. So far, the community's response is quite good in depositing its waste into Waste Bank. Bank Trashes deposited by the residents to the Bank Garbage parent and there is also directly to the collectors.

**B. Composting Activities**

- Mechanism of the composting process
  
  Compost process so far, good... according to DKRTH not match it between its input-output, because every day nerima raw materials, because compost scientifically 3-4 months new so, but the demand in society is very high sometimes not nyampe perfect already distributed because it is constrained by the demand of the community, people ask for free and it is not in charge of any fees, and many people we have to serve, because the demand is high, such as agencies that have a large area has 4 drums to 5 drum trucks direct, even though the compost of raw goods so it lives 25% shrink, we have the goods enter raw goods, will be only a quarter of its course, so the compost will shrink 75% loss, so if it adjusts the importance level, if the urgent yes prioritized first and if the others can still wait, because that's what we were when the material entered how much drum trucks enter but its bit.

**C. Recycling Activities**

- Economic Potential
  
  From an economic point of view if recycling in PDU Jambangan megurangi entering the landfill, processed itself automatically dimensiana darisana if in terms of the seller is not there because it is free to serve the community. The advantage of it is not paid to the landfill. If in terms of recycling house required assistance facilities such as workshops that have training places and parking to accommodate many guests.
IV. CONCLUSION

Characteristics of each activity that need to be improved is the need for the addition of garbage and composting facilities facilities (green barrels for organic waste, compost baskets or Takakura baskets per Dasa Wisma) in the respective houses in the house or in front of the house. Then, for the Trash Bank the need to conduct a healthy cooperation by equating prices that are not proportional to the price they offer to the public and the bookkeeping routine to be well recorded. For the Recycling site, a workshop is needed to enable the public to learn about recycling techniques and be able to capture wider partners in the future. For community participation is to invite and provide training to the RW that has not been active and forming environmental cadres as the driving force of its citizens, and establish good relationships with private parties that become CSR. The role of the Government as a community facilitator contributes to providing assistance such as waste facilities that are still lacking and needed by the community.

V. REFERENCES

[2] Undang-Undang Nomor 18 Tahun 2008 tentang Pengelolaan Sampah
[5] Undang-Undang Nomor 18 Tahun 2008 Tentang Pengelolaan Sampah
Curator Authority Related *Gijzeling* By Directorate General Of Tax For Taxpayer Institution In Bankruptcy With The Good Faith

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Abstract - In the fourth paragraph of the preamble of the 1945 Constitution, the Government of Indonesia has the objective of protecting the entire Indonesian nation and the blood of Indonesia, promoting the common good, enlightening the life of the nation and participating in a world order based on freedom, eternal peace and social justice. To achieve this goal, the State of the Republic of Indonesia collect tax revenues, the state collects taxes from the public. Financial Capability of Taxpayers in performing tax payment obligations to assist the Government plays an important role. The financial capability possessed by the Taxpayer is not always good in terms of liquidity or solvency. Financial Condition of Taxpayer in making payment of tax or debt other than tax can cause Taxpayer to experience Bankruptcy. One form of government effort in collecting taxes on uncooperative taxpayers is by enforcing the *Gijzeling* policy. *Gijzeling* as mentioned in Article 1 number 18 of Law no. 19 of 1997 is a temporary restraint of the time of the Taxpayer's freedom by placing it in a certain place. *Gijzeling* this as one of the forced tools used by the Directorate General of Taxation to force taxpayers to pay off tax payable that must be paid to the state. *Gijzeling* can only be done to the Tax Insurer who has a tax debt of at least Rp. 100.000.000,00 (One Hundred Million Rupiah) and doubt its good faith in paying off tax debt.

Index Terms- Taxpayer Institution, Gijzeling, Bankruptcy, Good Faith

I. INTRODUCTION

In the fourth paragraph of the preamble of the 1945 Constitution, the Government of Indonesia has the objective of protecting the entire Indonesian nation and the blood of Indonesia, promoting the common good, enlightening the life of the nation and participating in a world order based on freedom, eternal peace and social justice. To achieve this goal, the State of the Republic of Indonesia was founded based on Pancasila as the philosophy of life of the Indonesian nation consisting of the Supreme Godhead, Just and Civilized Humanity, Indonesian Unity, Democracy led by the wisdom of wisdom in deliberation/representation, and Social Justice for all Indonesian people.

The ideals of law to realize the promotion of the common prosperity one of them is reflected in the preparation of the State Budget (APBN) which contains State Revenue and Expenditure. In APBN, State Income, Tax Revenue becomes the largest component in the source of state income. In order to collect tax revenues, the state collects taxes from the public. Tax collection is regulated by law in accordance with the provisions of Article 23A of the 1945 Constitution of the State of the Republic of Indonesia which states that "Taxes and other charges that compel the state are regulated by law." Considering the importance of Tax Receipts to carry out national development, it is necessary role of the taxpayer community in fulfilling the tax payment obligation under the provisions of taxation, in fact still found the arrears of taxes as a result of not paying off the tax debt properly. Financial Capability of Taxpayers in performing tax payment obligations to assist the Government in the context of realizing a just and prosperous society based on Pancasila and the 1945 Constitution of the Republic of Indonesia (the 1945 Constitution of the Republic of Indonesia) plays an important role. The financial capability possessed by the Taxpayer is not always good in terms of liquidity or solvency. Financial Condition of Taxpayer in making payment of tax or debt other than tax can cause Taxpayer to experience Bankruptcy. One of the legal means required as a form of legal protection against a Taxpayer declared bankrupt is a regulation concerning bankruptcy including regulations concerning postponement of debt obligation as regulated in Law Number 37 Year 2004 concerning Bankruptcy and Postponement of Debt Payment Obligation. Bankruptcy as part of the civil law in debt settlement is expected to be a solution for the business of both legal entities and individuals to get out of the financial difficulties problems (Exit From Financial Distress) both
in the business and financial activities of individuals in general. As a legal instrument for debt settlement, the implementation of bankruptcy provisions cannot be separated from the values of Pancasila and the 1945 Constitution of the Republic of Indonesia to promote the general welfare based on social justice. Therefore, bankruptcy must be implemented by prioritizing a fair solution for all parties, as well as providing real solutions and able to encourage the realization of welfare for society and justice. One form of government effort in collecting taxes on uncooperative taxpayers is by enforcing the Gijzeling policy. Until the end of January 2016, the government showed its firmness by doing Gijzeling against uncooperative taxpayers paying off their tax debt. Gijzeling has also been done before in 2009 and 2011. Directorate General of Taxes noted per February 2015, there are 49 taxpayers who are threatened will be in Gijzeling for tax arrears total value of 1.38 trillion Rupiahs. A total of 49 taxpayers amounted to 56 people under the tax. About 90% of the taxpayers are corporate / corporate Taxpayers. While the rest are individual taxpayers. Gijzeling as mentioned in Article 1 number 18 of Law no. 19 of 1997 is a temporary restraint of the time of the Taxpayer's freedom by placing it in a certain place. Implementation of Gijzeling in accordance with article 33 paragraph (1) of Law Number 19 Year 1997 as lastly amended by Law Number 19 Year 2000 concerning Tax Collection by Forced War, stating that Hostage can only be conducted against Taxpayers who have a tax debt of at least -lack of 100,000,000,00 Rupiahs (One Hundred Million Rupiah) and doubt its good faith in paying off tax debt. Bankruptcy as a Form of Good Faith to prove that the Taxpayer of the Agency in Bankruptcy is indeed experiencing financial difficulties nature of the payment of tax debt and other debts. During the process of Bankruptcy which is fully authorized to all Debtor's assets declared bankrupt is the Curator.

Based on the Introduction mentioned above, it can be formulated problems are:

1. How is the Legal Arrangement of Curator Authority in Gijzeling conducted by the Directorate General of Taxes on Taxpayers of Institution in Bankruptcy?
2. How Does the Meaning of Good Faith Concept Taxpayer of Institution in Bankruptcy?

II. LITERATURE REVIEW

A. System Theory And Theory Of The Legal System

The term system is most often used to denote the meaning of the method or the way and something the set of elements or components that interconnect one other soma into a unified whole. Actually its use is more than that, but less well known. As a set, the system is also defined variously. The term system derives from the Greek "systema" which has some sense: 1. whole compounded of several parts (William A. Shrode and Don Voich, 1974: 115)
2. an organized, functioning relationship between units or components. (Elias M. Awad, 1979: 4)

The Legal System as the Object of Legal Sciences is a law consisting mainly of a collection of seemingly mixed legal rules which is a chaos: an unacceptable number of laws and regulations issued annually. Legal science does not see the law as a chaos or "mass of rules", but sees it as a "structured whole or system". The law itself is not just a collection or summation of rules that each stand alone. The significance of a rule of law is due to its systematic relationship to other laws. Law is a system means that the law is an order, is a unified whole consisting of parts or elements that are closely related to each other. In other words the legal system is an entity consisting of elements that have interaction with each other and work together to achieve the purpose of unity. The unity is applied to the complex juridical elements such as rule of law, legal principles and legal understanding. Each part must be seen in relation to other parts and with the whole, such as a mosaic image; an image that is cut into small pieces to then be connected again so that it looks whole again like the original picture. Each part is not independently independent of the other, but the hook is related to the other parts. Each part has no meaning beyond unity. Within the unity there is no need for conflict, contradiction or contradiction between the parts. If there is a conflict, it will be resolved by and within the system itself and not allowed to drag on. The legal system is an open system. The legal system is a unity of elements (ie rules, determinations) that are influenced by cultural, social, economic, historical and so on factors. In contrast, the legal system affects factors outside the legal system. The rules of the law are open to different interpretations, therefore always evolving. (Sudikno Mertokusumo, 2005: 162).

B. Theory of Legal Harmonization

Harmonization within the law includes the adjustment of laws and regulations, government decisions, judges' decisions, legal systems and legal principles with the aim of enhancing legal unity, legal certainty, justice and equality, the utility and legal clarity, without obscuring and sacrificing legal pluralism. The harmonization of law done to overcome and prevent the occurrence of legal disharmony requires techniques of legal discovery in order to reinforce the will of law, the will of society, and moral will. Thus harmonization of the law is an activity of discovery of the will of law, the will of society and moral desire through the activities of interpretation of law and legal reasoning, as well as the rational argumentation of the results of interpretation and reasoning law. There are several steps in the implementation of Legal Harmonization, namely: (Kusnu Goesniadhie, 2006:62)

1. Identify the location of legal disharmony in the application of laws and regulations.
2. Identify the cause of law disharmony.
3. Conducting legal discovery by echoing the method of interpretation and method of legal construction to change the legal state of disharmony into harmony.
4. Make legal reasoning efforts so that the results of interpretation and construction of the law makes sense or meet the element of logic.
5. Prepare rational argumentation by using good governance understanding to support and explain the results of legal interpretation, legal construction, and legal reasoning. Legal interpretations, legal constructs, legal reasoning, and rational argumentation are made to discover.
   a. The will of the law or the law (rechtidee), namely legal certainty.
   b. The will of society, that is justice.
   c. The moral will, that is truth.

There are several Approaches to Legal Harmonization: (Kusnu Goesniadhie, 2006:62)
1. Law Harmonization Referring to Legislation.
2. Law Harmonization Referring to Scope
3. Law Harmonization Referring to Institutional Integrity
4. Law Harmonization Refers to Codification and Unification

C. Authority Theory
   There are three categories of authority, the Delegative Attribute and the Mandate, which can be explained as follows: (Nur Basuki, Winanrno, 2008:70)
   1. Authority of the Attribute
      The authorization of attributes is usually outlined or derived from the division of powers by the laws and regulations. In the exercise of this attributive authority, the execution shall be carried out by the officer or body stipulated in the basic rules. Against the attributive authority of responsibility and accountability lies with the official or entity as set forth in the basic rules.
   2. Delegative authority
      Delegative authority comes from the transfer of a governmental organ to another organ under the rule of law. In the case of Delegative authority responsibility and accountability are transferred to those authorized and transferred to the delegate.
   3. Mandate Authority
      The Authority of the Mandate is an authority derived from a process or procedure of delegation from a higher official or body to a lower official or entity. The authority of the mandate exists in the routine relations of superiors and subordinates, unless expressly prohibited.

In relation to the concept of Attribution, the delegate, the mandate is expressed by J.G. Brouwer and A.E. Schilder, that: (Nur Basuki, Winanrno, 2008:74)
   1. With attribution, power is granted to an administrative authority by an independent legislative body. The power is core (original), which is to say that is not derived from a previously existed powers and assigns them to an authority.
   2. Delegations is the transfer of an administrative authority to another, so that the delegate (the body that has acquired the power) can exercise power its own name.
   3. With mandate, there is no transfer, but the mandate giver (mandate) assigns power to the other body mandate) to make decisions or take action in its name.

D. Theory And Tax Collection Principle
   In the literature of State finance, there are theories that provide the basis of justification or philosophical grounds for the State to levy taxes in a way that can be imposed. The theories are as follows: (Mardiasmo, 2002: 3-4)
   1. Theory of Insurance: According to this theory, the State in performing its duties / functions includes also the duty of protection of the soul and personal property.
   2. Interest theory: According to this theory, taxes have a relationship with the individual interests derived from the work of the State.
   3. Power Theory of Bearing: This theory suggests that all persons in tax burdens should be just as heavy, meaning that taxes must be paid in accordance with the powers of each individual.
   4. Theory of Absolute Liability: This theory is based on the understanding of the organization of the State that the State as an organization has the duty to organize the public interest.
   5. Buy Power Theory: This theory emphasizes that tax payments are made to the State to maintain the people of the State concerned, this theory is universal and applicable throughout the world, since collecting taxes means attracting the purchasing power of the public household to the State.

In addition to Tax Collection Theory there are also several Principles and Principles related to Tax Collection, namely: (Eeng Ahman, and Epi Indriani, 2008:31)
   1. Equality Tax Principle: collection should be fairly adjusted to the ability of the taxpayer. Large companies are taxed heavily, and small companies are taxed low.
   2. The Certainty Principle: In the tax collection should be clear, and certainly so understood taxpayers. Thus, calculation and administration will be easy.
   3. The Feasibility Principle: Tax collection should not burden taxpayers. For example, a person who is experiencing a business loss should not be taxed so high that his business can be maintained.
E. Theory Of Justice

John Rawls (1921-2002) is a thinker who has an enormous influence in the field of political philosophy and moral philosophy. Through the ideas outlined in A Theory of Justice (1971), Rawls makes himself a major foothold for contemporary political philosophy and philosophy debates. The thinkers after Rawls had only two choices: Approve or disapprove of Rawls. There is no option to ignore Rawls at all. This is due to Rawls's vast and deep reach of thought: Efforts to transcend the dominant utilitarianism of the era before Rawls and reconstruct Hobbes, Locke and Kant's legacy of social contract theory as a starting point for formulating a comprehensive and systematic theory of justice. (Daniels, Norman, 1975:15)

Theory of Justice is a work of strong, deep, subtle, systematic, political, philosophical philosophy that has not been seen since John Stuart Mill's work, or before. This thinking is the fountain of ideas, integrated together in a good unity. Political philosophers now have to work in Rawls's theory (Nozick, Robert, 1974: 183)

According to Rawls of Justice as Fairness, this concept allows members of a society to collectively accept and obey the social provisions governing the distribution of rights and duties among them. What can encourage these members of the community to volunteer in various social cooperation is a totalitarian social order, members of the community may be compelled to accept and comply with the social terms laid down by the totalitarian regime, as they may feel scared. On the condition of Fairness, Rawls argues that the volunteering of all members of society to accept and obey the existing social provisions is only possible if the society is well ordered in which justice as Fairness forms the basis for the principles of regulating the institutions it contains. (John Rawls, 1971:4)

Starting from the general principle above, Rawls formulates the two principles of justice as follows: (John Rawls, 1971:66)

1. Everyone shall have equal rights over the broadest basic freedom, equal freedom for all;
2. Socio-economic inequality should be arranged in such a way that (it is expected to benefit the most disadvantaged people, and all positions and positions are open to all.

The conclusions drawn from this discussion of Rawls's theory of justice are as follows:

First, Rawls argues that the volunteering of all members of society to accept and obey the existing social provisions is only possible if the society is well ordered in which justice as Fairness forms the basis for the principles of the institutional arrangements it contains. Rawls's starting point in designing his theory of justice is his conception of the moral person who essentially has two moral abilities: 1) the ability to understand and act on the sense of justice and thereby also be encouraged to seek a social cooperation; and 2) the ability to form, revise, and rationally seek to realize good concepts. Rawls calls these two abilities a Sense of Justice and a Sense of the Good. Second, Rawls considers that a Fair deal can only be achieved by an impartial procedure. Only by an impartial procedure can the principles of fairness be considered Fair. Therefore, for Rawls, fairness as Fairness is "pure procedural justice". In this case, what is needed by those involved in the process of formulating the concept of justice is just a fair (impartial) procedure to ensure a fair outcome as well. Third, Rawls emphasizes the important position of a Fair procedure for the birth of decisions that everyone can accept as fair. The procedure of this Fair can only be met if there is a contract climate that allows the birth of a decision with the ability to guarantee a fair distribution of rights and obligations. Rawls asserted the importance of all parties involved in the process of selecting the principles of justice, in an initial condition which he called the "Original Position". Here, the primal position is a demand for justice in the sense Fairness can be obtained. This primal position also serves as a liaison between the concept of moral person on the one hand, with the principles of justice on the other. Fourth, Rawls believes that the moral persons who conduct deliberations in the primal position will surely choose the principles of justice formulated as follows: 1. Everyone must have equal rights over the broadest basic freedoms, equal freedom for all; 2. Socio-economic inequality should be arranged in such a way that (a) it is expected that the Member benefits for everyone, and (b) all positions and positions are open to all.
Objective of the Bankrupt Debtor must be released in bankruptcy so that the curator can freely to communicate with the debtor, especially in making the bankruptcy property if the Debtor In Insolvency. However, in order to give a sense of Justice to Creditors in this case Preferential Creditors are related to Tax Bills on Debit Bankers, Curators must maintain harmonization related to private interests and Public interests, So long as the Bankruptcy Process Curator has the Absolute Authority of the Bankrupt Debtor, if necessary if the Debtor is not good. Implementation of a Taxpayer Entity that is declared bankrupt must be terminated until the bankruptcy process is terminated. The Government in this case the Directorate General of Taxes shall not be concerned with the payment of the Tax Debt, since the Receiver must verify the Tax Claim verification, so that if the Bankruptcy Property of the Debtor (Taxpayer of Bankruptcy) is sufficient to be paid for the tax debt. The ability of the Bankrupt Debtor to make the settlement of the Tax debt is in accordance with the Tax Principle related to the ability to pay. The protection of the creditors and the Debtors in the bankruptcy process must be kept under guard by the Curator, so that all Parties do not feel disadvantaged or benefited to certain parties. Law is a system means that the law is an order, is a unified whole consisting of parts or elements that are closely related to each other. In other words the legal system is an entity consisting of elements that have interaction with each other and work together to achieve the purpose of unity. The unity is applied to the complex jurisdictional elements such as rule of law, legal principles and legal understanding. Each part must be seen in relation to other parts and with the whole, such as a mosaic image of a cut image into small pieces and then reconnected to appear intact again as before. Each part is not independently independent of the other, but the hook is related to the other parts. Each part has no meaning beyond unity. Within the unity there is no need for conflict, contradiction or contradiction between the parts. If there is a conflict, it will be resolved by and within the system itself and not allowed to drag on.

Thus, the essence of the system, including the legal system, is an essential unity and fragmented in sections, in which every problem or issue finds an answer or completion. The answer lies within the system itself. Like the system in general, the legal system also has a consistent or permanent nature It has been argued that within the system is not desired a conflict and if there is a conflict will not be allowed. Because in human society there are many interests, it is possible that there is a conflict between these interests. It is possible that there is a conflict between laws and regulations, between the law and the custom, between the law and the court decision. For that it is necessary to have a general provision that its implementation is fixed or consistent. In the event of a conflict, for example between two laws, it will consistently apply the principles of lex specialis derogat legi generali, lex posterior derogare legi priori or lex superior derogare legi inferiori. Related to the Authority of Receivers in Law Number 37 Year 2004 concerning Bankruptcy and Suspension of Debt Payment Obligation to Debit Bankers, with the Authority of the Directorate General of Taxes to perform Gijzeling against Taxpayers in Bankruptcy in accordance with Law Number 19 Year 2000 regarding Tax Collection by Forced Letter, there has been a conflict, for it as a legal system then between the two Laws need to be Harmonized Law, in order to achieve the Legal Objectives of providing certainty, benefit, and justice. Related to the Bankruptcy Procedure, Law Number 37 Year 2004 concerning Bankruptcy and Postponement of Obligation of Debt Payment is a lex specialist derogare legi generali against Law Number 19 Year 2000 regarding Tax Collection by Forced Letter.

The Law Harmonization Effort is the best step in solving a Conflict of Legislation in a Legal System. There are several steps and approaches in conducting Legal Harmonization. In general these steps are:

1. Identify the location of legal disharmony in the application of laws and regulations.
2. Identify the cause of the disharmony of the Law
3. Efforts of legal discovery by using methods of interpretation and methods of legal construction to change the legal state of disharmony into harmony.
4. Efforts of legal reasoning for the results of interpretation and construction of the law to make sense or meet the elements of logic.
5. Preparation of rational arguments by using good governance understanding to support and explain the results of legal interpretation, legal construction, and legal reasoning.

The legal harmonization approach that can be used is:

1. Law Harmonization refers to the Laws and Regulations.
2. Harmonization of Law refers to Scope.
3. Law Harmonization refers to Institutional Integrity.
4. Law Harmonization refers to Codification and Unification.
5. Harmonization of Law refers to the laws and regulations of legislation.

In order to harmonize the law relating to the existence of legal disharmonization in the Authority of Receivers and Directorate General of Taxes to perform Gijzeling and Authority of Receivers During bankruptcy process it can be done Harmonization of Law by referring to the rules of scope legislation, and Institutional Coherence. Harmonization of Laws Related to the Authority of Receivers in Bankruptcy of Corporate Taxpayers against Gijzeling by the Directorate General of Taxation there are some conditions which can be explained as follows:

1. Taxpayer Agency that has been done by Gijzeling Directorate General of Taxes, then there is in a bankrupt position.
2. Taxpayer Agency that has not been done Gijzeling by Directorate General of Taxes, then there is in a bankrupt position.

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Each Legal Harmonization for each position / section mentioned above can be explained as follows: In accordance with the Principle of Law in Bankruptcy is to maintain the balance of Rights and Obligations of Debtors and Creditors and to provide Legal protection related to the interests of Debtors and Creditors, then If there is a corporate taxpayer that has been done Gijzelings By Directorate General of Taxes, then the body taxpayer in the position Bankrupt, must be released in accordance with the provisions of Article 31 Paragraph (1) of Law Number 37 Year 2004 concerning Bankruptcy and Postponement of Debt Payment obligations.

During the process of bankruptcy the Receiver Has Absolute Authority in relation to the Borrower, since the Receiver requires a good Communication with the Creditor in order to secure the Debtor's Property which is declared Bankrupt. Gijzelings conducted by the Directorate General of Taxes against the Taxpayer of the Agency in Bankruptcy, may hinder the Main Duty of the Curator during the Bankruptcy Process. The act of releasing Gijzelings against the taxpayer of the Entities in bankruptcy shall not be deemed to be detrimental to the Directorate General of Taxes, which has a Role to collect the State Revenue, since the Directorate General of Taxes as the Preferred Lender shall not be concerned with the Debtor's Debt Distribution during the Bankruptcy process to pay off all debts -he did. The In-duty Curator will provide a balanced legal protection against the Directorate General of Taxes, as one of the Creditor in bankruptcy. Main Objectives Gijzelings release By the Directorate General of Taxes, during the Bankruptcy Process are:
1. Assist the Curator in performing his duties during the Bankruptcy Process.
2. Make Communication more smoothly between the Receiver and the Taxpayer of the Agency in Bankruptcy, mainly related to the Meeting of Creditors, and Debt Verification.
3. Accelerate the Bankruptcy Process is complete, so that all the interests of creditors to the Lost Debtor Treasures can be protected.
4. Assist the Curator to be able to provide Legal Certainty and Justice against the Creditors in Bankruptcy.

With the action to release Gijzelings conducted by the Directorate General of Taxes, in order to expedite the Bankruptcy Process, it is expected that the Harmonization of Law related to the Authority of Receivers Associated Gijzelings Taxpayer Agency in Bankruptcy by the Directorate General of Taxation, this condition also in accordance with the principle of Legal Preference is lex specialist derogat legi generali, namely Law Number 37 Year 2004 concerning Bankruptcy and Postponement of Debt Payment Obligation is lex specialis derogat legi generali against Law Number 19 Year 2000 concerning Tax Billing with Forced Letter. Associated with the Bankruptcy Conditions of the corporate Taxpayer in bankruptcy that has not been done by Gijzelings Directorate General of Taxes, the Authority of the Receiver is Absolute against the corporate Taxpayer in Bankruptcy. Therefore, the Directorate General of Taxes cannot act directly against the Taxpayer of the entity under the Bankruptcy. All Legal Actions done by the Directorate General of Taxes are not permitted directly against the Taxpayer of the Agency in the bankruptcy, but must be through the Receiver as the person who is fully responsible to the corporate taxpayer in Bankruptcy.

Related to the Law Harmonization in this condition, the Directorate General of Taxes should not worry about the possibility of the existence of tax debt to be paid by the Taxpayer of the Agency in the bankruptcy, because during the bankruptcy process the Curator will conduct Tax Verification to the Directorate General of Taxes and will invite the Directorate General tax as one of the creditors in bankruptcy. The above actions are expected to avoid any conflict of interest between the Directorate General of Taxes and the Receiver, which may result in a Lawsuit made either by the Directorate General of Taxes or by the Curator. The main objective of the above Law Harmonization is to avoid conflict of norms and all parties will not benefit, and can create simplicity of law, legal certainty and justice.

B. The Meaning Of The Concept Of Good Faith for taxpayer Of Institution in Bankruptcy

Based on the explanations of History, Concepts, and some cases related to the understanding of the meaning of Good faith, then, in relation to Good Corporate Taxpayer Concept In bankruptcy, will be used some understanding of good faith in the Contract. The main reason for the approach of good faith intentional analysis used is on the contract are:
1. Implementation of Gijzelings by the Directorate General of Taxation against the Taxpayer of the Agency in Bankruptcy is the existence of Tax arrears of at least Rp.100.000.000 (One Hundred Million Rupiah) and doubt the Good Faith.
2. The taxpayer's commitment in the bankruptcy in conducting the payment of its tax debt to the Directorate General of Taxes can be viewed as a consensuality in the Contract between the corporate Taxpayer in Bankruptcy with the Directorate General of Taxes related to the Tax Debt.

Based on the above considerations, the wetting to understand the meaning of the concept of good faith in the consideration to perform Gijzelings can be described as follows: According to Adam Smith (The Origin of The Four Maxim Theory in the book "Wealth of Nations") there are principles in tax collection:
1. Equality Principle: means the principle of equilibrium with the ability or principle of justice and it is defined that the tax collection must be fair, in accordance with the ability and income of the taxpayer (Ability To Pay), impartial and discriminatory.
2. Certainty Principle: Certainty principle is defined as the legal certainty principle in which any tax levies imposed shall be based on the Law and there shall be no deviations.
3. Principle of Convenience of Payment: This principle is also called the principle of collecting tax on time, the tax is levied when the taxpayer is in a good moment and there is a financial ability, for example when receiving new income tax income) or get a prize (gift tax).

4. Efficiency Principle: the cost of tax collection is done as efficiently as possible so that no tax collection fee is greater than the tax revenue itself.

This good faith concept is usually paired with Fair Dealing. Goodwill is also often associated with the meaning of Fairness, Reasonable standard of fair dealing, decency, Reasonableness, A common ethical sense, A spirit of solidarity, and community standards. Given the good faith in the contract is a doctrine or principle derived from Roman law, then to get a better understanding must be learned from Roman law. The doctrine begins the Ex Bona Fides doctrine. The doctrine that requires good faith, in the contract has a long history in the course of Roman law. The development of good faith in Roman contract law can not be separated from the evolution of the contract law itself. Initially the Roman contract law was only related to Indicia Stricti Iuris, a contract arising from legal acts (Negotium) that strictly and formally referred to Ius Civile. If a judge faces such a contractual case, the judge must decide upon it in accordance with the law. The judge is bound to what is expressly stated in the contract (Express Term). Then Indicia Bona Fidei also developed. The legal act based on Indicia Bona Fidei is called Negotia Bonae Fidei. This Negotia comes from Ius Gentium which requires the party to make and execute the contract to be in good faith.

The good faith in Roman contract law refers to the three forms of behavior of the parties to the contract, namely:
1. The parties shall keep their word or word.
2. The Parties shall not take advantage of any misleading action against either party.
3. The Parties shall comply with their obligations and behave as respectable and honest persons, even if such obligations are not expressly agreed upon.

The Roman legal contract law is the provision of (maxim) Pacta Sunt Servanda, which serves as the basic provision of good faith. Thus, fides mean as belief in a person's words. Bona fides are applied to confirm the contents of the contract. The belief in one's words is a prerequisite for a legal relationship, Cicero describes it as the fundamentum iustitiae. Bona fides demands not only the fulfillment of the contract itself but also requires that the parties act in an honest manner, affecting the course of contract execution. Lombardi and Wieacker believe the teachings of the fides as a protection for one's interests so that people keep their promises, so according to Norr in fides combined two meanings, namely trust and trustworthiness. The parties shall not take advantage of any misleading action against either party. Anything contrary to good faith should be considered in a sale and purchase agreement, for example, property sales without explanation is subject to a servitude, since the sale and purchase agreement is based on good faith, there should be no fraud there. So a salesperson must be responsible to the buyer if he or she knows about selling someone else's property while he denies that the property belongs to no one else. The medieval law scholars concluded that good faith here means there must be no dolus or deceit.

For Roman law, actions contrary to good faith are dishonesty (dolus malus). In a narrow sense, such dishonesty only means fraud. In a broader context, it is applied in all acts, all social behavior as opposed to good faith. The third form of goodwill in the Roman contract law means that good faith is an action or behavior expected of an honorable or honest person who is required in any form of transaction. In one text the Roman law states, "nothing is more in agreement with the good faith that the do not want to agree by contracting parties. Roman law recognizes the existence of an informal consensual contract, if there is a dispute between the parties relating to the provision which expressly regulates the rights and obligations of the parties, the judge decides what should be based on good faith, this means that the parties are not only bound to what is expressly stated in the contract, but also to what is believed to be naturally implied in the agreement. The latest concept of good faith in the British common law system was discovered by Sir Anthony Mason in a lecture at Cambridge University in 1993 which stated that the concept of good faith includes three doctrines related to: (James Gordley, 2000:94)

   1. An obligation for parties to cooperate in achieving the objectives of the contract (honesty of the promise itself)
   2. Fulfillment of standards of respectable behavior; and
   3. the fulfillment of reasonable standards of contract relating to the interests of the parties.

Subjective good faith is associated with the law of things. Here we find the term holder with good intentions or buyers of good faith goods and so on as opposed to bad-tempered people. A good-faith buyer is someone who buys the goods with confidence that the seller is really the owner of the goods he or she sells. He had no idea that he was buying goods from people who were not their owners. He is an honest buyer. In the law of things, good faith is defined as honesty. A good-faith buyer is an honest person who does not know of any defects inherent in the goods he or she buys. It means a defect of its origin. In this case, good faith is a subjective element. This subjective good intentions are related to mental or psychic whether the person is aware of or knows that his or her actions are contradictory or not in good faith.

The good faith of contract implementation refers to the objective good faith. The standard used in good objective Faith is an objective standard that refers to an objective norm. The behavior of the parties to the contract should be tested on the basis of the unwritten objective norms developed within the society. Good faith provisions refer to unwritten norms that have become legal norms as a separate legal source. The norm is said to be objective because the behavior is not based on the contention of the parties themselves, but the behavior must be in accordance with the general assumption about the good faith.

The standard actually refers to the standards applicable in Roman law. In Roman law, good faith is a universal social norm governing social interrelationships, Which is every citizen has an obligation to act in good faith with all citizens. It is an objective concept universally applied to all transactions. This corresponds to what the Roscoe Pound says of a postulate: "Men must be able to
assume that they are dealt with in the general intercourse of society will act in good faith. Thus, if a person acts in good faith according to an objective standard of good faith based on customary social expectation, then the other person will act the same to himself. This is contrary to the concept of good faith adopted by Canonic law which places the good faith more as a universal moral norm rather than as a social norm. With such an approach, the contextual meaning of good faith is determined by every individual because, lest one breach a duty to God by fading or refusing to keep's promise, it is important to act in a reasonable or rational way against others. This is a subjective concept of good faith which refers to a subjective moral standard because it is based on individual honesty.

Since the contract is binding on both creditors and debtors, the contractors are creditor and debtor. Creditors and debtors are required to carry out contracts appropriately. Given in reciprocal contracts, both sides are reciprocated either as creditors or debtors, then those who have to execute the contract in good faith are both parties to the contract. What he means here is that the creditor exercises his right to good acts, and does not demand more than what he deserves. The creditor also will not burden the debtor with more costs than the winning required. The debtor must also perform its obligations well, will not make billing becomes difficult and convoluted.

In contract law, good faith has three functions. Good faith in its first function teaches that all contracts must be interpreted in accordance with good faith. The second function is the added function. The third function is the limiting and nullifying function.

Unlike the good faith functions mentioned above, in German contract law, good faith is believed to have three basic functions. First, as legal base on interstitial law-making by judiciary. Second, as the basis of legal defenses in private law suites. Thirdly, Siebert distinguishes the three functions of good faith under Article 242 BGB as in the Netherlands. First, the function change. Second, limiting functions. Third, Wegfall der Geschaftsgrundlage. In Belgium it is also commonly said that good faith has three functions, namely the function of interpretation (fonction interpretativa), the function of adding (fonction completive) and the restrictive function (fonction restrictive, limitative, moderattice). Sometimes it is added to the fourth function, which allows the court in certain situations to change the contents of the contract, but this fourth theory is generally not accepted by courts and academics.

The implementation of these good faith functions in court practice still creates some problems. (John Klein, 1993:116)

1. Contract for payment Tax Interpretation Must be Based on Good Faith
   A contract consists of a series of words. Therefore, to establish the contents of the contract, it is necessary to make an interpretation, so that clearly known intent of the parties in the contract. According to Corbin, interpretation or interpretation of the contract is a process in which a person gives meaning to a symbol of the expression used by others. Commonly used symbols are either one by one or group, oral or written words. An act can also be an interpretable symbol. the interpretation of the contract is the determination of the meaning that must be determined from statements made by the parties to the contract and the legal consequences arising therefrom. If the contract is to be interpreted in accordance with good faith, then each contract must be interpreted in a fair or proper manner.

2. Good Faith's in Payment Tax Adding Function With its second function, good faith can add to the contents of a particular agreement and may also add to the terms of the law regarding the treaty. Such a function may be applied where any rights and obligations arising between the parties are not expressly provided in the contract.

3. Good Function of Restricting and Abolishing Faith In the third good faith function it is a limiting and nullifying function. Some pre-war legal scholars argue that good faith also has this function. With this doctrine can be reached a legal effort for parties who are not serious in negotiating where the consequences of these conditions can harm other parties. This doctrine may also serve as a basis for legal action against a party that cancels a negotiation in which the cancellation or termination of the negotiation may be detrimental to the other party.

Based on the understanding of the Concept of Good faith above can be formulated in relation to the meaning of good faith Taxpayer Agency as a consideration Directorate General of Taxation To perform Gijzeling and related to the tax payments are as follows:

a. The taxpayer of Institution is willing to provide assurance to the Directorate General of Taxes by making Contract to make Tax payments.

b. Taxpayer of Institution always responds to the appeal from the Directorate General of Taxes to pay off the tax debt;

c. The taxpayer of Institution shall explain to the Directorate General of Taxation in relation to the actual financial condition of the nature with the intention that the Directorate General of Taxation may consider the Solution for the Taxpayer of the Agency to be willing to pay off the tax debts even if by installment;

d. The taxpayer of Institution is willing to submit all his property to pay off the tax debt.

e. The taxpayer of Institution shall not leave Indonesia forever or shall not intend to do so.

f. The taxpayer of Institution do not intend to transfer the goods owned or controlled.

g. The corporate taxpayer does not intend to discontinue or undermine the company's activities, or the work it does in Indonesia;

h. The taxpayer of Institution shall not dissolve its business entity or merge its business, or divest its business, or transfer the company owned or controlled, or make any other form of change.

i. The taxpayer of Institution shall not endeavor to use the law in its favor in order not to pay the tax debt.

j. The taxpayer of Institution shall provide Audit reports audited by the Public Accounting Firm in relation to its financial condition primarily, to prove that it is in an Insolvency, (Balance Sheet and Operational Cash Flows) condition and subject to its continuing constraints (Going Concern).
k. If The taxpayer of Institution in the bankruptcy entity is indeed in fact a financial hardship (Experiencing Insolvency) in making its payment to its Creditor, not as an intention to avoid the implementation of Gijzeling by the Directorate General of Taxes.
l. The taxpayer of Institution shall not profit by misleading action against the Directorate General of Taxes.
m. The taxpayer of Institution shall comply with its obligations and behave as respectable and honest, although such obligations are not expressly agreed upon in the conduct of tax liabilities.
n. If The taxpayer of Institution is in bankruptcy, if after the bankruptcy terminates, and then attempts again resulting in adequate financial condition, then with full awareness will make payment of the Tax Debt, in accordance with the fulfillment of the agreed contract.

IV. CONCLUSION

1. During the Bankruptcy Process, the Receiver has the Absolute Authority of the corporate Taxpayer in Bankruptcy, so that all legal actions or acts of Gijzeling made against the Taxpayer of the Agency by the Directorate General of Taxes prior to and during the bankruptcy process shall obtain Permission from the Receiver, including the release of the Gijzeling conducted by the Directorate General of Taxes against Taxpayers who have just been decided by Bankruptcy Commercial Court.

2. The Meaning of Good Corporate Tax Object of the Agency as a consideration to be conducted by Gijzeling Directorate General of Taxes is as follows:
   o. The taxpayer of Institution is willing to provide assurance to the Directorate General of Taxes by making Contract to make Tax payments.
   p. Taxpayer of Institution always responds to the appeal from the Directorate General of Taxes to pay off the tax debt;
   q. The taxpayer of Institution shall explain to the Directorate General of Taxation in relation to the actual financial condition of the nature with the intention that the Directorate General of Taxation may consider the Solution for the Taxpayer of the Agency to be willing to pay off the tax debts even if by installment;
   r. The taxpayer of Institution is willing to submit all his property to pay off the tax debt.
   s. The taxpayer of Institution shall not leave Indonesia forever or shall not intend to do so.
   t. The taxpayer of Institution do not intend to transfer the goods owned or controlled.
   u. The corporate taxpayer does not intend to discontinue or undermine the company's activities, or the work it does in Indonesia;
   v. The taxpayer of Institution shall not dissolve its business entity or merge its business, or divest its business, or transfer the company owned or controlled, or make any other form of change.
   w. The taxpayer of Institution shall not endeavor to use the law in its favor in order not to pay the tax debt.
   x. The taxpayer of Institution shall provide Audit reports audited by the Public Accounting Firm in relation to its financial condition primarily, to prove that it is in an Insolvency, (Balance Sheet and Operational Cash Flows) condition and subject to its continuing constraints (Going Concern).
   y. If The taxpayer of Institution in the bankruptcy entity is indeed in fact a financial hardship (Experiencing Insolvency) in making its payment to its Creditor, not as an intention to avoid the implementation of Gijzeling by the Directorate General of Taxes.
   z. The taxpayer of Institution shall not profit by misleading action against the Directorate General of Taxes.
   aa. The taxpayer of Institution shall comply with its obligations and behave as respectable and honest, although such obligations are not expressly agreed upon in the conduct of tax liabilities.
   bb. If The taxpayer of Institution is in bankruptcy, if after the bankruptcy terminates, and then attempts again resulting in adequate financial condition, then with full awareness will make payment of the Tax Debt, in accordance with the fulfillment of the agreed contract.

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SPO2 Vital Sign: Definition, Ranges, and Measurements


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Abstract- Saturation of Oxygen in the Blood (SPO2) is one of the most important vital signs. Moreover, determining its value is considered an imperative task for healthy and sick people.

Motivation: in this paper, worthy information about the SPO2 vital sign is presented as well as the associated medical issues and the various ways to measure the SPO2 were discussed.

Method: referring to some significant different resources, precise definitions of this vital sign and some medical details were provided.

Conclusion: every single person should be interested in knowing little essential information of the SPO2 vital sign. This information might save lives.

Index Terms- SPO2, Body Oxygenation, Normal Ranges, and Pulse Oximeter

I. INTRODUCTION

SPO2 stands for peripheral capillary oxygen saturation, a measurement of the oxygen in the blood. This measure is presented as a percentage of 100 since it is the division of oxygenated hemoglobin by the total amount of hemoglobin in the blood [1]. If the SPO2 measurement was 97%, then this means that each red blood cell is made up of 97% oxygenated hemoglobin and 3% of non-oxygenated hemoglobin. The blood flows in the body contains many proteins, one of the most important proteins is the hemoglobin which its primary duty is carrying the oxygen in the blood, and this is the reason behind the red color of the blood[2][3][4]. Each molecule of hemoglobin can bind to four molecules of oxygen. Considering the weight of the hemoglobin, each one gram of hemoglobin can bind to 1.39 ml of oxygen. Figure (1) below illustrates how oxygen bound to hemoglobin and how it dissolved in the blood.

![Dissolved Oxygen vs. Oxygen Bound to Hemoglobin](image1)

Figure (2) below shows the oxygenated blood which is in red, and that flows in the arteries as well as the non-oxygenated blood which is in blue color and that flows through the veins.

![Oxygenated Blood vs. Non-Oxygenated Blood](image2)
Indeed, the respiratory system is the one responsible for supplying the body with oxygen. The oxygen is gathered in the lungs and distributed to the rest of the body via the circulation of the blood. In general, the importance of oxygenated blood is to supply body muscles with energy, so that the person can perform the works and duties smoothly and correctly. So, during exercises, the person needs more oxygen and try hard to breathe faster.

The saturated blood cell is defined as the cell that carries a reasonable amount of oxygen [5]. Both too high and too low levels can have counteractive effects on the body.

II. RANGES AND ASSOCIATED DISEASES

Typical ranges of the SPO2 vital sign vary between 96% and 100%. However, when patients have some medical troubles such as cardiovascular, chronic diseases and pneumonia, the level of SPO2 may drop rapidly. Ranges between 95% and 90% are considered to be low but with no evidence of impairment. Moreover, when the level of SPO2 gets lower than 90%, then this causes acute respiratory failure. In fact, some people have normal levels of SPO2 that are lower than 90% such as those who live in high altitudes. In addition, levels of SPO2 drop considerably in some cases such as sleep and physical exercises. Indeed, when the value of oxygen that is saturated in the artery which is abbreviated as SaO2 is below 90%, this cause a problem called hypoxemia. Hypoxemia is a crucial problem and may result in different symptoms, such as shortness of breath. There are some factors needed to continuously supply the different cells, tissues, and organs in the body with oxygen such as:

1. Enough amount of oxygen in the surrounding environment.
2. Lungs efficiency to inhale the oxygen-containing air and to exhale the carbon dioxide.
3. The efficiency of blood arteries and veins to circulate the blood to the lungs.

Any problem with any factor of the above factors such as high altitude, diseases like asthma and heart diseases might cause this significant problem hypoxemia.

Furthermore, when the range of SaO2 is between 65% and 55%, then this will cause an impaired mental function on average. Besides, when the percentage in SaO2 reading is started from 55% and less, then this will cause a loss of consciousness on average[6][7].

Consequently, there are some situations; the person is advised to visit the doctor for obtaining consultancy. The situations might be:

1. Shortness of breath after small exertion or when the person is at rest.
2. Shortness of breath that becomes worse when doing exercise.
3. Sudden awakening with shortness of breath and this is indeed might be symptoms of sleep apnea[8][9].

It is very imperative to mention that there is some advice to avoid falling under chronic shortness of breath, such as:

1. Quit smoking: smoking affects lungs and may cause many severe heart diseases.
2. Avoid passive smoking: passive smoking is as dangerous as direct smoking.
3. Doing regular exercises: regular exercise can progress the aggregate strength and endurance[10].

III. MEASUREMENTS

The most common method to measure the SPO2 vital sign is by using the pulse oximeter. The pulse oximeter is indeed a
non-invasive technique. It depends mainly on the absorption property of both oxy and deoxyhemoglobin. However, the pulse oximeter provides two wavelengths, which are the 940 nm and the 600 nm from two different light sources. In addition to the two light sources, there is also a light detector to provide the photoplethysmographic (PPG) signal to detect both the oxy and deoxyhemoglobin. The parameters of the two PPG signals are used to evaluate the SPO2 [11][12][13][14].

Another method is used to measure the SPO2 reading, which is the conventional pulse oximetry (CPO). In this technique, the arterial blood is assumed to be the only light-absorbing pulsatile component in the path of light. Indeed, the SPO2 is calculated by dividing the value of the Pulsatile Transmitted Red (PTR) to the Infrared (IR) Light by using the following formula:[15]

\[
\text{Optical Density Ratio} = \frac{\text{Pulsatile Transmitted Red}}{\text{Infrared Light}}
\]  

(1)

Recently, another recent technique is used to measure the SPO2 vital sign. In fact, the smartphone's camera is used to evaluate the SPO2. In this method, the effects of the environmental light sources are compensated. In fact, this method depends mainly on evaluating the quality of the PPG signals, and this is done by analyzing the intensity of the light in both red and green light channels of the video scopes of the patient fingertip. Here, a suitable digital way initiates the scale factor of the PPG to gather the effects of external light for increasing the estimation of the SPO2 reading [16].

IV. CONCLUSIONS

Studies are underway to re-evaluate SPO2 as a crucial, vital sign in improving patient medical health and reducing the bills referring to medical issues and diseases. In conclusion, anyone must take care of the vital sign SPO2, keep the readings of this vital sign within the normal ranges by using the different ways to measure this percentage provided in this paper and take the advice presented in this paper into consideration to keep the health as possible.

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AUTHORS

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Design and Performance for 14kW Downdraft Open Core Gasifier

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Abstract- Gasification is a thermo –chemical conversion process in which biomass reacts in oxygen/air deficient atmosphere to produce a gaseous fuel mixture. The result of gasification is the producer gas, containing carbon monoxide and hydrogen as main combustible gases. Producer gas can be used by mixing with air in internal combustion engines and in furnaces for thermal applications. Gasifier is a reactor in which the gasification process is carried out. The objective of this paper is to study design and operation analysis of down-draught, open core gasifier which uses rice husk as gasification fuel. Its output is about 14 kW and the design consideration is intended for YSD2100 Diesel Engine. In this paper, the components of rice husk and their operations are studied. Moreover, reactor designs, gasifier efficiency and power output calculation are included. Besides, the maintenance and safety techniques, troubles and their solutions are also discussed.

Index Terms- Gasification, reactor, rice husk, Diesel Engine

I. INTRODUCTION

The demand for renewable sources of energy is increasing due to an elevated concern about global warming, climate change and the decline of fossil fuel reserves. Compared with other renewable energy resources, biomass is huge. Its annual production rate is high and it is geographically widespread throughout the world. In general, paddy, or rice, is one of the earth’s most prolific crops. Rice husk is a residue from rice farming and is considered an agricultural waste. Rice husk can be treated as energy sources, a new kind of renewable resource, while the most commonly used petrified fuels at present are energy mills can be more than self-sufficient in electric power. Thus the development of rice utilization can be positive effect on the economics of rice production and consuming countries. However, it appears that no producer gas has yet been developed to produce a clean, tar-free gas from uncarbonized solid fuels such as agricultural residues, designs have been proposed and tested to solve this problems. Although the production of gas needs a certain skill, its principal advantage is that a solid fuel is turned into a gaseous fuel, which can be used in engines.

II. GASIFICATION TECHNOLOGY

A. Gasification Reactions

Producing gas from biomass consists of the following main reactions, which occur inside a biomass gasifier.

Drying: Biomass fuels usually contain 10%–35% moisture. When biomass is heated to about 100 °C, the moisture is converted into steam.

Pyrolysis: After drying, as heating continues, the biomass undergoes pyrolysis. Pyrolysis involves burning biomass completely without supplying any oxygen. As a result, the biomass is decomposed or separated into solids, liquids, and gases. Charcoal is the solid part, tar is the liquid part, and flue gases make up the gaseous part.

Oxidation: Air is introduced into the gasifier after the decomposition process. During oxidation, this takes place at about 700–1,400°C, charcoal, or the solid carbonized fuel, reacts with the oxygen in the air to produce carbon dioxide and heat.

\[ C + O_2 \rightarrow CO_2 + \text{heat} \]

Reduction: At higher temperatures and under reducing conditions, that is when not enough oxygen is available, the following reactions take place forming carbon dioxide, hydrogen, and methane.

\[ C + CO_2 \rightarrow 2 CO \]
\[ C + H_2O \rightarrow CO + H_2 \]
\[ CO + H_2O \rightarrow CO_2 + H_2 \]
\[ C + 2H_2 \rightarrow CH_4 \]

B. Types of Gasifiers

Several types of gasifiers are currently available for commercial use: counter-current or up draft fixed bed, co-current fixed bed or down draft, fluidized bed, entrained flow, plasma, and free radical. Temperature and pressure operating conditions as well as residence time are key factors in determining the nature of the produced fuel gas. Gasifiers have been designed in various configurations. Based on solid fuel combustion, gasification reactors can be divided into three main categories: fixed bed gasifiers (updraft and downdraft), fluidized bed gasifiers and the less established entrained bed gasifiers. Detailed reviews of gasifier options are available in the international literature. Various biomass gasification designs have been developed during the past two decades. Fixed bed gasifiers are mainly used in the small-scale range, whilst for larger scale fluidized bed gasifiers are proposed. Two different types of fixed bed gasifiers were originally developed: updraft and downdraft gasifiers. In updraft gasifiers, the gasification agent is introduced at the bottom and the fuel gas flow is upwards counter-current to the biomass, which is fed from the top. The fuel gas
leaves the gasifier at the top and the ash is discharged at the bottom. Several zones are created in updraft fixed bed gasifiers, which are starting from the top – the drying, the pyrolysis, the reduction and the oxidation zone. The temperature is increasing from the top to the bottom. The tars are produced mainly in the pyrolysis zone and leave the gasifier together with the fuel gas. Since there is no zone above the pyrolysis zone that has a higher temperature to thermally destroy the tars, a high amount of tars is expected in the fuel gas.

The downdraft gasifiers can be classified of two types. Those having, throat type design (including choke plate) and those with open core design. Throat type gasifiers are used for biomass fuels with low ash and uniform size, while open core gasifiers can tolerate more variation in fuel properties like fuel moisture, size and ash content. Also smaller throat diameter means higher gas velocities at the oxidative and reduction zones. This reduces tars but increases dust loading. Large throat diameter causes an increase of tar in the gas stream due to by passing of the hot zone. Fuels with high ash content (e.g. rice husk)

C. Down draft or co-current gasifiers

The downdraft (also known as co-current) gasifier is the most common type of gasifier. In a downdraft reactor biomass is fed at the top and the air intake is also at the top or from the sides. The gas leaves at the bottom of the reactor, so the fuel and the gas move in the same direction. The advantages of downdraft gasification include

(a) Up to 99.9 percent of the tar formed is consume requiring minimal or no tar cleanup.
(b) Minerals remain with the char/ash, reducing the need for a cyclone separator.
(c) Proven, simple and low cost processIn downdraft gasifiers,

The disadvantages of downdraft gasification are

(a) Requires feed drying to a low moisture content (<20%)
(b) Producer exiting the reactor is at high temperature.
(c) Requires secondary heat recovery system.
(d) 4-7 percent of carbon remains unconverted.

As a result, the mixture of gases in the exit stream is relatively clean. The position of the combustion zone is thus a critical element in the downdraft gasifier, its main advantage being that it produces gas with low tar content, which is suitable for gas engines.

Figure1. Down Draught Gasifier

C. Composition of Rice Husk Fuel

Composition of Rice Husk Fuel depends upon types of rice and different moisture content. This composition can be determined by proximate and ultimate analysis.

Table1. Typical Proximate Analysis of Rice Husk (Percentage by weight)

<table>
<thead>
<tr>
<th>Reference</th>
<th>Moisture</th>
<th>Ash</th>
<th>Fixed carbon</th>
<th>Volatile matter</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.A. Hicks</td>
<td>11.51</td>
<td>17.49</td>
<td>14.64</td>
<td>56.35</td>
</tr>
<tr>
<td>P.V.Grover</td>
<td>0</td>
<td>19.5</td>
<td>19.9</td>
<td>60.6</td>
</tr>
<tr>
<td>I.E.Cruz</td>
<td>0</td>
<td>23.2</td>
<td>15.3</td>
<td>61.5</td>
</tr>
<tr>
<td>Kaupp</td>
<td>9.8</td>
<td>23.0</td>
<td>12.5</td>
<td>54.7</td>
</tr>
<tr>
<td>10.1-12</td>
<td>15.8-23.0</td>
<td>12.7-17.4</td>
<td>56.4-69.3</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Various Ultimate Analysis of Rice Huck (Percentage by weight)

<table>
<thead>
<tr>
<th>Reference</th>
<th>C</th>
<th>H</th>
<th>O</th>
<th>N</th>
<th>S</th>
<th>Ash</th>
<th>Moisture</th>
<th>Heating Value(MJ/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.A Hicks</td>
<td>35.49</td>
<td>4.56</td>
<td>30.44</td>
<td>0.51</td>
<td>little</td>
<td>17.49</td>
<td>11.51</td>
<td>13.1</td>
</tr>
<tr>
<td>P.D. Grover</td>
<td>39.0</td>
<td>4.9</td>
<td>33.97</td>
<td>0.53</td>
<td>&lt;0.01</td>
<td>21.6</td>
<td>10.1</td>
<td>13.4</td>
</tr>
<tr>
<td>I.E. Cruz</td>
<td>35.6</td>
<td>5.2</td>
<td>35.8</td>
<td>0.2</td>
<td>–</td>
<td>23.2</td>
<td>0</td>
<td>14.5</td>
</tr>
</tbody>
</table>

Table 3. Main three successive stages of biomass gasification

<table>
<thead>
<tr>
<th>Gasification stage</th>
<th>Reaction formula</th>
<th>Reaction number/Reaction type</th>
<th>Reaction heat (kJ/Kmol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage I: Oxidation and other exothermic reaction</td>
<td>C+½O₂→CO (1) Partial oxidation</td>
<td>+110,700</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CO+½O₂→CO₂ (2) CO oxidation</td>
<td>+263,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C+O₂→ CO (3) Total Oxidation</td>
<td>+393,790</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C₆H₁₀O₅→xCO₂+yH₂O (4) Total Oxidation</td>
<td>&gt;&gt;0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H₂+½O₂→H₂O (5) Hydrogen Oxidation</td>
<td>+241,820</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CO + H₂O→CO₂+H₂ (6) Water-gas shift</td>
<td>+41,170</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CO + 3H₂→CH₄+H₂O (7) Methanation</td>
<td>+206,300</td>
<td></td>
</tr>
<tr>
<td>Stage II : Pyrolysis</td>
<td>C₆H₁₀O₅→C₇H₇+CO (8) Pyrolysis</td>
<td>&lt;0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C₆H₁₀O₅→C₄H₆O₄ (9) Pyrolysis</td>
<td>&lt;0</td>
<td></td>
</tr>
<tr>
<td>Stage III : Gasification (reduction)</td>
<td>C+ H₂O→CO+H₂ (10) Steam gasification</td>
<td>-131,400</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C+ CO₂→2CO (11) Boudouard reaction</td>
<td>-172,580</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CO₂+ H₂→CO+H₂O (12) Reverse water shift</td>
<td>-41,170</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C+ 2H₂→C H₄ (13) Hydrogenation</td>
<td>+74,900</td>
<td></td>
</tr>
</tbody>
</table>

III. METHODOLOGY AND DESIGN CALCULATION

A. Reactor Design Consideration

A typical rice husk gasifier has the following operational characteristics:
(a) A fuel is used which has a high natural ash content (15% - 23% by weight) and a low bulk density (100 kg/m³)
(b) A gas output of 200 Nm³/hr is achieved in large diameter furnace (1.5m)
(c) The residue after gasification amount of 30% – 40% of the initial volume of feedstock and 25% – 35% of its initial weight. An effective continuous ash removal system is therefore required.
(d) The low bulk density of rice husks necessitates either a very large hopper of a mechanism for continuous feeding. Three parameters which influence rice husk gasification the most are following:
   - Diameter of the reactor
   - Continuous ash removal
   - Superficial gas velocity

B. Calculation of the Power Output of Producer Gas Engine

The gasifier will be designed for YSD2100 Diesel Engine. The specification of YSD 2100 Diesel Engine and Modified Gas Engine are shown in Table 4.

Table 4. Specification of YSD2100 Diesel Engine and Modified Gas Engine

<table>
<thead>
<tr>
<th></th>
<th>YSD2100</th>
<th>Modified Gas Engine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Model</td>
<td>Vertical, Water-cooling, Four stroke direct combustion chamber</td>
</tr>
<tr>
<td>2</td>
<td>Type</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Number of cylinder</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Bore (mm)</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>Stroke(mm)</td>
<td>118</td>
</tr>
<tr>
<td>6</td>
<td>Compression ratio</td>
<td>18 : 1</td>
</tr>
<tr>
<td>7</td>
<td>Total displacement (mm)</td>
<td>1.854</td>
</tr>
<tr>
<td>8</td>
<td>Firing Order</td>
<td>1–2</td>
</tr>
<tr>
<td>9</td>
<td>Rated power (KW)</td>
<td>22.4 ~ 26.5</td>
</tr>
<tr>
<td>10</td>
<td>Cooling Method</td>
<td>Force water cooling</td>
</tr>
<tr>
<td>11</td>
<td>Minimum specific fuel consumption at full load</td>
<td>≤240.7 (g/kW.h)</td>
</tr>
</tbody>
</table>

Maximum air + gas intake into the engine cylinder = \( \frac{1}{2} \times \frac{rpm \times V_f}{60 \times 1000} = \frac{1}{2} \times \frac{225 \times 0.854}{60 \times 1000} = 0.03476 \text{m}^3/\text{s} \)

Air/gas ratio by volume = 1: 1.225

Maximum gas intake = \( \frac{1.225}{2.225} \times 0.03476 \approx 0.01914 \text{m}^3/\text{s} \)

The real gas intake is 0.1914\( \times \eta_v \), where \( \eta_v \) is volumetric efficiency of the engine.

For a well designed and clean air inlet manifold, \( \eta_v \) can be taken as 0.8.

The real gas intake is \( Q_g = 0.1914 \times 0.8 = 0.01531 \text{m}^3/\text{s} \)

The heating value (\( H_g \)) of the rice husk gas is taken as 4184 kJ/\( \text{m}^3 \)

Therefore thermal power in the gas is:

\[ P_g = 0.01531 \times 4184 = 64.057 \text{kW} \]

For a compression ratio of 10: 1, the efficiency can be estimated as 25 percent.

Therefore the maximum mechanical output of this engine is:

\[ P_m \text{ maximum} = 64.057 \times 0.25 = 16.0125 \text{kW} = 21.475 \text{HP} \]

The efficiency of generator can be estimated as 85 percent.

The maximum electrical output is therefore \( P_e \text{ maximum} = 16.01425 \times 0.85 = 13.612 \approx 14 \text{kW} \)

14kW output Down – draught Open Core Gasifier Design Calculation

Rice Husk Used for electricity

Thermal efficiency of the gasifier is taken as 50%

Thermal power consumption (full load) = 64.057/0.5 = 128.114 kW

Heating value of rice husk (11% to 20%MC) : 13000kJ/kg

Rice husk consumption of gasifier, \( G_m = \frac{128.114}{13000} \text{kJ/s} \)

So the installation under consideration uses \( \frac{P_e \text{ max}}{G_m} = 2.51 \text{kg/kWh} \)

2.51 kg of rice husk to produce 1 kWh electricity.

C. Reactor Design

To calculate reactor diameter, one important imperial formula is

\[ D_R = 1130 \times \frac{G_m}{q} \]

where \( D_R \) is the diameter of reactor

\( q \) = intensity of gasification or specific gasification rates taken as \((110 \sim 210) \text{kgm}^{-2}\text{h}^{-1} \)

\( G_m \) is the rice husk consumption in kg/hr

Therefore reactor diameter (\( D_R \)),

For \( q = 110 \text{kgm}^{-2}\text{h}^{-1} \), \( D_R = (1130 \times 35.46)/110 = 364.27 \text{mm} \)

For \( q = 210 \text{kgm}^{-2}\text{h}^{-1} \), \( D_R = (1130 \times 35.46)/210 = 190.808 \text{mm} \)

Therefore diameter of reactor should be within 190.808 ~ 364.27 mm

The height of the gasifier can be determined by the following formula, \( H = D + 1.5D \)

where \( H \) = height of the gasifier and \( D \) = diameter of the gasifier

Therefore height of the gasifier (\( H \)),

For \( q = 110 \text{kgm}^{-2}\text{h}^{-1} \), \( H = 364.27 + (1.5 \times 364.27) = 910.675 \text{mm} \)

For \( q = 210 \text{kgm}^{-2}\text{h}^{-1} \), \( H = 190.808 + (1.5 \times 190.808) = 477.02 \text{mm} \)

Therefore height of reactor should be within 477.02 ~ 910.675 mm

D. Gasifier Efficiency

A useful definition of the gasification efficiency if the gas is used for engine applications is:

\[ \eta_m = \frac{H_g \times Q_g}{H_s \times M_s} \times 100(\%) \]

In which:

\( \eta_m \) = mechanical efficiency of gasification (%)

\( H_g \) = heating value of the rice husk gas (kJ/m³),

\( Q_g \) = volume flow of gas (m³/s)

\( H_s \) = lower heating value of gasifier fuel (kJ/kg)

\( M_s \) = gasifier solid fuel consumption (kg/s)

\[ \eta_m = \frac{4184 \times 0.01534}{13000 \times 0.00985} = 0.50025 = 50\% \]

Depending on type and design of gasifier as well as the characteristics of the fuel \( \eta_m \) may be changed.

Based on the observation, it was decided that a controlled continuous ash removal system is necessary for reliable continuous gasification of rice husks. When dealing with a difficult fuel such as rice husks, it is very important to eliminate factors that may influence the performance of a grate, but are not caused by the design of the grate. For instance, even a well-designed grate will not help if the rice husk fuel bed above the grate cake. A good ash removal system should meet the following criteria:
IV. CONCLUSION

In this paper, the author approaches the open core rice husk gasifier from the point of mechanical view. Final output of the gasifier is about 14kW. Reactor diameter is 35.6 cm. Height of the gasifier is 61 cm. Gasifier efficiency is 50 percent. Gasifier is needed to maintain one time in one or two weeks. So the author design the movable parts to install easily. Moreover the author describes the maintenance and operation stages to obtain more efficiency and to escape the operator from danger. The gasifier can be used by attaching 14 kW engine in many places such as irrigation pump, ice plant, oil mill, tractors and small industries.

V. DISCUSSION AND RECOMMENDATION

Analyze and understand all the provided review comments. Using gasifier, rural areas can be obtained many benefits as follows:

- With electric power and available of water, there are possibilities for irrigation of rice fields or other crops.
- With power and light, small industries can grow and increase earning for people.
- Electric power will improve agricultural can grow and increase earning for people.
- Electric light means a lot for adult education since the daylight hours must be used for work in the fields.
- With light and power, small clinics can be made possible for improvement of health.

The main problems of rice husk gasification system can be summarized as follows:

- Tar formal during the gasification process reach the engine and the technology of tar removal has to be improved.
- System maintenance is time consuming and costly.
- The water consumption for the existing gasification system is high.

In the design, reactor diameter can save for required power and it may be minimum diameter for economy. The location of heat exchanger is very important. The best and suitable position is between the reactor exist and ash flushing tube. In dry filter design, good absorption materials are used and have been designed to enable the bedmaterial to be replaced easily and cheaply. An attempt should be made to install as much tar – absorbing fibre plates as possible in the gas storage tank so that tar is really reduced to a minimum before the gas reaches the engine. Producer gas is poison gas so the operator should take care of his health. In this paper, studies on the gasification of rice husk and producer gas is used in internal combustion engine have shown encouraging results as (a) 100% diesel fuel can be replaced successfully by producer gas (b) generator can produced about 14 kW driving with converted YSD2100 Diesel Engine (c) producer gas engine can be applied commercially in near future. It can be expected that the reliable, efficient and economical rice husk gasifier will be operated in rural area of Myanmar by using as reference on this paper. Further research will be continued to improve the engine gasifier system.

REFERENCES

A Study on Sthalavrikshas in Temples of Madurai District, Tamil Nadu

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Abstract- India delivers rich biodiversity and it is not just the world’s twelve mega diverse countries, but also one of the eight major centers of origin and diversification of domesticated taxa. These taxa are conserved and have been considered sacred because of their cultural, religious and economic importance. In Tamil Nadu, some sacred trees are in the status of extinct, endangered, threatened, and vulnerable and vary rare habit. The sacred trees are very good examples of ex situ conservation, where a single plant is conserved and worshipped. A study of Sthalavrikshas is also known as sacred trees (or) temple trees was conducted in the temples of the Madurai district during 2016-2017. The study revealed the presence of Sthalavrikshas in 65 temples out of 100 temples studied. Totally 31 species of Sthalavriksha recorded in these 65 temples.

Index Terms- Biodiversity, Conservation, Sthalavrikshas.

I. INTRODUCTION

Sacred groves and sthalavriksha (temple tree) have been acting as a major role in the conservation of plants and animals. In the location are certain ethnic groups as residential district in India, which have been worshiping forests, trees and certain animals since time immemorial. Occurrence of sacred groves at several spaces in India, clearly defines the community’s attachment to nature.

Sacred plants play a really significant role in ecology. Due to their ecological value and effective properties, sacred plants continue to be employed in the religious and social festivals of the Hindus. The five most sacred leaves of pipal, Cluster fig, white fig, banyan and mango are ubiquitously employed in making prayers and oblations. On auspicious occasions, mango leaves are attached to train and strung up on doors as a welcome banner, and leaves of purasu and banyan make workable plates and bowls during community feasts. Leaves of some other trees are also customarily offered to deities e.g., Vilvam (Bengal quince) to Lord Siva, of banana and Arjuna to Lord Ganeshas, and of kontrai (Cassia fistula) to all the gods and goddesses. The red flowers of the Indian coral tree are used in the worship of Lord Vishnu and Lord Siva; of Alari (Nerium indicum) in the worship of Lord Siva and the Sun-god; of ketaki (Yucca gloriosa) in the worship of Lakshmi, and of pala or breadfruit (Artocarpus integrifolia) in the worship of Lord Vishnu. The purpose of some flowers is prohibited in worship rites like vaagai (sirisa or parrot tree/Albizia lebbeck) in the worship of Lord Ganesha and vengai (Pterocarpus marsupium) in the worship of Lord Siva. The wood of the sacred trees like vilvam, banyan, vrassu and pipal is never employed as fuel, as it is believed to invite the anger of gods. But it is employed in other ways, in sacrificial rites and ceremonies. (Sudhakar, 2016). Sthalavriksha worship in temples is a popular exercise. Most of these temples have their own Sthalavrikshas (temple trees) and Nanthavanam (flower garden). Sacred plants provide food, shelter and nesting substratum for several species of birds and squirrels. All souls of certain species are completely protected. Sthalavriksha is a natural tree found in the temple site before construction of the temple and most temple myths (Sthalapuranas) and temple histories (Sthalavaralaru) refer to a prime deity that was first unearthed or found under the tree (Gunasekaran & Balasubramanian, 2005). Every temple has one plant or tree as sthalavriksham. Sthalavriksha means the tree of the locality (sthal-place; vr kuksha-tree). In Tamilnadu state, about sacred trees are in the status of extinct, endangered, threatened, and vulnerable and vary rare habit. Such trees are both ethno botanically or culturally important and ecological representative of the area.

Sthalavriksha or temple tree is a single plant worshipped as equal as the prime deity in the temples. In both Hinduism and Buddhism, temple tree worship holds a bigger significance. The plant, primarily worshipped are Peepal (Ficus religiosa), Neem (Azadirachta indica), Bael (Aegle marmelos), Sandalwood (Santulum album), etc.

There are temples which have more than one Sthalavriksham simultaneously, whereas some temples like a Sri Kallalagar temple (Prosopis cineraria (L.) Druce and (Pterocarpus santalinus L.f.) have to have different Sthalavriksham is different yugas. On that point are also examples of more than temple having the same trees as sthalavriksham (eg.) Aegle marmelos (L.) Corr.serr. and Azadirachta indica Adr. Juss. etc. Some of the important temple festivals are associated with the sthalavriksham of the temples concerned mavadi sevai of kanci Ekambareswara temple and makizhadi sevai of tiruvottiyur temple are two such festivals.

Sthalavriksha mostly occurs in tree habit, in main or big temples of Tamilnadu. In some temples, it occurs in herb, shrub, grass or climber forms. Sacred trees are therefore handled as any other sacred space, and it is thus not surprising that many of the customs and ceremonies mentioned in sacred places, in general, are also observed at the sites of sacred trees. This habit shows characteristically the importance of medicinal plants in Indian System of Medicine. Medicinal parts of the Sacred Trees

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(Sthalavrikshas) are practiced in different forms. It is presented in the form of paste, juice, dried powder and made into tablets and juices mixed with sugar and honey to cure various diseases. (Amirthalingam. 1998)

II. MATERIAL AND METHODS

2- Study Area
2.1 Historical Background

Madurai is one of the major districts of Tamilnadu State. Madurai is located along the bank of the river Vaigai. It is an ancient urban center known for its age old legacy and agile of contemporary modern lifestyle – a singular spot for worship and the Modern-day of living. Madurai is also visited by different names like "City of Jasmine" (Malligai maanagar), "Temple City" (Koil maanagar), "City that never sleeps" (Thoonga Nagaram) and "City of four junctions" (Naanmada koodal).

2.2 Location & Geographical Area

The Madurai district lies between 9° 56' 20.7348" N and 78° 7' 18.1884" E. It takes in an area of 37 41.73 Sq. Km and is bordered on the west by Theni district, on the north by Dindigul district, on the east by Sivagangai district and along the south by Virudhunagar district. The district is empowered with a semi arid tropical climate with normal rainfall of 827.1 mm as against 923.1 mm for the state.

The present study was extended out in Madurai district, Tamilnadu. 130 temples were enumerated, data gathered from the local people. Flowering twigs of trees set up within the temple premises were collected and identified taxonomically using the Floras. The tree species grown as Sthalavriksha in 65 temples in Madurai district were enumerated. The survey documented several interesting facets of tree worship. The local people, including Temple handoff, Priests, Temple Defendable and Worshipers was interacted with temple area of Madurai district that have indigenous knowledge about sacred plants of their locality and information’s were collected by group discussions and interviews with them in their local language (Tamil). Binomials of the plants with family, their local names, parts used and Medicinal uses were recorded.

2.3 Interview and Ethno medicinal data collection

The ethno medicinal information was collected by interacting with the priest and people living around the temples through interview as a recorded data.

2.4 Collection of plant

The floral parts and twigs were collected from the Sthalavriksha for Binomial name identification. Generally, the plant specimens were collected with flower and fruit. In case, if there are no flowers and fruit conditions, the plant twig with few leaves was collected for proper identification.

III. RESULT AND DISCUSSION

Sthalavriksha worship in temples is an ancient religious practice in India. This study is the first attempt to survey the Sthalavrikshas of 100 temples in Madurai district, Tamilnadu, India. Of the surveyed 100 temples, there were only 68 temples in which Sthalavriksha were present. The temples found among them 12 were Lord Shiva temples, 28 were Lord Amman temples, 7 were Goddess Sakthi temples, and 7 were Lord Murugan temples, 3 were Vinayaga temples, 11 various deity temples. A total of 31 plant species belonging 20 families was recorded in the study. Most of these plants belong to Dicotyledons of angiosperms and one species belong to Monocotyledons (Borassus flabellifer L.). 30 Sthalavriksha plants were trees while one was a shrub (Tabernaemontana divaricata R.Br.ex Roem. & Schult.). All the Sthalavrikshas documented in the study are given in Table.1

In Madurai district, the ancient temples were recorded for this study. The temples include Meenakshi Amman temple, Kallalagar temple, Thiruvaapudaiyar temple, Innalum Nanmai Taruvar Temple, Puttu Sokanathar Temple etc. A total of 31 Sthalavriksha species belonging to 20 families were recorded, and Dominant families were Moraceae and Fabaceae with 4 species each, Moraceae, represented by 4 species (Ficus benghalensis L. Ficus microcarpa L.f. Ficus religiosa L. Ficus tintoria G.Forst). Fabaceae represented by 4 species (Prosopsis cineraria (L.) Druce, Pterocarpus santalinus L.f. Acacia leucophloea Wild. and Prosopis cineraria (L.) Druce) and the other dominated families were Anacardiaceae and Mimosaceae. Each family is represented by 2 species, Mimosaceae (Albizia amara (Roxb.) Acacia nilotica (L.) Wild. ex Del.) and Anacardiaceae, includes 2 species (Lannea coromandelica (Houtt.) Merr and Mangifera indica L.) Among these Rutaceae was the dominant family represented by 16 temples followed by Moraceae represented by 6 temples and followed by Meliaceae and Rubiaceae represented by 4 temples each. The frequently
occurring species was *Aegle marmelos* (L.) Correa recorded in 17 temples followed by *Ficus benghalensis* L. Druce in 6 temples and *Azadirachta indica* Adr. Juss and *Neolamarckia cadamba* (Roxb.) Bosser was recorded in 4 temples each. All the 31 species were reported to have medicinal properties. Tholkappiyavathi *et al.*, (2013) reported that 16 temples have Sthalavrikshas while 20 such element exists in remaining temples. 9 species of Sthalavrikshas have been recorded in these 16 temples. Prabakaran *et al.*, (2017) surveyed the sthalavriksha of 106 temples in Salem, Namakkal, Karur district. They record sthalavriksha were found in 81 temples and a total 18 plant species belong to 18 genera and 14 families. Among this Caesalpiniaaceae was the dominant family represented by 3 species followed by Rutaceae and Moraceae represented by 2 species each.

![Dominant sacred plant species](image1)

![Dominant families are sthalavriksha species](image2)

**Table-1 list of Sthalavriksha species**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Botanical Names</th>
<th>Family</th>
<th>Habit</th>
<th>Local name</th>
<th>Temple Name</th>
<th>IUCN Status</th>
<th>No of Individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Acacia leucophloea</em> Wild.</td>
<td>Mimosaceae</td>
<td>Tree</td>
<td>Velamaram</td>
<td>Mathichiyarkaru</td>
<td>Least Concern</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td><em>Acacia nilotica</em> (L.) Willd. ex Del.</td>
<td>Mimosaceae</td>
<td>Tree</td>
<td>Palkruclai</td>
<td>Ellai karupha</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td><em>Aegle marmelos</em> (L.) Corr.serr.</td>
<td>Rutaceae</td>
<td>Tree</td>
<td>Vilvam</td>
<td>Agnieaswer</td>
<td>Least Concern</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td><em>Ailanthus excelsa</em> Roxb.</td>
<td>Simaroubaceae</td>
<td>Tree</td>
<td>Peru</td>
<td>Periya kathavarayan</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td><em>Alangium salviifolium</em> (L.f.) Wangerin</td>
<td>Cornaceae</td>
<td>Tree</td>
<td>Alangi</td>
<td>Munisamy</td>
<td>Least Concern</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td><em>Albizia amara</em> (Roxb.)</td>
<td>Mimosaceae</td>
<td>Tree</td>
<td>Usilaimaram</td>
<td>Periya ayyan</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td><em>Azadirachta indica</em> Adr. Juss.</td>
<td>Meliaceae</td>
<td>Tree</td>
<td>Vembu</td>
<td>Kaaliyamman</td>
<td>Least Concern</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td><em>Borassus flabellifer</em> L.</td>
<td>Arecaceae</td>
<td>Tree</td>
<td>Panai</td>
<td>Muniyandi</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td><em>Cassia fistula</em> L.</td>
<td>Fabaceae</td>
<td>Tree</td>
<td>Sarakontrai</td>
<td>Thiruvappudaiyar</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td><em>Crapeva adansomii</em> DC.ssp.odora (Buch.Ham.) M.Jacobs</td>
<td>Capparaceae</td>
<td>Tree</td>
<td>Mavilingam</td>
<td>Kadasari nallakurumpa</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td><em>Ficus benghalensis</em> L.</td>
<td>Moraceae</td>
<td>Tree</td>
<td>Alamaram</td>
<td>Kanni kamachi</td>
<td>Least Concern</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td><em>Ficus microcarpa</em> L.f.</td>
<td>Moraceae</td>
<td>Tree</td>
<td>Ithimaram</td>
<td>Pandi aandi</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>No.</td>
<td>Species</td>
<td>Family</td>
<td>Type</td>
<td>Common Name 1</td>
<td>Common Name 2</td>
<td>Status</td>
<td>No.</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------</td>
<td>----------------</td>
<td>---------</td>
<td>------------------------</td>
<td>------------------------</td>
<td>--------------</td>
<td>-----</td>
</tr>
<tr>
<td>13</td>
<td><em>Ficus religiosa</em> L.</td>
<td>Moraceae</td>
<td>Tree</td>
<td>Arasu</td>
<td>Madhanga gopalan</td>
<td>Least Concern</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td><em>Ficus tintoria</em> G. Forst</td>
<td>Moraceae</td>
<td>Tree</td>
<td>Kallathith</td>
<td>Supiraminiy swami</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td><em>Lannea coronandela</em> (Houtt.) Merr.</td>
<td>Anacardiaceae</td>
<td>Tree</td>
<td>Uthiyamaram</td>
<td>Manathiraiyan</td>
<td>Least Concern</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td><em>Lepisanthes tetraphylla</em> (Vahl) Radlk</td>
<td>Sapindaceae</td>
<td>Tree</td>
<td>Kookamathi</td>
<td>Cinna puli ayyanar</td>
<td>Least Concern</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td><em>Mangifera indica</em> L.</td>
<td>Anacardiaceae</td>
<td>Tree</td>
<td>Maa</td>
<td>Mottu kaiyan</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td><em>Millingtonia hortensis</em> L.f.</td>
<td>Bignoniaceae</td>
<td>Tree</td>
<td>Kattumalli</td>
<td>Ellamal &amp; pappamal</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td><em>Mimusops elengi</em> L.</td>
<td>Sapotaceae</td>
<td>Tree</td>
<td>Magizham</td>
<td>Thirupaapudaiyar</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td><em>Morinda tinctoria</em> Roxb.</td>
<td>Rubiaceae</td>
<td>Tree</td>
<td>Manjanathi</td>
<td>Ellai amman</td>
<td>Least Concern</td>
<td>4</td>
</tr>
<tr>
<td>21</td>
<td><em>Musa paradisiaca</em> L.</td>
<td>Musaceae</td>
<td>Tree</td>
<td>Vazhai</td>
<td>Koodalagar perumal</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td><em>Naringi crenulata</em> (Roxb.) Nicolson</td>
<td>Rutaceae</td>
<td>Tree</td>
<td>Thasathala vilvam</td>
<td>Imailum nanmai</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td><em>Neolamarckia cadamba</em> (Roxb.) Bosser</td>
<td>Rubiaceae</td>
<td>Tree</td>
<td>Kadambam</td>
<td>Sri meenachi sokkanathar</td>
<td>Least Concern</td>
<td>4</td>
</tr>
<tr>
<td>24</td>
<td><em>Pongamia pinnata</em> (L.) Pierc</td>
<td>Fabaceae</td>
<td>Tree</td>
<td>Punnai</td>
<td>Naagar</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td><em>Prosopis cineraria</em> (L.) Druce</td>
<td>Fabaceae</td>
<td>Tree</td>
<td>Vanni</td>
<td>Kallalagar</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td><em>Pterocarpus santalinus</em> L.f.</td>
<td>Fabaceae</td>
<td>Tree</td>
<td>Santhanamaram</td>
<td>Kallalagar</td>
<td>Endangered</td>
<td>1</td>
</tr>
<tr>
<td>27</td>
<td><em>Syzygium cumini</em> (L.) Skeels</td>
<td>Myrtaceae</td>
<td>Tree</td>
<td>Naval</td>
<td>Pazhamudhir solai</td>
<td>Least Concern</td>
<td>2</td>
</tr>
<tr>
<td>28</td>
<td><em>Tabernaemontana divaricata</em> R.Br. ex Roem. &amp; Schult.</td>
<td>Apocynaceae</td>
<td>Shrub</td>
<td>Nanthiyavatti Seiya mutthaiya ayyanar</td>
<td>Least Concern</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td><em>Tamarindus indica</em> L.</td>
<td>Caesalpinaceae</td>
<td>Tree</td>
<td>Puli</td>
<td>Ayyanar</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td><em>Terminalia arjuna</em> (Roxb.ex DC.)Wight &amp; Arn.</td>
<td>Combretaceae</td>
<td>Tree</td>
<td>Maruthu</td>
<td>Marutha kaali amman</td>
<td>Least Concern</td>
<td>1</td>
</tr>
<tr>
<td>31</td>
<td><em>Thespesia populnea</em> (L.) Sol.ex Corr. Serr.</td>
<td>Malvaceae</td>
<td>Tree</td>
<td>Puvarasu</td>
<td>Veyil ugantha amman</td>
<td>Least Concern</td>
<td>1</td>
</tr>
</tbody>
</table>

### 3.1. Economically important on Species

Most of the plants put down from sacred plants (Sthalavriksha) of Madurai district are economically significant. The medicinal plants comprise about 31 species, 29 species having timber value and 19 species were regarded for minor forest produce. Many multipurpose species have also been reported from the groves. Of these, 23 species are used as timber and medicine, 34 species as medicine and minor forest produce, 18 species as minor forest products and timber, and 10 species as timber, medicine and minor forest produce. Sukumaran *et al.*, (2010) reported 329 species belonging to 251 genera of 100 families and economically important plants such as medicinal value (194 sp.), timber value (34sp.) and minor forest product (19sp.)
3.2. Quantitative analyses of Medicinal use

The village people have used the Sthalavriksha plants for many ills. It may be noted here that most of the sacred trees usually have great medicinal value. Traditional medicine continues to act as an important role in health maintenance. Medicinal parts of the Sacred Trees (Sthalavrikshas) are practiced in dissimilar kinds. It is presented in the form of a paste, juice, dried powder and juices mixed with sugar and honey to cure several diseases. The similar documented was made for 31 plants belong to 20 families are identified as traditional medical used species (Table-2). Gastrointestinal problems like digestive problems, diarrhea, dysentery, stomach ache and constipation were treated using specific herbal prescriptions by the local peoples same reported. Respiratory problem like cough, cold, and asthma also used medicinal plant. The plant parts, mostly reported in this regard were Leaves (29%), Bark (25%), Fruit (14), Root (12%), Flower (8%), Stem (6%), Seed (4%) and Latex (2%). Gunasekaran., et al (2012) - Ethnomedicinal uses of 91 Sthalavrikshas (temple trees) in Tamil Nadu, southern India, posses medicinal uses and cured various diseases like Toothache, Dysentery, Stomach ache, Diarrhea, etc.

Table-2 Ethinomedicinal uses of sacred plants

<table>
<thead>
<tr>
<th>S.No</th>
<th>Botanical Names</th>
<th>Plant part</th>
<th>Medicinal uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acacia leucophloea Wild.</td>
<td>Leaf, bark, root</td>
<td>Cough, throat infection, dysentery</td>
</tr>
<tr>
<td>2</td>
<td>Acacia nilotica (L.) Willd. ex Del.</td>
<td>Leaf</td>
<td>Diarrhea, dysentery</td>
</tr>
<tr>
<td>3</td>
<td>Aegle marmelos (L.) Corr.serr.</td>
<td>Whole plant</td>
<td>Fever, diarrhea, skin disease</td>
</tr>
<tr>
<td>4</td>
<td>Ailanthus excelsa Roxb.</td>
<td>Bark</td>
<td>Cough and cold</td>
</tr>
<tr>
<td>5</td>
<td>Alangium salvifolium (L.f.) Wangerin</td>
<td>Fruit</td>
<td>Eye disease</td>
</tr>
<tr>
<td>6</td>
<td>Albizia amara (Roxb.)</td>
<td>Gum</td>
<td>Ulcer</td>
</tr>
<tr>
<td>7</td>
<td>Azadirachta indica Adr. Juss.</td>
<td>Whole plant</td>
<td>Skin infection, malaria</td>
</tr>
<tr>
<td>8</td>
<td>Borassus flabellifer L.</td>
<td>Fruit</td>
<td>Skin disease</td>
</tr>
<tr>
<td>9</td>
<td>Cassia fistula L.</td>
<td>Leaf, flower, root</td>
<td>Skin disease, snake bite</td>
</tr>
<tr>
<td>10</td>
<td>Crateva adansonii DC.ssp.odora (Buch.Ham.) M.Jacobs</td>
<td>Bark, leaf</td>
<td>Stomach troubles, jaundice</td>
</tr>
<tr>
<td>11</td>
<td>Ficus benghalensis L.</td>
<td>Whole plant</td>
<td>Toothache, female sterility</td>
</tr>
<tr>
<td>12</td>
<td>Ficus microcarpa L.f.</td>
<td>Leaf, bark</td>
<td>Headache, liver diseases, stomach pain</td>
</tr>
<tr>
<td>13</td>
<td>Ficus religiosa L.</td>
<td>Leaf, bark</td>
<td>Jaundice, skin diseases, ulcer</td>
</tr>
<tr>
<td>14</td>
<td>Ficus tintoria G. Forst</td>
<td>Leaf</td>
<td>Broken bones</td>
</tr>
<tr>
<td>15</td>
<td>Lannea coromandelica (Houtt.) Merr.</td>
<td>Bark</td>
<td>Stomach pain</td>
</tr>
</tbody>
</table>
3.3. Medicinal preparations

The medicinal preparations followed by the Sthalavrikshas of Madurai district to cure a disease were based on many kinds of preparations which are as follows.

1. **Decoction**: A decoction was obtained by boiling the plant in water until the volume of liquid was reduced to more than \( \frac{1}{2} \) or \( \frac{3}{4} \) of the original amount of liquid.

2. **Extract**: The plant material was ground with some amount of water as per the need and filtered. The filtrate was used as an extract.

3. **Juice**: The juice was obtained by grinding the plant material and this preparation was administered wholly (This juiciest material used for filtered or non-filtered).

4. **Latex**: Latex was obtained by detaching the leaf or young stem at normal region of the plants and used.

5. **Paste**: The paste was prepared by grinding fresh, dried material with water.

6. **Powder**: The powder was prepared by grinding dried material.

7. **Raw**: The plant material is also used in raw form, was used immediately after harvesting.

It was also likewise mentioned that the sthalavrikshas in Madurai district in Tamil Nadu used the medicinal preparation mostly in the form of Paste (19%), followed by decoction (20%), juice (20%), extract (15%), Powder (9%), Raw and Latex (17%). Some of the sacred plants cure to various diseases, taken from various forms, such as *Aegle marmelos* species bark decoction is used to treat intermittent fever. Bark powder used for skin diseases. Leaf act as a blood purifier, *Cassia fistula* species taken from various forms, Leaf (paste) flower (juice) and root (extract) cured of some diseases such as skin diseases, snakebite, fever and cold. Gunasekaran et al., (2012) - Ethnomedicinal uses of 91 Sthalavrikshas (temple trees) in Tamil Nadu, southern India, they reported medicinal uses and taken from various formations such as juice, decoction, powder, paste, used to cure for various diseases and ailments like Diarrhea, fever, cough, cold, etc.

From the present investigation, it was noted that the Sthalavriksha plants on Madurai district of the study area used to herbal preparation made from the medicinal plants mostly used for the treatment of diarrhea (5 species: *Aegle marmelos*, *Mangifera indica*, *Acacia nilotica*, *Morinda tinctoria*, *Tamarindus indica*), dysentery (5 species: *Acacia nilotica*, *Acacia leucophloea*, *Syzygium cumini*, *Tabernaemontana divaricata*, *Morinda tinctoria*), cough (5 species: *Ailanthus excels*, *Acacia leucophloea*, *Lepisanthes tetraphylla*, *Prospis cineraria*, *Millingtonia hortensis*), skin diseases (9 species: *Aegle marmelos*, *Azadirachta indica*, *Mimusops elengi*, *Morinda tinctoria*, *Neolamarckia cadamba*), joint pains, rheumatism.

3.4. Conservation status of the plants
The plant species *Pterocarpus santalinus* comes under the Endangered category, all other species are of least concerned status.

### 3.5. The necessity of security

Sthalavrikshas worshipped in plants are a means of conservation of plants. Plants in the temple gardens are cultivated and maintained and this is also a means of conservation of plants. The role of people in the conservation of plant has been an age old practice since historic period. It was concluded that the Sthalavriksha worship is an age old practice, myths, beliefs and this practice play a major role in the conservation of plants.

Thus, the above results and discussion proved the relation of the human and the nature towards plant conservation. The traditional worshipping has protected many plants which have tremendous medicinal value and made them as sacred, so that with the fear of deity nobody eradicates it. So we have to protect these sacred plants for us and our next generation for better survival. On the basis of this study, we have to follow our ancestors belief in humanity and nature sustainability.

### IV. CONCLUSION

Madurai district, unitary of the ancient districts of Tamil Nadu famous for its religious culture, was studying for the sthalavriksha plants. It was noted that a total of 31 plant species was recorded. The recorded plant species belong to 20 families. Among that family of Moraceae and Fabaceae dominated together with 4 species followed by Rutaceae, Rubiaceae, Anacardiaceae and Mimosaceae family consequently represented with 2 plant species. Medicines are obtained from the Sthalavrikshas and are used in different forms. Sthalavrikshas are valued for their botanical, medicinal, environmental, religious and mythical importance. The sthalavrikshas of Tamilnadu constitute a lot of genetic resources for the conservation of species diversity. Propagation of sthalavrikshas in temples contributes to the conservation of our floral diversity. Some trees are significant for their economic use of shipbuilding or in the timber industry, some for providing homes for various animals, birds, and others for their medicinal value. In the present study, it is concluded that the religious activities are having a close relationship with plants boost up the mental health of local people of Madurai district and many of the sacred plants found in the household and temples were used for various religious cultural activities as well as for health care. These sacred plants are worshiped by the local people for getting the blessing of health and wealth by positive powers of nature. Hence the religious ceremonies, rites act as a protective factor or device for the conservation of sacred plants. So, it is the duty of the present generation to preserve and promote these aesthetic treasures to conserve biodiversity and nature, which will surely play a part in the progression of human beings. These sacred trees preserved through millennia by our ancestors as potential biore sources should be respected and conserved for the future generation. The sthalavrikshas is a mean of conservation of biodiversity.

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Application of Data Mining Technique for Wheat Crop Yield Forecasting for Districts of Gujarat State

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Abstract- Objectives: The main objective of this research is to forecast the wheat crop yield for the different districts of Gujarat state.

Methods/Statistical analysis: To predict the wheat crop yield, data mining classification algorithms and step-wise linear regression method were used. Weighted and unweighted weather indices were calculated using the weekly weather data as suggested by the crop yield forecasting model by IASIR, New Delhi. The actual yield data is used from 1985 to 2012 years as training set and from 2013 to 2015 as validation years.

Findings: The result was studied for both the techniques and result shows that various districts coefficient of determination (R2) was ranged between 64% for Valsad to 97% for Bharuch using crop yield forecasting model. By using the WEKA classification MLP algorithm, the coefficient of determination (R2) was found 92% for Valsad, 98% for Ahmedabad and for the rest of the districts it’s 100%. The result of actual and predicted wheat yield from 2012-13 to 2014-15 was studied for yield forecast model and found that error percents were underestimated and overestimated predictions for the different districts. Study shows that the results of MLP and AR algorithms were better compare to other algorithms.

Application/Improvements: Use of data mining techniques for the agriculture sector is a new research filed. Application of agriculture using Data mining techniques can be generated for the different crop yield forecasting.

I. INTRODUCTION

Agriculture data are highly extended in provisions of nature, interdependencies and resources region-wise. Wheat is grown more or less in all the districts in the state but north Gujarat covers large area of wheat crop. The productivity of Gujarat is equal to national average but lower as compare to Punjab, Haryana and Uttar Pradesh. Gujarat contributes about 4.627% of total Wheat production in the country. Predicting the potential effects of rainfall and weather on crop yields requires a model of how crops respond to weather. This paper discusses the statistical forecasting model and data mining classification algorithms for wheat crop yield forecasting. Data mining techniques can facilitate discovery of rules and patterns in sets of data and provides a good result as compared to statistical model.

II. RELATED WORK

Many researchers have used the crop yield forecasting model for different crops of different regions to predict the crop yield at district and state level. Yunous Vagh studied the effect of rainfall on crop yield in South Western Australia using the classification techniques of data mining1. He used the data from 2001-2006 and split the data into training set and test set and applied different classification algorithm of WEKA tool. He concluded that the GP algorithm showed the strong positive relationship between annual rain fall and wheat yield. He said that the performance of the WEKA tool algorithms could be improved by increasing the sample size. Author focused on WEKA algorithm for cotton crop yield forecasting. Authors conducted the experiment on field and studied the effects of weather variables on wheat yield for Anand district of Gujarat state. A. K. Giri, M. Bhan And K.K. Agrawa forecasted wheat and rice yield in eastern Madhya Pradesh for 7 districts using the 30 years of weather data and validates the generated model for 2 years. They concluded that the difference between actual and predicted yield was less than 15% and further refinement needed to make it 10%. R.S. Singh and his team forecasted wheat and rice yield in eastern Uttar Pradesh for 9 districts using the 18 years of weather data and validates the generated model for 2 years. They concluded that the developed models were validated with ±10% error. Smita Gupta and other co-authors forecasted mustard and wheat yield in western Uttar Pradesh for 10 districts and used weather data from 1992-2015. They discussed that for both the crop the difference between observed and predicted yield were less than 10%.

III. MATERIAL AND METHODS

The actual yield data for the wheat crop was collected from Directorate of Agriculture, Gandhinagar and weather data from the Agro-meteorology department, Anand Agricultural University, Anand. Statistical regression methodology and different data mining algorithm were used for yield prediction.
For the analysis of data SPSS “Statistical Package for Social Science” and WEKA “Waikato Environment for Knowledge Analysis” tools were used. Weekly data were calculated as per the SMW “Standard Meteorological Week”. Weighted and unweighted weather indices were calculated using the weekly weather data as suggested by the crop yield forecasting model by IASIR, New Delhi (Agrawal et al 1980; 1983; Jain et al 1980). These Weighted and unweighted values are used in SPSS tool and multiple linear stepwise regression technique has been applied to generate the model for crop yield prediction at district level.

a. Selection of districts and data

In Gujarat state there are eight agroclimatic zones namely South Gujarat (heavy rainfall area), South Gujarat, Middle Gujarat, North Gujarat, North West Zone, North Saurashtra, South Saurashtra, Bhal and Costal area. One district from each zone is selected for the research purpose; these are Valsad, Bharuch, Anand, Sabarkantha, Banaskantha, Bhavnagar, Junagadh and Ahmedabad. Agrometeorology observatories for the selected districts are Navsari, Bharuch, Anand, Khedbrahma, Sardarkrushinagar, Mahuva, Junagadh and Armej respectively. Weather data used from 1985 to 2015 for Valsad, Anand, Sabarkantha, Banaskantha and Junagadh districts and from 1990 to 2015 for Bharuch, Bhavnagar and Ahmedabad districts. Weekly weather variables used in this study for seven districts except Junagadh district were basic sun shine hours (BSS), maximum (MAXT) and minimum (MINT) temperature (°C), morning (RH1) and afternoon (RH2) relative humidity (%), morning (VP1) and afternoon (VP2) vapour pressure. Due to unavailability of vapour pressure data for Junagadh district, it was not considered in the research work. The period selected for sowing to harvest of wheat i.e. from 44th to 52nd SMW of selected year to 11th SMW of next year. Weather data and actual yield data are used for the analysis. The actual yield data is used from 1985/1990 to 2012 years as training set and from 2013 to 2015 as validation years.

b. Forecast for wheat – using step wise linear regression

For wheat crop yield forecast linear stepwise regression model was developed by using the methodology described by Ghosh et al., (2014). In 1924 Fisher suggested the crop yield forecast model using composite weather variables. In 1943 Hendrick and Scholl modified the Fischer’s technique and suggested modified model that was extended to study combined effects of weather variables and added time trend variable T. IASRI modified the model of Hendricks and Scholl and suggested modified model (Agrawal et al. 1980, 1983; Jain et al. 1980, Agrawal et al. 1986). The modified model formula was applied for this research purpose and crop yield forecast modes were generated at district level for Gujarat state.

Different classification algorithms applied on weather data using the training set and test set and cross validation options of WEKA. The classifiers in WEKA are calculated to be trained to forecast a single ‘class’ attribute, which is the target for forecast. In this research the target variable is ‘Yield’. Different classification algorithms within WEKA were applied on selected data and algorithms namely Gaussian Processes (GP), Multilayer Perceptron (MLP), Kstar, Sequential Minimal Optimization (SMO), MSRules and Additive Regression (AR) were selected in this study. These classification algorithms use the different regression techniques and are used for the prediction and forecasting continuous values. GP is a probabilistic method for regression and classification where the distribution is over mean and covariance functions without hyper parameter tuning for the classifier function (C. E. Rasmussen et al. 2004). MLP is a feed forward multi-layer neural network classifier that uses the supervised learning technique of back propagation to classify instances (J. M. Nazzal et al. 2008). MLPs are widely used for classification, pattern recognition, prediction and estimate. SMOreg algorithm implements the Support Vector Machine (SVM) for regression. SVM finds a line that best separates the training data into classes. Additive regression (AR) is a Meta classifier that enhances the performance of a regression base classifier. It’s relying on an underlying Bayesian probability model rather than a pure algorithm.

IV. RESULT AND DISCUSSION

When applied the step-wise linear regression using SPSS, there was strong relationship found between actual yield and weather variables. Forecast model was developed using the 5% probability level for selected districts of Gujarat state. District prediction model shows that the weighted coefficient values play vital role compared to unweighted coefficient values. Different weather parameters were used at district level model development. The most effective weather indices appearing in the yield forecast model equations were RH1*VP2, VP1*VP2, BSS*RH1, MAXT*MINT. R² ranged from 0.647 to 0.974 with significant at 5% probability level. RMSE ranged from 81.15 to 314.95. The result of actual and predicted wheat yield from 2012-13 to 2014-15 was studied for yield forecast model and found that error percent ranges from -58.3% to 3% for Valsad, -18.4 to 48.9% for Bharuch, -4.3 to 12.1% for Anand, 9.5 to 19.8% for Sabarkantha, 6.2 to 15.9 for Banaskantha, -2.9 to 47.3% for Bhavnagar, -14.4 to 21.1 for Junagadh, -27.6 to 23.6% for Ahmedabad district. Values of error percent were underestimated and overestimated predictions for the different districts. Figure 1 shows the actual and predicted yield from 2012-13 to 2014-15 year for selected districts using step wise regression method.
Figure 1: Actual and predicted wheat yield from 2012-13 to 2014-15 for selected districts of Gujarat state using step wise regression method

The result from WEKA classification technique algorithm was also studied. For training set the value of $R^2$ ranges from 0.75 to 0.88 for GP, 0.92 to 1.00 for ML, 0.79 to 0.91 for SMOReg, 0.61 to 0.91 for M5Rule and 0.96 to 1.00 for AR algorithms. Algorithms with the higher RMSE for the cross validation result will be ruled out in first instance. RMSE of training set found low compare to cross validation. For most of the districts SMOReg, M5Rule algorithms were ruled out due to high RMSE. The result of training set shows that the RMSE for GP is higher than the AR and MLP thus GP was also rule out in second instance. MLP and AR have the lowest RMSE and correlation coefficient is positively correlated with other parameters. Figure 2 shows the $R^2$ of different classification algorithms for selected districts.

Figure 2: $R^2$ using WEKA classification algorithms for districts of Gujarat state

The result of actual and predicted wheat yield from 2012-13 to 2014-15 was studied for WEKA classification technique and error percent for MLP algorithm ranges from -75.4 to 15.03% for Valsad, -4.77 to 34.66% for Bharuch, -23.74 to 12.67% for Anand, 0.58 to 11% for Sabarkantha, -3.73 to 14.45 for Banaskantha, -21.35 to 13.95% for Bhavnagar, -25.01 to 20.51 for Junagadh, -13.62 to 32.98% for Ahmedabad district. Figure 3 shows the actual and predicted yield using WEKA classification technique from 2012-13 to 2014-15 year for selected districts.
V. CONCLUSION

For the development of wheat crop yield model the modified model of Hendrick and Scholl (Agrawal et al. 1986) has been used for this research work for selected districts of Gujarat state. Different classification algorithms of data mining were applied on the weather data using WEKA tool for crop yield forecast. The performance of different algorithms and statistical forecast model is studied and it is found that the performance of the statistical model and MLP and AR algorithms model was quite better than the other algorithms. Better results can be generated by changing the training and validation year for both statistical model and data mining classification technique.

ABBREVIATIONS AND ACRONYMS

| DM  | Data Mining                           |
| IASRI | Indian Agricultural Statistical Research Institute |
| SMW  | Standard Meteorological Week         |
| SPSS | Statistical Package for Social Sciences |
| WEKA | Waikato Environment for Knowledge Analysis |
| GP   | Gaussian Processes                   |
| MLP  | Multilayer Perceptron                |
| SMORe | Sequential Minimal Optimization      |

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The Arrangement Of Open Space Of Kapuas Riverbank Pontianak Base On Sustainable Tourism

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Abstract- Pontianak city has a river area that can be developed as a tourist area. The banks of the Kapuas river have a strong socio-cultural potential to be lifted as tourism. Many activities that can be done by the community on the banks of the Kapuas river, such as boating, playing canoe, fishing, boating tours, carbide cannon festival, Bakcang and Peh Cun festivals, and social activities of residents and other visitors. The existence of this potential is not supported by the quality of the environment and the unpredictability of open space on the banks of the Kapuas river, so it does not balance the environmental aspects, thus affecting the socio-cultural and economic aspects of society. Tourism development in this study base on sustainable tourism, where there are principles underlying the development of tourism, namely; social culture, environment, and economy. This research focuses on socio-cultural aspects because the banks of the Kapuas river have strong socio-cultural characteristics to be developed in open space. The research method used in this research is qualitative descriptive research with observation and interview. This study aims to produce the concept of open space arrangement on the banks of the Kapuas River based on sustainable tourism: 1) Maintain and open the visual of historic buildings; 2) Creating open space as a social area and cultural attraction; 3) Provide supporting facilities; 4) Material selection; 5) Improving the quality of road space and street furniture; 6) Improvement of waste management; 7) Develop the concept of mix use.

Index Terms- Socio-Cultural, Kapuas River, Sustainable Tourism

I. INTRODUCTION

Pontianak City is divided by the Kapuas river, has the identity of the river city and has characteristics and potential that can be developed as a tourist. Characteristic of a typical region has the potential to be developed into a tourist attraction. Kapuas river area will be developed by the Government of Pontianak City and West Kalimantan Provincial Government as a water tourism object [1].

Kapuas River has a cultural and historical value and plays a very important role in the development of Pontianak city typical water. In addition, the same opinion from the Governor of West Kalimantan, that the arrangement of the Kapuas river area can be a leading water attraction for West Kalimantan Province [2]. The edge of the Kapuas River has the potential that should be optimized, that is the open space of the river bank. As an open space has the potential to become a public space that can improve people's accessibility to the utilization of water bodies. So as to realize the connectivity of the objects of trade and services on the banks of the river [3]. Today tourism development refers to sustainable development or sustainable tourism that refers to environmental, economic and socio-cultural aspects. Where these three aspects must be balanced in the long run [4]. Kapuas riverbank is a public open space in the Pontianak city that is currently considered by the government. Public open space is an open space outside the building that can be used by everyone and provide opportunities for the emergence of various activities. Public open space within a city is closely related to the social activities / social interactions that exist in it [5]. Open space is a very important need in a city where can improve the quality of life in terms of environmental, social and municipal communities with its function. Open space serves as a park, a place to gather, socialize and can accommodate activities that are recreative.

Kapuas river area becomes a social-cultural space for the community, there are several cultural festivals performed on the edge and body of river water such as Carbide cannon, ornamental boat, sampan race, bakcang festival, and mandi peh cun. In addition, the open space river banks also become a space for interaction of citizens such as playing, fishing and sports such as wave skate, canoe, and football. River basin areas have physical and environmental conditions that are not optimally structuring. The unconnected access to the whole and a lot of waste in the environment affect the social and cultural life of society and the economy of the region and even the city. Based on the condition of the area above, there is an environmental imbalance with the socio-cultural and economic aspects in creating the tour. Therefore, it is necessary to restructure the open spaces of the Kapuas River as a tourism by considering the balance of environmental, socio-cultural and economic aspects base on sustainable tourism. Where in this research emphasizes the development of tourism that focuses on characteristics and socio-cultural areas.
II. RESEARCH ELABORATIONS AND METHODOLOGY

Sustainable tourism is simply defined as tourism that takes into account of the economic, social and environmental impact for the present and the future to meet the needs of visitors, industry, the environment, and local communities [6].

![Sustainable Tourism Aspect](image)

- Environment
  Make optimal use of environment resources that constitute a key element in tourism development, maintaining essential ecological processes and helping to conserve natural resources and biodiversity.

- Socio-cultural
  Respect the socio-cultural authenticity of host communities, conserve their built and living cultural heritage and traditional values, and contribute to intercultural understanding and tolerance.

III. RESULTS AND FINDINGS

Taking into account the physical and nonphysical aspects of socio-cultural, environmental and economic to know the characteristics of the location and get the concept of a suitable tourist arrangement developed on the banks of the Kapuas river:

A. Physical Aspect – Character Appraisal

The physical aspect takes into account the criteria of Hamid Sirvani’s theory [12] that is:

- First, land use. Land use in the field is dominated by trade buildings, ports, and settlements.
- Second, the structure of the building. It is found the order of building mass that is not regular orientation, there is a typology of a mass of building, like typology of Malay building with its house of stilt and typology of a cultural heritage building with Tiong Hoa ornament which is historic in the region.
- Third, circulation. The unconnected construction of inspection roads connects all areas to the riverbank.
- Fourth, open space. The form of open space in a liner-shaped area follows the shape of the Kapuas riverbank.
- Fifth, the pedestrian way. Not found a pedestrian way that supports walking activities in the region. A pedestrian using plaster and road vehicles to get to the destination area on the banks of the river.

- Economic

Ensure viable, long-term economic operations, providing socio-economic benefits to all stakeholders that are fairly distributed, including stable employment and incomeearning opportunities and social services to host communities, and contributing to poverty alleviation.

Definitions open space are spaces within cities or wider territories either in the form of areas or in the form of longitudinal areas or pathways wherein its use are more open, essentially without buildings [8]. In addition, open space is a container that accommodates human activity in an environment that has no cover in physical form [9]. Based on land cover and function, open space can be classified into 2 (two) types: green open space and non-green open space.

This research method uses descriptive qualitative research, where this research aims to create a systematic, factual and accurate description of the facts and characteristics of a particular population or region with existing symptoms [10]. The advantages of qualitative methods allow the researcher to gain a thorough understanding of existing conditions and phenomena by exploring the study sites more in depth [11]. The technique of data collection is done by observation and interview. The analysis used in this research consider the non-physical aspects of user activity in the region by taking into account the socio-cultural activities of the community at the location of the research with behavior observation technique analysis. Besides other aspects of the physical aspect to consider the conditions of open space, buildings, and road patterns or access the area with character appraisal analysis.

Six, sign. Lack of presence of signs found on the banks of the river. there is banned forbidden information, but it is not obeyed by boat users.
B. Socio-cultural activities- Behavior Mapping

To explore community participation and understand the perceptions of the people and visitors who engage in river activities. Data were collected through interviews with questionnaires to find potential sites for development and those with problems based on public opinion. The questionnaire is closely related to the convenience, preferred place, and problems felt by the users. Questionnaires were distributed in the form of questions supplemented with river cutting maps and suggestions or inputs for the arrangement of study areas.

![Figure 3. Respondent Questionnaire Results](image)

Based on the results of questionnaires and suggestions to the respondents generated that almost all regions require the arrangement of areas that take into account the connected areas and community activities and festivals that exist. From the results of the above interviews, the most potential areas for tourism developed are located on point 1, 3, 5, and 7, the problematic areas of the environment at the point of settlement of points 2 and 3, the area considered comfortable at point 7, and the area favored by residents on point 1, 5, and 7 on the region.

Observers see the activities that occur during the day and night. Assessment of activity observed on the region to pay attention to the type of activities conducted by the users in the region are:

Primary activities, Activities performed by users on a regular or daily basis, mostly involving walking. Examples are like going to work or school, shopping, waiting for public transportation, doing work.

Optional activities, activities that are affected by external conditions and level of need, allowing users to perform activities. Examples such as standing enjoy the scenery, sitting, fishing, watching the show/festival or sunbathing.

Social activities, activities that involve the existence of others there are open spaces that are spontaneous. This activity is done because of the connection between two users. Examples such as talking, gathering citizens in a game group or a discussion of citizens.

The conclusions of activity analysis in the Kapuas river basin are the findings of main activities such as work activities, shopping, and waiting for public water transport in the morning and afternoon. While social activities become activities produced in the afternoon and evening in the area, where activities are carried out such as talking, playing canoe, waves, kites and gathering residents as activities interact in the region.

Based on the opinion of the respondents, it is known that the area has a potential place to be developed into a very attractive tourist spot in the area which is a favorite area in the port area of Senghie and the dock area and Kapuas Indah. areas with visually diverse and interesting areas for visitors.

![Figure 4. User Activity on the Study Site Daytime and (B) Night](image)
Third, the lack of existence of softscape elements and the arrangement of street furniture in the whole area.

Fourth, the uneven distribution of inspection and jetty roads in the region affects the connectedness of the area.

Fifth, the lack of business space that can support the economic activities of local communities.

Figure 5. Overview of Overall Results of Area Analysis

Characteristics that have been generated above formulated criteria of spatial arrangement that can support the development of sustainable tourism as follows:

First, it must defend the existence and open the visual of historic buildings in the region.

Second, it should provide a space that can accommodate cultural activities and festivals as social spaces and tourist attractions.

Third, must provide a jetty to connect the area through water bodies and equipped with public facilities and markers of signboard as visitor information.

Fourth, it must provide open space as a potential for public space and recreation and buffer ecosystems by considering material selection.

Fifth, must provide utility infrastructure to improve the quality of road space in the form of construction of road inspection, pedestrian way and arrangement of street furniture on the whole.

Sixth, must have waste management to improve the quality of tourist environment and surrounding areas.

Seventh, it must provide a selling facility for local businesses and the development of mix use concept in the region.

IV. CONCLUSION

The macro concept of the area shows an outline of the arrangement of the area by noticing the connectedness and flow of movement that can be enjoyed by visitors to tourist destinations.
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Design of Speed Control System for Pelton Turbine

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Abstract- In hydropower plants, the water turbines are the heart of electricity generation. In this paper, the turbine used for hydropower plant is the Pelton turbine which is one of the impulse turbines. The design data are taken from Wattwon hydropower in Pyin Oo Lwin, Myanmar. This paper is to design the Pelton turbine, its regulating mechanism and speed control system that can develop a power output of 225 kW. The head of water is 213.36m (700 ft) and the speed of the turbine is 1000 rpm. Since it is required to control the quantity of water flowing, the nozzle and the deflector are the main parts of regulating mechanism. The designed nozzle has a jet velocity of 63.73 m/s, jet diameter of 0.052m and nozzle outlet diameter of 0.064m. The other dimensions of the nozzle and the deflector are also calculated. As hydraulic turbines are usually coupled to AC generators which run at a constant speed, it is essential that the speed of the turbine should also remain constant, irrespective of variation in load. This work is done by a device called the governor. In this paper, the specifications of the governor are calculated.

Index Terms- flow rate, head, velocity, Specific Speed, Pelton Turbine

I. INTRODUCTION

Hydraulic turbines extract energy from the flowing water and convert it to mechanical energy to drive electric generator. In Pelton turbine, nozzle and deflector are the main parts for regulating the flow of quantity of water. The nozzle is a circular guide mechanism, which guides the water to flow at a designed direction and also to regulate the flow of water.

II. DESIGN CALCULATION OF SPEED CONTROL SYSTEM FOR THE PELTON TURBINE

A. Design Calculation of the Pelton Turbine

The required design data are selected from Wattwon Hydroelectric Power Station of Pyin Oo Lwin in Myanmar. In this hydroelectric power station, the Pelton turbine is designed for

- Power, \( P = 225 \text{ kW} \)
- Turbine speed, \( N = 1000 \text{ rpm} \)
- Head, \( H = 700 \text{ ft} = 213.36 \text{ m} \)
- Efficiency, \( \eta_0 = 80\% \) (Assuming)

(i) Determination of the required Volume Flow Rate or Discharge

\[
Q = \frac{P}{\eta_0 \rho g H}
= 0.134 \text{ m}^3/\text{s}
\]
(ii) Calculation of the Velocity of the Jet, \( V = C_v \sqrt{2gH} \)

Where, \( C_v \) is the coefficient of velocity for the nozzle and its value is ranging from 0.97 to 0.99.

Choose \( C_v = 0.985 \) (as mean)

\[ V = 63.73 \text{ m/s} \]

(iii) Calculation of the Diameter of the Jet, \( d = \left( \frac{4Q}{\pi C_v \sqrt{2gH}} \right)^{1/2} = 0.542 \left( \frac{Q}{\sqrt{H}} \right)^{1/2} = 0.052 \text{ m} \)

(iv) Calculation of the Peripheral Velocity of the Runner, \( u = \phi \left( \sqrt{2gH} \right) \)

Where, \( \phi \) is speed ratio and in practice the values of \( \phi \) range from 0.43 to 0.47.

Choose \( \phi = 0.46 \), \( u = 29.76 \text{ m/s} \)

(v) Calculation of Mean Diameter or Pitch Circle Diameter of the Pelton Wheel, \( D = \frac{60u}{\pi N} = 0.568 \text{ m} \)

(vi) Calculation of the Jet Ratio, \( m = \frac{D}{d_0} = \frac{0.568}{0.052} = 11 \)

For the maximum efficiency, the jet ratio should be from 11 to 14. So, the jet ratio, \( m = 11 \)

(vii) Calculation of Bucket Dimensions

\[ B = (4 \text{ to } 5) d_0; \]
\[ C = (0.81 \text{ to } 1.05) d_0; \]
\[ M = (1.1 \text{ to } 1.25) d_0; \]

Again

\[ \beta = 5^{\circ} \text{ to } 8^{\circ} \]
\[ L = (2.4 \text{ to } 3.2) d_0; \]
\[ I = (1.2 \text{ to } 1.9) d_0; \]
\[ \text{Angle } \Phi = 10^{\circ} \text{ to } 20^{\circ} \]

Main dimensions of the bucket are;

\[ B = 4.5 \text{ } d_0 = 4.5 \times 0.052 = 0.234 \text{ m} \]
\[ C = 0.93 \text{ } d_0 = 0.93 \times 0.052 = 0.048 \text{ m} \]
\[ M = 1.175 \text{ } d_0 = 1.175 \times 0.052 = 0.061 \text{ m} \]
\[ L = 2.8 \text{ } d_0 = 2.8 \times 0.052 = 0.146 \text{ m} \]
\[ I = 1.55 \text{ } d_0 = 1.55 \times 0.052 = 0.081 \text{ m} \]

(viii) Calculation of the Number of Buckets

\[ Z = \frac{D}{2d_0} + 15 = 20.5 \text{ For balancing of the runner, } Z = 21. \]

B. Calculation of Specific Speed of the Pelton Turbine

\[ N_s = \frac{N \sqrt{P}}{H^{5/4}} = \frac{1000 \times \sqrt{225}}{213.36^{5/4}} = 18.4 \]

According to Table 1, the specific speed of the Pelton turbine with one nozzle must be between 4 and 35. Hence, the specific speed of the turbine 18.4 is suitable.

<table>
<thead>
<tr>
<th>No.</th>
<th>Specific speed</th>
<th>Type of Turbine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>4 to 35</td>
<td>Pelton wheel with 1 nozzle</td>
</tr>
<tr>
<td>2.</td>
<td>17 to 50</td>
<td>Pelton wheel with 2 nozzles</td>
</tr>
<tr>
<td>3.</td>
<td>24 to 70</td>
<td>Pelton wheel with 4 nozzles</td>
</tr>
<tr>
<td>4.</td>
<td>80 to 120</td>
<td>Francis turbine, low-speed</td>
</tr>
<tr>
<td>5.</td>
<td>120 to 220</td>
<td>Francis turbine, normal</td>
</tr>
<tr>
<td>6.</td>
<td>220 to 350</td>
<td>Francis turbine, high-speed</td>
</tr>
<tr>
<td>7.</td>
<td>350 to 430</td>
<td>Francis turbine, express</td>
</tr>
<tr>
<td>8.</td>
<td>300 to 1000</td>
<td>Propeller and Kaplan turbines</td>
</tr>
</tbody>
</table>
C. Design Calculation of Regulating Mechanism (Nozzle and Deflector)

(i) Calculation of the Nozzle Outlet Diameter

From Equation 3.5, the required nozzle outlet diameter is

\[ d_1 = \sqrt{\frac{Q \sin \alpha}{2.66 \mu C \sqrt{VH}}} \]

where \( \mu = \) the efflux coefficient (0.8 and 0.88)
Choose \( \mu = 0.84 \) as mean
Assume \( \alpha = 80^\circ \)

\[ d_1 = \sqrt{\frac{0.134 \sin 80}{2.66 \times 0.84 \times 0.985 \times \sqrt{213.36}}} \] = 0.064 m

Checking the nozzle outlet diameter
The nozzle outlet diameter , \( d_1 = (1.2 \sim 1.25) d_o \)
The maximum outlet diameter , \( d_{\text{max}} = 1.25 \) \( d_o = 0.065 \) m
The minimum outlet diameter , \( d_{\text{min}} = 1.2 \) \( d_o = 0.0624 \) m
The above-calculated nozzle outlet diameter is between the maximum and minimum range.

(ii) Calculation of Nozzle Dimensions

All types of nozzle dimensions depend upon the nozzle outlet diameter. Fig. (3) indicates the labels of nozzle dimensions. The detailed dimensions of nozzle are shown in Table 2.

The calculated nozzle dimensions are:

<table>
<thead>
<tr>
<th>Item</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.63 ( d_1 )</td>
</tr>
<tr>
<td>s</td>
<td>1.35 ( d_1 )</td>
</tr>
<tr>
<td>x</td>
<td>0.503 ( d_1 )</td>
</tr>
<tr>
<td>d</td>
<td>0.63 ( d_1 )</td>
</tr>
<tr>
<td>I</td>
<td>3.17 ( d_1 )</td>
</tr>
<tr>
<td>r</td>
<td>0.705 ( d_1 )</td>
</tr>
<tr>
<td>R</td>
<td>2.2 ( d_1 )</td>
</tr>
<tr>
<td>h</td>
<td>0.6 ( d_1 )</td>
</tr>
<tr>
<td>e</td>
<td>0.05 ( d_1 )</td>
</tr>
<tr>
<td>f</td>
<td>1.13 ( d_1 )</td>
</tr>
</tbody>
</table>

Table 2. Nozzle Dimensions [14]

Figure 3. Calculated Dimensions for a Typical Nozzle

(iii) Calculation of Deflector Dimensions

Figure 4. Deflector Cut-off Plate at Partial Deflection for Design Calculation
The most commonly used practical value of $\theta_i$ is 30°.

\[ P_x = \frac{r}{g} QV - \frac{r}{g} QV \cos \theta_i = \rho QV (1 - \cos \theta_i) = 1000 \times 0.134 \times 63.73 (1 - \cos 30°) = 1144.1 \text{ N} \]

The force acting on the deflector in y-direction determined by \( P_y = \frac{r}{g} QV \sin \theta_i = \rho QV \sin \theta_i = 4269.9 \text{ N} \)

The resultant force acting on the deflector described by \( P = \sqrt{P_x^2 + P_y^2} = 4420 \text{ N} \)

The height of the deflected part calculated by \( h_i = \frac{d_0}{2} + \frac{d_1}{2} \sin \theta_i = \frac{0.052}{2} + \frac{0.052}{2} \sin 30° = 0.039 \text{ m} \)

The other dimensions of the deflector are:
- \( R_1 = 2.32 \text{ m} \)
- \( d_1 = 3.32 \times 0.064 = 0.148 \text{ m} \)
- \( L = 1.86 \times 0.064 = 0.119 \text{ m} \)
- \( t = 0.23 \times 0.064 = 0.015 \text{ m} \)

**D. Design Calculation for Servomotor**

**Capacity of the servomotor** = \( P \times \text{Volume} \)

\[ \text{Volume} = \frac{\pi}{4} D^2 L \]

The Stoke length of the needle is \( a = \frac{\sin \alpha}{\sin \alpha} \)

Spear stroke must be greater than 0.16 m. Assume that the stroke is 0.03 m.

The force acting on the needle is \( F = \frac{\pi}{4} (d_1^2 - d_0^2) \rho g H = \frac{\pi}{4} (0.064^2 - 0.042) \times 1000 \times 9.81 \times 213.36 = 4103 \text{ N} \)

Volume of packing \[ = \pi r^2 h = \pi \times d_0^2 \times I = \pi \times 0.040^2 \times 0.203 = 1.02 \times 10^{-3} \text{ m}^3 \]

Volume of spear \[ = \frac{1}{3} \pi r^2 h + \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi r^2 (s + s) = \frac{1}{3} \pi r^2 (I - s) = 3.07 \times 10^{-4} \text{ m}^3 \]

Total Volume \[ = 1.02 \times 10^{-3} + 3.07 \times 10^{-4} = 1.327 \times 10^{-3} \text{ m}^3 \]

Packing Friction force \[ = \text{Friction Coefficient} \times \text{Total Weight} \]

\[ = C_f \times \rho V g = 0.3 \times 7870 \times 1.327 \times 10^{-3} \times 9.81 = 30.70 \text{ N} \]

Force applied to control linkage is \( F = 4103 + 30.70 = 4133.70 \text{ N} \)

Servomotor's Capacity \[ = 0.03 \times 4133.70 = 124 \text{ Nm} \]

Servomotor's Capacity \[ = P \times \text{Volume} \]

\[ P = \frac{\pi}{4} \times 0.15^2 \times 0.3 = 5.301 \times 10^{-4} \text{ m}^3 \]

\[ = \frac{124}{5.301 \times 10^{-4}} = 234 \text{ kN/m}^2 \]

**E. Calculation of Synchronous Speed Range for the Generator and Speed Ratio** \( N_g = \frac{120f}{p} \)

Assuming \( p = 4 \) poles

For minimum synchronous speed for the generator,

Assuming frequency, \( f = 50 \text{ Hz} \),

\[ N_{\text{min}} = \frac{120 \times 50}{4} = 1500 \text{ rpm} \]
For mean synchronous speed for the generator, Assuming frequency, \( f = 55 \text{Hz} \), \( N_{\text{mean}} = \frac{120 	imes 55}{4} = 1650 \text{ rpm} \)

For maximum synchronous speed for the generator, Assuming frequency, \( f = 60 \text{Hz} \),

\[
N_{\text{max}} = \frac{120 	imes 60}{4} = 1800 \text{ rpm}
\]

Speed Ratio = \( \frac{\text{Mean Synchronous Speed for Generator}}{\text{Turbine Speed}} \) = \( \frac{1650}{1000} = 1.65 \)

**F. Calculation of the Governor Speed Range**

Minimum governor speed, \( N_1 = \frac{N_{\text{mini}}}{1.65} = \frac{1500}{1.65} = 909 \text{ rpm} \)

Mean governor speed, \( N_2 = \frac{N_{\text{mean}}}{1.65} = \frac{1650}{1.65} = 1000 \text{ rpm} \)

Maximum governor speed, \( N_3 = \frac{N_{\text{max}}}{1.65} = \frac{1800}{1.65} = 1091 \text{ rpm} \)

**G. Calculation of Governor Specifications**

Assume that
- the length of upper arm = 15 cm
- the length of lower arm = 15 cm
- the distance between the lower arm and the sleeve from the axis = 2.5 cm
- the weight of the governor ball, \( w \) = 50 N
- the weight of the sleeve = 400 N
- the force required to open the control valve = 100 N

\[ W = 400 + 100 = 500 \text{ N} \]

![Figure 5. One-half of the Porter Governor for Design Calculation](image)

(i). Calculation of Governor Specifications at Mean Governor Speed

Mean Governor speed, \( N_{\text{mean}} = 1000 \text{ rpm} \)

Assume \( \alpha_1 = 45^\circ \)

\[
\begin{align*}
AB &= 15 \text{ cm} \\
BC &= 15 \text{ cm} \\
EF &= 2.5 \text{ cm} \\
h_1 &= AF = AB \cos \alpha_1 = 10.61 \text{ cm} \\
r_1 &= BF = AB \sin \alpha_1 = 10.61 \text{ cm} \\
\beta_1 &= \sin^{-1} \left( \frac{BE}{BC} \right) = 32.73^\circ \\
k_1 &= \frac{\tan \beta_1}{\tan \alpha_1} = \frac{\tan 32.73^\circ}{\tan 45^\circ} = 0.64
\end{align*}
\]
\[ F_1 = \left( \frac{W}{2} (k + 1) + w \right) \tan \alpha_1 = \left[ \frac{500}{2} (0.64 + 1) + 50 \right] \times \tan 45^\circ = 460 \text{ N} \]

(ii). Calculation of Governor Specifications at Minimum Governor Speed

Minimum Governor speed, \( N_{\text{mini}} = 909 \text{ rpm} \)

Assume \( \alpha_2 = 30^\circ \)

\[
\begin{align*}
  h_2 &= AF = AB \cos \alpha_2 = 12.99 \text{ cm} \\
  r_2 &= BF = AB \sin \alpha_2 = 7.5 \text{ cm} \\
  \beta_2 &= \sin^{-1} \left( \frac{BE}{BC} \right) = 19.5^\circ \\
  k_2 &= \frac{\tan \beta_2}{\tan \alpha_2} = 0.61 \\
  F_2 &= \left( \frac{W}{2} (k + 1) + w \right) \tan \alpha_2 = 261.25 \text{ N}
\end{align*}
\]

(iii). Calculation of Governor Specifications at Maximum Governor Speed

Maximum Governor speed, \( N_{\text{maxi}} = 1091 \text{ rpm} \)

Assume \( \alpha_3 = 60^\circ \)

\[
\begin{align*}
  h_3 &= AF = AB \cos \alpha_3 = 7.5 \text{ cm} \\
  r_3 &= BF = AB \sin \alpha_3 = 12.99 \text{ cm} \\
  \beta_3 &= \sin^{-1} \left( \frac{BE}{BC} \right) = 44.37^\circ \\
  k_3 &= \frac{\tan \beta_3}{\tan \alpha_3} = 0.56 \\
  F_3 &= \left( \frac{W}{2} (k + 1) + w \right) \tan \alpha_3 = 762.1 \text{ N}
\end{align*}
\]

### Table 3 - Governor Specification Results

<table>
<thead>
<tr>
<th>N (rpm)</th>
<th>h (cm)</th>
<th>( \alpha ) (degree)</th>
<th>( \beta ) (degree)</th>
<th>F(N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( N_{\text{mean}} = 1000 )</td>
<td>10.61</td>
<td>45</td>
<td>32.73</td>
<td>460</td>
</tr>
<tr>
<td>( N_{\text{mini}} = 909 )</td>
<td>12.99</td>
<td>30</td>
<td>19.5</td>
<td>261.25</td>
</tr>
<tr>
<td>( N_{\text{maxi}} = 1091 )</td>
<td>7.5</td>
<td>60</td>
<td>44.37</td>
<td>762.1</td>
</tr>
</tbody>
</table>

### III. CONCLUSION

The Pelton turbine has been designed at the head of 213.36m (700 feet) at the turbine speed of 1000 rpm and the flow rate of water (0.134 m³/s) to generate 225 kW output power, assuming its overall efficiency of 80%. The required power output of the generator can be obtained from both the maximum speed (1800 rpm) and the minimum speed (1500 rpm). In this paper, the various speeds of governor have been calculated by depending on the speed generator. The designs of the nozzle and the deflector have been calculated as the regulating mechanism of the turbine to get the required flow rate of water. And the governing system designs have been calculated as the speed control system.
APPENDIX

Figure A.1. Assembly of Nozzle and Needle

Figure A.2. Assembly of Deflector
REFERENCES


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Analysis of FDI impact on the economic development of Arab Gulf countries

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Abstract- It is customary for each country to develop a plan of economic actions to improve the living standards and economic health of a particular area. Economic development can be called quantitative and qualitative changes in the economy. Such actions can include several areas including the development of human capital, critical infrastructure, regional competitiveness, environmental sustainability, social inclusion, health, security, literacy and other initiatives. Economic development can also be considered as a static theory that at certain times documents the state of the economy. Local economic development can be defined as increasing the capacity of the local economy to generate wealth for its inhabitants. Economic development can occur through local job growth, causing unemployed workforce and land. However, economic development takes place by shifting the workforce and land to more productive ways, for example, better jobs. The local economic development is consciously influenced by all activities of local self-government. However, local economic development policies are usually defined more specifically as specific activities undertaken by public or private groups in order to promote economic development. The positive impact of FDI as modernization and more efficient exploitation of oil due to the influx of new technologies, the discovery of new sites, due to advanced technologies, new management models are introduced. The negative impacts of the FDI are the outflow of profits in foreign countries, the lack of jobs for the domestic population, the lowering of the labor cost, and so on. The scientific aims of the research are the scientific description of the extent, origin and structure of FDI in the Arabian Gulf countries, and scientific explanation of the positive and negative impacts of FDI on the economic development of the countries of the Arabian Gulf.

Index Terms- unemployment, foreign direct investment, economic development

I. INTRODUCTION

The World Bank and UNCTAD distinguish developed and developing countries in relation to the economic situation. According to UNCTAD and the World Bank, all Arab countries are considered developing countries. The FDI inflows and outflows in the Arab world are also divided into three economic categories (GCC economies - Gulf Arab countries, least developed countries, and diversified economies). In this part of the paper will be defined the terms: developed and developing countries and Arab countries. The developed country is a country with a high degree of development in accordance with certain criteria. According to the International Monetary Fund, developed economies accounted for 65.8% of the global nominal GDP and 52.1% of the global PPP in 2010 (IMF, 2010). The country is classified as a developed country if it meets the following requirements:

1. per capita income: countries with high gross domestic product (GDP) per capita can be described as a developed country,
2. The second economic criterion is industrialization: countries in which tertiary quaternary sectors of industry dominate can be described as a developed country,
3. Human Development Index (HDI): combining economic measures, national income, life expectancy indices and education are highlighted. This criterion would define developed countries as those with a very high HDI rating (UNDP, 2016).

II. ECONOMIC DEVELOPMENT IN ARAB COUNTRIES

Growth in Arab countries in 2014 was 3.2% compared to a growth of 2.2% in 2013 (IMF, 2014). The political and social unrest that followed after the Arab Spring in 2011 continues to reduce the economic prospects of all Arab countries. During the second quarter of 2013, tourism, investment, industrial production and confidence in the Egyptian economy collapsed, and after a political turmoil in which the Morsi government collapsed. The Syrian civil war seriously jeopardized the economic activity of the country, and riots spread to Jordan, Iraq and Lebanon. Oil exports from Arab oil exporting countries in 2013 have fallen due to infrastructure and security challenges with US sanctions against Iran. However, oil exporters in the Arabian countries, with the exception of Kuwait and Saudi Arabia, whose product was reduced, continued to export oil at the same pace as 2012. After many years of growth in oil exporting countries, it slowed down in 2013 due to interruptions in oil supplies caused by political turmoil, as well as lower global demand due to poor economic activity. Oil exports have fallen since 2009 due to disruptions in Iraq and Libya, sanctions imposed on Iran, and the marginal decline in production in Saudi Arabia. On the other hand, increased government spending with the recovery of private sector credit growth has supported the growth of the non-oil sector in most Arab countries. The labor market has been enhanced by increasing employment opportunities in the Arabian Gulf countries in line with growth in non-oil sectors. However, unemployment among domestic workers continues to be an important issue in the region, with
Saïd Arabia introducing more stringent labor policies, promoting “Saudization”, which aims to provide more employment opportunities for its citizens in the private sector (currently the labor market is dominated by the right-wingers). Inflation has increased in the Arabian countries at a time when commodity prices in the international markets remained relatively stable, due to the improvement in domestic demand. Fiscal policy continued to adjust to focus on capital expenditures and large infrastructure projects. The growth of oil exports in the Arabian Gulf countries has improved slightly mainly due to improvements in tourism and FDI. In order to improve their standard of living and generate employment opportunities, these countries should achieve higher economic growth rates. The aggravating factor is regional unrest and political uncertainty that permanently delay recovery in the whole region. The escalation of the Syrian conflict and the political events in Egypt and Tunisia have increased the chances of further destabilization in the region. Net oil GDP has remained high in most countries, fueled by high public spending and a recovery in private sector credit growth. In 2014, the increase was 3.4%, as oil production recovered, leading to higher demand as global economic activity increased despite the projected mild fall in oil prices (Oil and Gas Journal, 2017). Iran continued to face sanctions that led to a reduction in exports oil and capacity expansion operations in Iraq have slowed down due to the renewal of the infrastructure of the incidents of violence by terrorist groups of ISIL. Fiscal balances have deteriorated in most of the Arabian Gulf oil exporters, as they rely on increasing oil prices. Growth in the non-oil sector is expected to continue to rise to 5% in 2018 due to an increase in public spending. Consumption has increased the higher demand in the retail and services sector, stimulated by employment opportunities and high salaries. It is expected that growth in the Gulf of Arabia will continue in 2018, as their economic diversification policies are aimed at reducing dependence on the oil production sector. The budgetary dependence on these revenues, together with the growth in consumption after the Arab Spring, made the economies of the Arabian Gulf vulnerable to sudden changes in oil prices.

III. SIGNIFICANCE OF THE ARABIAN GULF IN THE WORLD ECONOMY

The natural significance of the Arabian Gulf in the world economy in view of the geopolitical, geo-strategic, communication and cultural characteristics of that region imposes a greater influence of the region on the world decision-making system. Given the close connection between the new structure of the world order, the different levels of local, national, regional and international disparities, new regionalism in the Middle East can successfully exploit the potential of the Arab world. The countries of the Arabian Gulf as a climate where three major world religions were created, is an ancient center of science and learning and a region of distinct natural and human resources. In the era of globalization, using the rapid flow of goods, capital and services, this region can play an important role. On this path, the region can successfully seize all the potentials of the Arabian part of the world, which represents 23% of the world's population, owns over 30% of the world's natural resources, including 74% of the world's crude oil reserves, 50% of the uncovered natural gas quantities, 20% of the total 30% phosphate reserves, 10% uranium, 20% of the world's total cotton production, 17% of world rice production, and 17% of the world's global land area.

IV. FOREIGN DIRECT INVESTMENT IN THE ARAB COUNTRIES

The inflow of foreign direct investment in the Arab countries notes the growing economic crisis, while the last two years begin to decline slightly. Based on UNCTAD data, the global inflow of the SDI into the Arab world increased and reached its peak in 2008 (UNCTAD, WIR, 2010). The Arabian Gulf countries are the largest recipient of foreign direct investment after the economic crisis. They rose from 54% to 60% in the period from 2006 to 2010, which shows economic stability and the development of the economic situation in the Arabian Gulf region. FDI inflows to Saudi Arabia in 2008 amounted to $ 38.15 billion from $ 96.76 billion of total FDI inflows in Arab countries, accounting for 39% of total FDI inflows in Arab countries. On the other hand, the decline in FDI inflows in the least developed countries can be explained by the weak economic infrastructure of these countries. Thus, the decline in FDI inflow dropped dramatically from 7% in 2006 to 2% in 2010. UNCTAD has proposed a plan for investment in the least developed countries. The emphasis of the plan is on the policy of access to investments, the development of technical capacities and businesses in the areas: development of public-private infrastructure; assistance for the development of production capacities; local business development and access to finance and regulatory and institutional reform. Saudi Arabia was the main recipient of the FDI in the Arabian Gulf countries and among the top ten in the world in 2009. The inflow of foreign direct investment in Saudi Arabia in 2010 began to decline by 11.4%, ie to $ 32.1 billion in 2009 to $ 28.1 billion in 2010, but Saudi Arabia remains attractive for FDI inflow Qatar had an FDI inflow of $ 5.5 billion in 2010 (UNCTAD, WIR, 2011). Despite the decline in inflows since the peak of the economic downturn in 2009 and 2010, the Arab League is, in its entirety, a less dramatic drop in FDI inflows compared to other developing countries. Total inflows were 13% lower in 2010 than in 2009. The share of FDI in GDP was lower than in previous years, due to a larger decline in inflows of foreign direct investments compared to GDP.

V. FOREIGN DIRECT INVESTMENT IMPACT ON ECONOMIC DEVELOPMENT OF ARABIAN GULF REGION

The decline in foreign direct investment in the Arabian Gulf region can be explained by the fall in oil prices in the world market, the decline in profits in the oil sector, the sharp correction of prices in the real estate sector and political instability. Other reasons relate mainly to the slowdown in economic growth in developed countries, less available and more expensive financing, increased nervousness of large companies and banks in terms of investment in global companies and smaller cross-border mergers and acquisitions (M & A). Risk factors such as the unpredictability of global economic governance, the possible widening of the public debt crisis and
the fiscal imbalance in the financial sector in some developed countries, as well as rising inflation can slow down the FDI recovery. It is very important to know that some of the Gulf Arab countries have a very weak financial system (for example, Oman), so FDI inflows and outflow data are not fully available. The FDI outbreak in the past two years reflects the impact of the global financial crisis, especially in Dubai. However, the Arab world accounts for more than 29% of the world's oil production, so it is important to know that increasing and/or decreasing the price of oil is very important for investors' decision whether to invest or not in the Arab world. The main interpretation of fluctuations in the inflow and outflow of FDI is their relation to the price of oil. The prospects for economic growth of oil exporting countries from the Arabian Gulf countries are projected to improve in 2018, according to a report by the PwC Economics Department for the Middle East. The report, like other similar studies, agrees that GDP growth in the region is lower than it was in 2017 despite efforts to increase the economic activity of the private and oil sector due to fiscal consolidation. Although 2017 showed signs of improvement in GDP growth compared to 2016, growth was lower than expected at the beginning of the year due to oil market prices. Crude (Brent) oil in 2017 averaged $52 a barrel, down from $58 per barrel as expected at the beginning of the year (Markets Insider, 2017), primarily due to inadequate alignment with the reduction in consumption, as well as due to the production of Libya, Nigeria and the American production of shale oil. Economic and fiscal sources for the first half of the year were less than expected. However, there are indications that a stronger economic growth could be restored in 2018, as oil prices are maintained or exceeded by current price levels. The International Monetary Fund (IMF), in its latest report, predicted stronger growth prospects in oil exporting countries, although continued low oil prices are expected to continue to affect the growth of the GDP of oil exporters. While the IMF has welcomed fiscal reforms in the Gulf countries, it is expected that the impact of low oil prices on the economic growth of the region will be longer. The prolonged decline in oil prices is a heavy blow to economic growth in the Arabian Gulf countries. Oil exporters are heavily affected by long-term implications for growth prospects. The latest IMF forecast for 2018 has shown that regional GDP growth has risen to 3.3 percent, largely due to turnarounds in key regional economies such as the UAE, Saudi Arabia and Kuwait (IMF, 2018). Real GDP growth in Saudi Arabia is projected at 0.1 percent, from 1.7 percent last year. The next year, Saudi GDP is likely to improve slightly, but largely due to the growth of the non-oil sector. The real GDP growth in Saudi Arabia is expected to be around zero (0.1 percent), as the share of oil-related GDP is reduced in line with Saudi Arabia's commitments under the OPEC framework. However, the IMF expects GDP to be strengthened in the medium term once structural reforms are implemented in the KSA. The growth of the oil derivatives sector in Saudi Arabia will increase to 1.7 percent in 2017, with additional growth in 2018, with a projected total GDP growth of 1.1 percent. It is expected that the economic growth of the United Arab Emirates, which faces a slowdown in growth from 2015, will rise in 2018, according to IMF forecasts (IMF, 2018).

VI. Conclusion

The Arabian Gulf countries are heavily dependent on exports of petroleum products. Large fluctuations in oil prices have a strong impact on the labor market because then the workers in the oil sector are dismissed. Arab Gulf countries should take measures to focus on private sector investment, facilitate the expansion of small and medium-sized enterprises, and improve the banking system in terms of liquidity and solvency. Growth of GDP in the Arabian Gulf countries influences the FDI inflow to a large extent (around 70%) as expected, as the economies are based on the oil sector that attracts significant FDIs. The correlation of these two sizes is directly proportional, so it is true that if the inflow of FDI is reduced, the GDP of the countries of the Arabian Gulf. This proves the first and second hypotheses that if the FDI in the Gulf countries grows then gross domestic product is increased and vice versa, and if the FDI in the Gulf Arab countries then raises the income of the local population, and vice versa. Industrial growth in the Arabian countries is directly dependent on FDI inflows as expected, as industrial activities in the Arabian Gulf countries are directly related to the oil sector that contributes most to industrial growth. Correlation of FDI and industrial growth is almost 50% of industrial production growth is based on the growth of foreign investments. Inflow of foreign direct investment into the countries of the Arabian Bay is directly proportional to the economic development of these countries, which implies not only the growth of gross domestic product, but also industrial growth. The year of 2017 was characterized by a lower growth rate compared to the previous period, an increase in deficits and large fiscal adjustments in a very rigid public spending environment. Higher levels of knowledge and skills are needed among employees. These elements are key preconditions for a successful transformation of the economies of the Arabian Gulf countries. Looking ahead, the Arabian Gulf countries should undertake a comprehensive transformation of the role of oil dependency reduction, shifting the focus of growth from public to private enterprises, creating an ideal environment for small and medium enterprises, and improving the liquidity and solvency of the banking system. Economic growth has increased over the past decade, but did not have all the desired outcomes. State spending is not sufficiently supportive growth rates in the non-oil economy and has not established an adequate or good infrastructure. Employment for the citizens of the Arabian Gulf countries is not enough, and economies remain largely dependent on oil. To a large extent, these disadvantages can affect the inadequate productivity growth and economic development that rely on the often low-skilled foreign workforce that has worked out salaries that were below what the citizens of the Gulf countries were willingly accepting. The challenge is to launch activities that have a higher added value in order to meet development goals, emphasis should be placed on improving productivity through strengthening education systems and increasing people's standards. The current higher oil price provides fiscal stability, so it is a good opportunity for the countries of the Arabian Gulf to face this fundamental challenge. All countries have articulated ambitious development plans. The realization of the planned goals, and in particular the creation of jobs for its citizens, is to make local workers more productive, thereby increasing their attractiveness as employees. However, in
order to achieve this, it will take a while to pass. In the short and medium term, some active labor market interventions may still be needed. This will require careful balancing of regulations, such as employment quotas for citizens and the need for policies to build incentives for employment growth in the private sector without creating unnecessary disturbances. In this regard, the analysis of labor market policy policies could provide an analytical basis for future policy formulation. In order to encourage the employment of nationals of the countries of the Arabian Gulf, the areas for consideration would be providing incentives for them to acquire the skills necessary for employment in the private sector, and assessing the suitability and calibration of taxes for foreign workers (for example, extending plans to increase work-license fees) in a way that minimizes.

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Facade Design Preferences of Generation Z
by Using Sorting Method

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Abstract - As a future market of residential property, Generation Z are an unusual target of market segmentation in the dynamic of today's property business market. Generation Z are millennial generation born in 1996-2010. Generation Z have different characteristics of behavior and personality from previous generation. People with the same background may have different preferences and behavior patterns, whereas people with different background may have similar preferences and behavior patterns. This research was conducted to find out the façade house design preferences for Generation Z visually. The sorting method was used to conduct survey on respondents. The population in this research was Generation Z in Indonesia. Based on the survey results, it can be concluded that the sampling technique used in this research was Accidental/Incidental Sampling. The design of a suitable house facade was needed to be developed in the future, i.e. the façade design that looked like a house in general and many were found in everyday life.

Index Terms- Preferences, Housing Facade Design, Generation Z, Sorting Method

I. INTRODUCTION

Human is motivated to meet the needs of his life, one of which is residential house as a place to live in. However, the development of residential architecture designs today appear as a commodity of human consumption, resulting in changes in the meaning of house. The beauty of residential house becomes an important consideration besides its function as a residence. The beauty of residential house can be seen one of which by its façade.

As a future market of residential property, Generation Z are an unusual target of market segmentation in the dynamic of today's property business market. Segmentation is a set of markets (consumers) classified in groups based on a certain criterion [1]. Generation Z have different characteristics of behavior and personality from previous generation. Generation Z are millennial generation born in 1996-2010. The millennial generation have a very clear passion. They highly appreciate brands using right technology to interact with them via smartphones, e-mail, social media, and more. Compared to other market segments, they are more convinced that most brands do not use the right technology to interact with them. Therefore, they assume that there is a gap between their expectation of product and reality.

Global web index also states it through its review and survey results of 2018 in "Trends 18 - The Trends to Know for 2018". It is described, though Generation Z are included in the millennial generation, they have some different characteristics with those of generation Y that are also considered as a millennial generation. The following is 6 aspects of differences:

a. Generation mobile

Generation Z spend more time with smartphones than any other electronic devices. While the millennial generation are still using a wide range of them, such as television, radio, and others. Generation Z also prefer streaming on their smartphones than through the radio if they want to listen to music.

b. Social, social, social

Generation Z use much more social media than the older millennial generation do, approximately 3 hours a day. While the older millennial generation only take 2 hours 39 minutes.

c. Time rich

Generation Z are more fond of social life than any other generation are. Really, they use social media not only to spend their spare times, but also to search for content. This is the reason why Generation Z spend more time for it than the older millennial generation do.

d. Social research

Generation Z more believe in the results of product reviews conducted through social media than from search engines. This is very much paradoxical with the older millennial generation. They use more search engines than social media reviews.

e. Status matters

In choosing a product, Generation Z do not just look from the brand. They prefer products that they think are impressive regardless of what brands they are. It is in contrast with the older millennial generation. They really consider that brand is status. For example to choose gadgets, older millennial generation tend to choose I-phone. While Generation Z have more variety of brands, as long as the products they think are impressive.

f. Enthusiasm Trumps Ownership

Generation Z tend to better understand what they need and want than the older millennial do. However, they are lack of

http://dx.doi.org/10.29322/IJSRP.8.6.2018.p7952
effort and enthusiasm to get them. They tend to prefer something that is promos, discounts, and others. Unlike the older millennial generation who are better able to buy premium goods and they are considered to be more prosperous than Generation Z.

In a study on environmental behavior, there is a 'filter' generated from what so-called 'cohort effect', i.e. the similarity between group of individual because for example they are born on a certain time (in the same generation).[2] They are starting from Traditionalist Generation, Baby Boomer, to Generation X, Y, Z. Therefore, further research and analysis are needed. People with the same background may have different preferences and behavior patterns, whereas people with different background may have similar preferences and behavior patterns.[3] Consumer preferences can be measured with a measurement model that analyses relationship between product knowledge owned by the consumer and the attitude of the product according to the characteristics and attributes of the products[4]. Consumer preferences are defined as the likes or dislikes by a person for the product (goods or services). People's preferences show person's fondness for various product choices[5].

This research was conducted to find out the façade house design preferences for Generation Z visually. By knowing these preferences, this research was expected to be a guide to property business that can provide suitable residential property product and can be absorbed by Generation Z market in the future. The sorting method was used to conduct survey on respondents. According to Nielsen (1995), this method was used to help design or evaluate information by making respondents organize or sequence the topics into categories that had previously been labeled respectively. This method used tools like cards, either actual cards, paper pieces, and even used sorting software.

II. RESEARCH ELABORATIONS

Architecture is the sciences and arts of established environment. Architecture can influence the way a person feels, helps (accommodates) what is done everyday, and also influence a person's habits of doing something. Furthermore, architecture is part of the art of life.[7] An architecture is considered to be successful when it is able to give expression of the life that inhabits it because one's feelings can be influenced by an architectural form.

House is one form of architecture that becomes one of the basic needs of human life. The Hierarchy of Needs Theory can be used to determine the level of human needs for his house. From the theory, it can be seen that if the most basic needs are fulfilled, people will increasingly strive to meet other needs.[8]

The first level is physiological or basic needs. This is the most important need, such as food to eat, air for breathing, space to move, and the need to rest or sleep. In the context of the need for space, human requires the space to rest.

The second level is the need for safety (safety needs). When the basic needs are met, they increase to the need for security. In the dwelling, for example, human needs for a safe house. These can be accommodated through simple houses.

The third level is the need to be loved and belonging (love / belonging needs). At this level, a house is considered as a means to represent social needs. The house serves as a means of interacting and doing social activities, because human wants other human beings.

The fourth level is the need to be rewarded (esteem needs). In terms of the dwelling, human assumes that the existence of a house can improve self-image of the owner. This happens because human requires rewards for himself, such as self-confidence, success, competition, and independence.

The last or fifth level is self-actualization. It is the peak of human needs. After meeting all the needs, then human needs a means for self-actualization. House can be one of them as realization, reflection, or status symbol of someone to represent self expression. Possessing the first house is included in the needs of levels 2 and 3, which can increase to level 4, depending on individual. As for upper-middle-level economic consumers, houses are of level 4 and level 5. These needs are influenced by lifestyles which are defined as the way of life they followed, including social rules and characteristics setting. In this case, behavioral factors have an effect on preferences.

In general, to get actual knowledge about the design preferences of Generation Z house facades, this study focused on the theory of preferences within the scope of environmental behavior studies. This theory was used to analyze the level of customer satisfaction of a product. Every consumer aimed at maximizing the level of satisfaction obtained from a certain amount of money he spent.[9] For this purpose, each consumer unit was considered to be able to rank all of the existing commodities. In other words, each consumer unit had to be able to determine the order of preference of the existing commodities.

Consumer preferences were defined as like or dislike by a person for the product (goods or services). Consumer preferences indicated one's fondness from a wide selection of the existing products.[5] To find consumer preferences, it would be easier if the manufacturer knew the market segmentation of the products.
it offered. Segmentation was a set of markets (consumers) classified in groups based on a certain criterion.[1] The consumer segmentation referred to in this research was Generation Z. What so-called Generation Z was millennial generation born in 1996 - 2010. Generation Z was chosen as the object of research because there were studies and articles saying that millennial generation (including Generation Z) were threatened to have house in the future.

In identifying market segments, three stages of procedure could be performed, namely:

a. Survey Stage  
At this stage interviews were conducted to target market segments to gain an understanding of attitudes, motivations, and consumer behavior. Interviews could be in the form of questionnaires, in which the data of collected questionnaires could be used as information on the required attributes.

b. Stage Analysis  
At this stage, data containing highly correlated variables were discarded, then group analysis was performed to produce the maximum number of different segments.

c. Formation Stage  
At this stage a group was formed based on different attitudes, behaviors, demographics, psychological, psychographics, and media patterns. From the dominant characters found in the group, a profile name was given to the segmented group.

In the market segmentation procurement, division was divided by the following categories:

a. Market Segmentation based on Geography.  
b. Market Segmentation based on Demographics.  
c. Market Segmentation based on Psychographics.  
d. Market Segmentation based on Socio-cultural.  
e. Market Segmentation based on extreme relationships. It was associated with loyalty to manufacturers and brands.  
f. Segmentation based on usage situation.  
g. Segmentation based on benefits.  
h. Hybrid segmentation. This segment was formed based on a combination of several segment variables that made up a single segment.  
i. Market Segmentation based on Behavior. Segmentation was grouped based on buyer’s knowledge, attitude, use, or reaction to a product.

By knowing the intended market segmentation, the producers would be easier to know the preferences of consumers because they had been grouped homogeneously by certain criteria, in this case was Generation Z. This aspect of research was related to Generation Z preference and the design of suitable residential façades developed in the future.

The survey method used the sorting method. This method was used to help design or evaluate information by making respondents set or sequence the topic into categories that had previously been labeled respectively. The results of the research would be examined quantitatively to find the residential facade design that was in accordance with the Generation Z preference. Furthermore, qualitative analysis was conducted by interviewing several respondents to get complete information.

The population in this research was Generation Z in Indonesia. Within the next 10 years (2027) when the demographic bonus was predicted to occur, the age of the population ranged from 25 to 29 years and was possible to have a private dwelling. However, this study did not take Generation Z across Indonesia, but only those who were currently studying in senior high schools or equivalent in Surabaya. The sampling technique used in this research was Accidental / Incidental Sampling. This technique was included in the category of non-probability sampling, which did not provide equal opportunities for each element or member of the population to be selected as a sample.[10] Therefore, criteria were needed to determine the appropriate sample. They were:

a. Aged between 15 - 19 years.  
b. Being in senior high school or equivalent in Surabaya.

III. RESULT AND FINDINGS

To observe Generation Z residential preference visually, questionnaire surveys and sorting method were applied. Respondents were asked to sequence 5 (five) images of the house façade from the most preferred to the least favored. The drawings were chosen based on the representation of house façade design styles commonly seen by Indonesian people.

![Figure 02. The houses’ facade for questionnaire](http://dx.doi.org/10.29322/IJSRP.8.6.2018.p7952)

The following were general overview of the design images of the house façade:

- a. Figure A represents a house with a classic style.
- b. Figure B represents a house with asymmetrical force.
- c. Figure C represents a house with a modern-traditional style.
- d. Figure D represents a modern full-style house.
- e. Figure E represents a minimalist style house.

After sorting and quantitative analysis of the survey results were undertaken, respondents mostly liked the Figures of E (33%), A (25%), and C (25%) as the first choice (33%). As for the fifth option (least liked), respondents chose D (55%) and B (29%) respectively. Hence, respondents preferred a house that looked like a house in general and it could be found in their everyday lives. What they used to see was recorded in their memories and experiences that became a habit. When the way a person did something was really embedded in him, it became a habit and was called as 'common sense'. There was an individual ‘filter’ reflected in personal experience of living environment image, experience, something more memorable, and so on.[2]

Minimalist style, classical, and modern-traditional houses were currently the most popular in Indonesia. They were proved by the number of housing in Indonesia, which took these styles for house product design. While Figure D and B represented house images that tended to be uncommon and rarely
encountered in Indonesia. Many respondents placed Figure D and B as their fifth (least preferred) option. What was interesting was that there were 12% of respondents chose Figure D as their first choice, even the percentage was bigger than the one who chose Figure B as their first choice (5%).

This was because the behavior of Generation Z liked using technology for social activities and reviewing things through the virtual world and social media. Figure D was a unique and futuristic house representation that was loaded in cyberspace and social media. However, more respondents chose Figure A, C, and E. This proved that there were still more respondents who prioritized usual choices they saw and felt real.

This is in line with what Blakley, a special Generation Z consultant, said in his interview with Forbes Magazine. He said that the producers should have specific strategies to deal with Generation Z consumer, one of which was 'relatability'. Generation Z demanded something original, real, and close to their daily lives. In fact, it also appeared from their choices of who promoted a product. They were more confident in the existing product reviews in social media because the use of products was more real than ads which were too superior to the product. That's why endorsement phenomena, influencers, and so forth arose even popularity could beat the 'ordinary' celebrities in promoting the product. By definition, Lifestyle Expert type influencers were the first real people, while celebrities were the second. Based on the nature of their media and content, Lifestyle Expert category was one of the most reliable and relatable brand ambassadors because they actually used the products they reviewed/promoted in their daily lives.

Architecture was relatively complex with many fields involved in it. It was not only related to engineering, but also related to experience, tradition, and precedent. This was in line with qualitative analysis results of interviews with some respondents to get the selection reasons of the sequence of their sorting method results of 5 drawings of the house. Respondents said that they liked the drawing of house facades A, C, and E because they looked comfortable and what they were for them. This is because they felt that the house looked like house in general. They preferred the traditional minimalist, classical, and modern style house that were often encountered in their everyday lives. Hence, their impressions were more comfortable than the modern and futuristic houses. They were considered too unique and strange, so that less reflected the comfort for the dwelling.

In addition, respondents acknowledged that the house facade drawings of B and D looked unique, unusual, and had an extreme design. However, they felt that they were not a 'home'. For them, the design of such a facade was more suitable to be applied to offices or other properties that required more creativity for the façade design. Hence, it could be seen that experiences and precedents could influence them in choosing the façade design of the house they liked.
IV. CONCLUSIONS

Based on the visual design preference of Generation Z house façade, the design of a suitable house facade was needed to be developed in the future, i.e. the façade design that looked like a house in general and many were found in everyday life. They were less fond of ‘futuristic’ house designs and looked different from what they saw and lived all along. When the way a person did something was really embedded in him, it became a habit and was called 'common sense'. There was an individual 'filter' reflected in the personal experience of the image of living environment, experience, something more memorable, and so on. Architecture was relatively complex as many fields involved in it. It was not only related to technique, but also related to experience, tradition, and precedent.

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Design an Online Payment Acknowledgement System
(A Case Study of Kampala International University, Main Campus)

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Abstract- The researcher’s has study the student payment process (a case study of kampala International University).

The purpose of this study is to develop an online system that provides an electronic means of payment of fees to make the system easy then the current manual system of payent.

The problems of the current manual system can be solved by developing an online payment system which bridged the gap left by the past researchers. This system will be developed using PHP, CSS, Notepad, Dreamweaver and Excel.

Index Terms- Kampala international University KIU

I. BACKGROUND OF THE STUDY

University education system is growing in Africa and technology is improving the access of candidate to the education all over the world. However there is a challenge in accessing the education in Africa include cumbersome admission process, problem associated with payment of admission fee, acceptance fee and tuitions fee.

Kampala international university (KIU) is a private International University that admit student from all east African countries and beyond. Therefore it’s difficult to depend on face to face contact for admission process and payment. A number of student from Uganda and outside have problems accessing admission and payment of acceptances fee in Kampala International University (KIU) because the payment is not automated, for example the person that is living in Iganga district has to travel to Kampala or send they relatives to pay the fee just like any other student of (KIU). The problems justified the need for an online payment system for university like (KIU).

The exact current practice in (KIU) that the students have to go to the bank physically and fill in the deposit slip, makes the deposit including the bank charges and then take the copy (s) of the deposit slip back to the university finance department for clearance thus the process is tedious and inefficient. The setbacks of this manual approach includes: Delay in the process of registration, it is expensive approach since it includes bank charges, it is limited to the designated banks and wastage of time before the students are cleared during examination period, this result into missing examinations.

II. THE CONTACT OBJECTIVE OF THE STUDY

To develop an online payment acknowledgement system that eases the payment process new of and satellite student of (KIU).

Specific objectives
1. To investigate the problem that associated with current payment system
2. To design an online payment system for the institution to help students in the payment process.

Scope of the study
This study covered the department of finance Kampala International University (Main Campus).

The technology scope is limited to the notepad++, Dreamweaver, PHP, CSS.

III. RESEARCH POPULATION

According to Bush, R. F. (2010), “A Population as the concept that refers to as the all elements, individuals, or units that meet the selection criteria for a group to be studied, and from which a representative sample is taken for detailed examination. This research is limited only to the Department of finance Kampala international university community as the target population studied.

Research Methodology
Introduction
**Data collection**

The researcher’s interacted with the staffs in the finance department of (KIU), to access information on the procedure of the payment system in the school. The research also attended the payment process through which the challenges were evaluated.

**Current Registration Process**

The system for semester registration payment has been in existence at (KIU) since 2001. The system is capable of receiving the student’s detail of payment from the designated banks of which the students are mandated to carry out the transaction as specified by the KIU (Equity Bank and UBA Bank). When the notification of the payment is received by the finance department from their system sent to them by the above specified banks then they issue ledgers to the students which stipulate the summary of the students’ transaction. Also this system helps the finance department to able to track the number of students who have done the part payment, who completed the payment and whom late payment has applied to. The developed system has bridged the gap left by the past developers.

This system provides the direct interactivity between the finance department and the students by bridging the gap between both of them. The student gets access to make payment directly to the university electronically without being physically in the bank.

The system ensured more security by denying the unauthorized users to access the students’ financial statement through providing username and password to the students. Also it provides the confirmation email to the users who are in the registration mode. Roles of the developed system includes; registration payment, issuance of the financial statement and examination number.

The system enables the students to carry out their payment electronically by providing an interface for them. This is done when the students has login to the system, then the students is required to enter the login credentials in case of the registered users. Upon the authenticity of the user account, the student get access in to the system and then click on the Registration button, when the form appeared, the students fills in the blank spaces which includes First name, Last name, Faculty/School, program, year of study and semester of study. When the students completed filling the blank spaces, the notification email is sent to their accounts confirming their payment which consist of the examination number. On the same session, the students can enter their registration number to fetch the record of their financial statement.

**Research design**

The researchers have used both quantitative and qualitative approach but majorly focused on quantitative design.

Quantitative research is basically used to quantify the problem by way of generating numerical data or data that can be transformed into useable statistics. It is used to quantify attitudes, opinions, behaviors, and other defined variables and generalize results from a larger sample population. Quantitative Research uses measurable data to formulate facts and uncover patterns in research methods. Quantitative data collection methods include various forms of surveys -online surveys, paper surveys, mobile surveys and kiosk surveys, face-to-face interviews, telephone interviews, longitudinal studies, website interceptors, online polls, and systematic observations.

Qualitative Research It is used to gain an understanding of underlying reasons, opinions, and motivations. It provides insights into the problem or helps to develop ideas or hypotheses for potential quantitative research. Qualitative Research is also used to uncover trends in thought and opinions, and dive deeper into the problem. Some common methods include focus groups (group discussions), individual interviews, and participation/observations. The sample size is typically small, and respondents are selected to fulfill a given quota.

**Data collection instruments**

The researchers used the questionnaires, interviews and observation as the data collection instrument to gather the data from the respondents.

**Respondents**

The table below shows the number of individuals targeted for collecting data and the actual number of individuals involved in the data collection. Sample population interviewed.

**Table 1 : Respondents involved**

<table>
<thead>
<tr>
<th>Target population used in the questionnaire and interview process</th>
<th>Number of individuals targeted.</th>
<th>Number of individuals involved.</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staffs</td>
<td>15</td>
<td>11</td>
<td>73%</td>
</tr>
<tr>
<td>Students</td>
<td>1000</td>
<td>520</td>
<td>92%</td>
</tr>
<tr>
<td>Total</td>
<td>1015</td>
<td>531</td>
<td>92%</td>
</tr>
</tbody>
</table>

**IV. Result**

**Evaluation of the current system**

The finance are using the current system since 2001 for student payment and the system may course delay in the process, in the process a student will need at least 3 to 5 hours from bank to the completing to the bank by bring the bank taller to the school finance for the confirmation of the payment and get exam card if is exam time, if is a end of semester the time need for the student is beyond 5 hours be course the student a many during exam period and finance computers are very slow be course the...
Memory 512MB Processor speed 2.0 GHZ and in sometimes finance computers get crash.

### Requirements for the proposed system

<table>
<thead>
<tr>
<th>Functional Requirements</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Registration</td>
<td>Students register with the system by entering their details</td>
</tr>
<tr>
<td>Making Payment</td>
<td>After successful registration, students log into the system by giving out their details so that they can proceed to make payment.</td>
</tr>
<tr>
<td>View Confirmation</td>
<td>This requirement includes processing of payment and processing the results to the student.</td>
</tr>
<tr>
<td>View guide menu</td>
<td>This requirement allows the students to view the guide menu about the functionality of the system.</td>
</tr>
</tbody>
</table>

### Hardware Requirements
The hardware required need to install the new developed system includes:
1. Memory 512MB
2. Processor speed 4.0 GHZ
3. Pentium IV and above processor
4. Hard disk capacity of 40 GB to above.
5. Scanner and printer
6. Fast Ethernet network of High speed

### System development tools
The system has been developed using open source software and tools which includes Wamp server, Notepad++, PHP and CSS.

- **Wampserver**
  Wampserver is the web server application that comprises of many programs which enables the client to send the request for the process of the dynamic web pages.

- **Notepad++**
  Notepad++ is the advanced version of Notepad. Notepad allow the web site developers to write the HTML tags in order to populate the website. Documents written using Notepad++ can be saved using TEXT, PHP and CSS file extensions.

- **PHP**
  PHP is the server side scripting language that helps the web programmer to develop the dynamic web pages. It is the language that integrate the front-end and back-end of the system.

- **CSS**
  CSS is the cascading sheet style that helps the web programmers to style the HTML document and avoid the duplication of the codes by creating one CSS file that will be called in every page to serve the desired needs.

- **Programming Languages**
  The system was developed using the PHP as the web integration language, JavaScript as the client side server language in order to add interactivity to the webpages and the cascading sheet styles in order to add styles to the webpages.

- **Data base Management system**
  The system has been developed using Mysql as a data base management system which is used to keep the record of the students about their transactions.

- **The Water Fall Model**
  The system has been developed using waterfall model as the model for software system development. The Waterfall Model was first Process Model to be introduced. It is also referred to as a linear-sequential life cycle model. It is very simple to understand and use. In a waterfall model, each phase must be completed before the next phase can begin and there is no overlapping in the phases.

    Waterfall model is the earliest SDLC approach that was used for software development.

    The waterfall Model illustrates the software development process in a linear sequential flow; hence it is also referred to as a linear-sequential life cycle model. This means that any phase in the development process begins only if the previous phase is complete. In waterfall model phases do not overlap.
The use case diagram below represents the two main actors of an online payment acknowledgement system and how they interact with system to complete some specific tasks.
Login Screen

This screen enables users to easily login. And to register if a user is not registered, to the system, so that he can view the system.
The above figure represents the login page whereby users are required to login to the system by providing both username and password. If a user is not registered in the system then he/she will click on the link Click here to register. Upon the successful login, a user will be taken to the Home page.

**Figure 2: Admin page**
This page helps the system Administrator to view the list of students who made a payment contained in the link (click here to view Payment Table) and feedback sent by the students in the link(Click here to view feedback/complaint table).
This page helps the user to make payment by filling all the detail required and then submit. If the required information is filled then the alert box will appear to remind the user that such information is required.
This page provides the acknowledgement to the student after he/she has successfully filled in and submit the form.

**Need for further study**

We hope in future to include bar coding technology. So as our future work is hoping to have an advanced bar code included. Bar coding have numerous advantages such as: reduction in errors, saves time, improved operating efficiency, overall cost savings; to mention but a few. Capturing students finger print as an access control measure. Currently the system cannot capture user's finger print but in the future this could be changed such that the system would record physiological sample of users for easy identification. Capturing user photo. Currently the system cannot capture user's photo but in the future this could be changed.
VI. CONCLUSION

The study project developed a babush system for student payment that can be implemented by any university. It has been a challenging one since most of the organizations have different approaches of carrying out their transactions standalone i.e. not integrated as a wholly system. We had to develop it as a single hoping in future to integrate it with existing systems such as Online Information Management System (OIMS) to save on the system resources.

Theoretical Evaluation

The online payment acknowledgement system has been designed and developed to overcome the challenges of making tuition fees payment at Kampala International University using technology via web-based system. The system will ease and expedite the processes of payment and managing it, it will curb the amount of time consumed by the old system, eliminate resource expenditure of acquiring papers and other infrastructures used in the system, it enables students of Kampala International University to make payment from anywhere they are in as long as they can access network.

REFERENCES


AUTHORS

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Appendices. 1

Admin

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Null</th>
<th>Key</th>
<th>Default</th>
<th>Extra</th>
</tr>
</thead>
<tbody>
<tr>
<td>Username</td>
<td>varchar(20)</td>
<td>YES</td>
<td></td>
<td>NULL</td>
<td>NULL</td>
</tr>
<tr>
<td>Password</td>
<td>varchar(20)</td>
<td>YES</td>
<td></td>
<td>NULL</td>
<td>NULL</td>
</tr>
</tbody>
</table>

Sign up
### Payment

```
mysql> desc payment;
+----------------+-----------------+-------+-------+-----------+-----------+---------+
| Field          | Type            | Null  | Key   | Default   | Extra     |
+----------------+-----------------+-------+-------+-----------+-----------+---------+
| Payment_ID      | varchar(20)     | YES   | NULL  | NULL      |           |         |
| Full_Name       | varchar(20)     | YES   | NULL  | NULL      |           |         |
| Reg_Number      | varchar(30)     | YES   | NULL  | NULL      |           |         |
| Amount_deposited| varchar(20)     | YES   | NULL  | NULL      |           |         |
| Year            | varchar(20)     | YES   | NULL  | NULL      |           |         |
| Semester        | varchar(20)     | YES   | NULL  | NULL      |           |         |
| Card_Name       | varchar(20)     | YES   | NULL  | NULL      |           |         |
| Card_Number     | varchar(20)     | YES   | NULL  | NULL      |           |         |
+----------------+-----------------+-------+-------+-----------+-----------+---------+
9 rows in set (0.03 sec)
```

### Feedback

```
mysql> desc feedback;
+----------------+-----------------+-------+-------+-----------+-----------+---------+
| Field          | Type            | Null  | Key   | Default   | Extra     |
+----------------+-----------------+-------+-------+-----------+-----------+---------+
| Full_Name       | varchar(20)     | YES   | NULL  | NULL      |           |         |
| Program         | varchar(20)     | YES   | NULL  | NULL      |           |         |
| Subject         | varchar(20)     | YES   | NULL  | NULL      |           |         |
| Email           | varchar(20)     | YES   | NULL  | NULL      |           |         |
| About           | varchar(20)     | YES   | NULL  | NULL      |           |         |
+----------------+-----------------+-------+-------+-----------+-----------+---------+
6 rows in set (0.03 sec)
```
An overview of nanotechnology applications in food industry.

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Abstract - Advancements of the science has prominently affected the food sector and food consumption patterns in the last few decades. Nanotechnology is one of the major areas that contributed to this improvement as it is an essentially modern scientific field that is constantly evolving as a broad area of research, with respect food processing, preservation, packaging and development of functional foods. Food manufacturers, agricultural producers, and consumers could gain a more competitive position through nanotechnology. Furthermore, the delivery of bioactive compounds for nutritional as well as development of functional food are possible through this technology. It will also replace many fields with tremendous application potential in the area of dairy and food sectors.

Keywords: Nanotechnology, Nano Food, Food Processing, Nano Applications

I. INTRODUCTION

Nanotechnology is understanding the behavior of the matter in dimensions around 1-100 nm [1]. Nanomaterials exhibit unique properties than macro level molecules due to their very nature. It was first integrated and applied in food industry by United States and then followed by Japan and China. Nano food market is rising steadily despite of the criticism it receives and it is expected to grow by 20.4 billion US dollars in 2020 [2]. By 2020 Asian countries will be the biggest market for nanofood with the leading allocation to China. Even though most of the Nano-based food are nutraceuticals and functional foods, product categories will expand in future.

Nanotechnology is also more focused on developing a better nutrition delivery system which have better competitive edge than most of the available delivery systems such as delivering the ingredients accurately to the targeted site [3]. Most of the world’s leading food companies have invested in nanofood technology because of the sustainable and promising results it has been able to provide. Nestlé, Unilever, Hershey, and Kraft are among these multinational companies [4] [5] [6] [7]. Woodrow Wilson International Centre has identified more than 800 products that are targeted towards consumers which indicates the extent and future demand in the nanofood industry.

Sri Lanka also has established nanotechnology academy (SLINTEC Academy) as a private research institute [8]. As for many developing countries including Sri Lanka in South Asia, nanotechnology food market and nanotechnology is at very limitedly applied but growing. Among the nanofood that so far has been developed there is a canola active oil (Israel), which have potentiality to inhibit the cholesterol transportation into the vascular system and increase the bioavailability of vitamins, minerals, and phytochemicals that are insoluble in water or fats.

China has also developed a nanotechnology-based tea which intensifies the additional health benefits. Some food developers in US have developed a chocolate shake that has reduced the use of excessive sugar and with enhanced flavors. South Korea has taken the leading steps of developing antibacterial wheat flour with the use of Nano silver [9] [10]. Nanofood industry is in a constant verge of developing additives for food processing, preservation flavor and color Improvement, safety and packaging. Also, it is applied in matrix design, nanomaterials formation, sensing, processing technology, delivery systems and hygienic aspects.

II. NATURAL NANO FOOD

Nutrients and the structures of food carry more important aspects in creating nanofood. Even in milk most of the nutrients such as protein molecules that fold in to large structures, Fat globules, polysaccharides, disaccharides as lactose, inorganic minerals and vitamins are considered Nano sized molecules [11]. Also, naturally occurring nanostructures improve the functional behaviour of food [12].

Studies have reported that the casein micelles, structural component of milk, can be used to load and deliver nutraceuticals such as Vitamin D2 with lesser photochemical degradation. β-lactoglobulin of milk offers various functional properties of thickening, emulsification, gelation or foaming [13]. Denatured β-lactoglobulin of milk protein at nanoscale process enhanced gelation properties [14]. β-lactoglobulin forms complexes with pectin and convey omega 3 poly unsaturated fatty acids [15]. Not only β-lactoglobulin, other milk whey protein such as α-lactalbumin is also used to develop nanotubes from hydrolyzation by a method known as bottom up process [16].
According to Momin et al. (2010), processes such as milk homogenization favour able environment for the synthesis of Nano scale products. Milk fat globule membrane is utilized in creating nanoliposomes which have possible applications in cheese industry as a carrier. In Nano technological storm, casein micelles, fat globules, whey proteins are very useful in Dairy industry to formulate micro sized and Nano sized structures to achieve desirable Dairy products.

III. APPLICATION METHODS

In general, nanotechnology can be applied by two main different methodologies. Those are “bottom up” method and “top down.” method [17]. In top down method, mechanical processes are utilized in converting larger material into nano size materials. Mechanical processes such as grinding, milling and advance processes of removing molecules from the surfaces are used in top down method to reduce the particle size and increase the surface area [18]. As an instance, a sphere can be used as a contact surface to produce fullerene from a thin flake of graphene. Another example for top down application in Food industry is dry-milling technology. This milling process can convert flour into fine size particles with high water-binding capacity.

However, bottom-up approach of nanotechnology was derived from the basic concept of biology like self-assembly and self-organization. By gradual aggregation of atom by atom or molecules by molecules leads to engineering of substances with Nano level properties. The bottom-up technique includes chemical synthesis, self-assembly and positional assembly [19] [20] [21] [22] [23].

Nanoparticles of a wide range of materials ranging from organic and biological compounds to inorganic oxides, metals, and semiconductors can be processed using chemical self-assembly techniques [24]. These techniques exploit selective attachment of molecules to specific surfaces, biomolecular recognition and self-ordering principles (e.g. the preferential docking of DNA strands with complementary base pairs) as well as well-developed chemistry for attaching molecules onto clusters and substrates (e.g. thiol (-SH) end groups) and other techniques like reverse micelle, sonochemical, and photochemical synthesis to release 1-D, 2-D and 3-D self-assembled nanostructures without an obvious driving force present [25].

Other than that, creating Nano particles such as proteins on templates is also a prominent example of bottom up approach application in food industry. Even though the application of such methods is currently limited in food industry, there are several processes that utilize the bottom up approach methods to produce nanoparticles from atoms are chemical processes based on transformations in solution e.g. sol-gel processing, chemical vapour deposition (CVD), plasma or flame spraying synthesis, laser pyrolysis, atomic or molecular condensation.

IV. NANODISPERSIONS AND NANOENCAPSULATION

Nanoparticles are very useful as delivery vehicle of Functional ingredients (for example, drugs, vitamins, antimicrobials, antioxidants, flavorings, colorants, and preservatives etc.) and their required concentration at desired site can be achieved through nanotechnology. These ingredients, which are rarely utilized directly in their pure form; they are often incorporated into some form of delivery system.

Besides being compatible with food product attributes such as taste, texture, and shelf life, other functions of a delivery system include protecting an ingredient from chemical or biological degradation, such as oxidation, and controlling the functional ingredient's rate of release under specific environmental conditions. Nano dispersion and nano encapsulation are ideal delivery system because they include Association colloids, Bio polymeric nanoparticles, Nano emulsion [26,27].

V. ASSOCIATION COLLOID

A colloid is a stable system of a substance containing small particles dispersed throughout. It is either a binary or multicomponent system whose structure and properties are between those of liquid solutions and sols. These systems are categorized as microheterogeneous systems in which the particles of the colloidal dispersed phase (micelles) are formed by the agglomeration of molecules or ions of the substance dissolved in the dispersion medium. The micelles, or associates, are in thermodynamic equilibrium with the surrounding solution; therefore, a change in the external conditions, the composition of the dissolving medium, or the concentration of the dissolved (dispersed) substance causes redistribution of the substance between the micelles and the solution. Surfactant micelles, vesicles, bilayers, invert micelles, and liquid crystals are a few cases of association colloids which have been utilized to embody and convey polar, nonpolar, and amphiphilic functional ingredients [28,29].

VI. BIOPOLYMERIC NANOPARTICLES

The risks of chronic toxicity due to the intracellular and tissue overloading of non-degradable polymers were soon considered as a major limitation for human application. Therefore, the medical field is more concerned on developing Biopolymeric nanoparticles. Biopolymeric nanoparticles can produce by using basic components of any food such as proteins or polysaccharides through aggregation or by inducing phase separation in mixed biopolymer systems [30].

First Biopolymeric nano particles designed by using Albumin &non-biodegradable synthetic polymers such as poly acrylamide and polymethyl acrylate [31]. Polylactic acid (PLA), a common biodegradable nanoparticle; which is often used to encapsulate and deliver drugs and micronutrients like iron, vitamin, protein etc. It
has confirmed that the PLA need an associative compound such as polyethylene glycol for successful results and the functional ingredients can be encapsulated in nanoparticles and released in response to specific environmental triggers [32]. biopolymer nanoparticles in particular offer several advantages, which include the ease of their preparation from well-understood biodegradable polymers and their high stability in biological fluids and during storage. These nanoparticles have a higher potential in therapeutic and food industry relate applications.

VII. NANO-EMULSIONS

According to Weiss L. (2006), processing techniques and functional foods are used for homogenization. But high-pressure valve homogenizers or micro fluidizers are used to produce nano-emulsions. Nano-emulsion droplet sizes varies in the range of 20–200 nm and show narrow size distributions. As McClements (2004) stated, The functional ingredients can be incorporated at droplet, interfacial region or continuous phase using the nano-emulsions. Nano emulsions enhance solubilization capacity for lightly soluble drugs.

The small droplet size creates unique rheological and textural properties of nano-emulsion. Also, it makes them transparent and pleasant to touch [33]. According to McClements and Dekker [34], nano-structured multiple emulsions can offer multiple encapsulating abilities from a single delivery system due to complex properties. Nano emulsions are not limited to one functional component. They can carry several functional components and they released in response to a specific environmental trigger.

According to Quresh et.al. (2012), It is possible to develop smart delivery systems by engineering the properties of the nanostructured shell around the droplets. It can facilitate the use of less fat without compromise in creaminess for callery concern people. such concept is incorporated in fabrication of ice-cream by Nestle and Unilever [35].

VIII. NANOFIBERS

Nanofibers varies in diameters from 10 to 1000 nm. They are produced by electrical spinning with the use of synthetic polymer. As the fiber from not a food grade biopolymer, it is limitedly used in food industry. Cellulose is the most abundant and -cost to biodegradable by-product in the food and agricultural industries. According to Ravichandran R. (2010), If in future, it will possible to manufacture nanofibers from Food grade biopolymer, then its use may undeniably increase. Nanofibers are used as structural component of green food packaging, platform for bacterial culture and structural matrix for artificial food.

IX. NANOTUBES

Graveland, Bikker and Kruif have reported that certain globular protein from milk like α-lactalbumin can be made to self-assemble to form nanotubes under appropriate condition. Firstly, milk protein α- lactalbumin are partially hydrolyzed then itself assemble to form nanotubes at neutral pH & the presence of appropriate cation. The diameter of nano tube is around 20nm. For fabrication of nanotubes, the required minimum concentration of α-lactalbumin is 20gm/l [36].

The desirable properties of Nanotubes include high ability to withstand pasteurization temperature, important encapsulating agent and mask undesirable flavour and aroma productive substance [38]. Apart from these, being basically milk protein, it is easy to apply in other Dairy products [37]; nonetheless its hydrolysis its hydrolysis increase Digestibility and nutritive value [39].

REFERENCES


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The implementation of Balanced Scorecard Toward Work Performance Through Competency and Work Discipline

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Department of Management, University of Jember

Abstract- This study aims to analyze the influence of Balance Scorecard toward employee’s competency and work discipline. This study was conducted in Indonesia, with PT Muamalat Bank as the participant. It used confirmatory research (explanatory research). The data collection techniques used were through questionnaires, interviews and observations. The population in this research is all employees of Muamalat Indonesia Bank. The whole employees are about 420 people. Thus, the sampling technique used was Simple Random Sampling. The number of samples in this study set at 81 respondents refers to the opinion of Slovin and Umar (2005: 78). The results showed that there is a significant influence of Balance Scorecard in the perspective of learning and growth of competence and work discipline.

Keywords: Balanced Scorecard, Employee’s Performance, Competency, Work Discipline, Intervening

I. INTRODUCTION

Employee performance is closely related to performance appraisal. Performance appraisals are needed to determine the outcome or level of employee success. The purposes of performance appraisal is to create human resource decisions, evaluation, and feedback (Dessler, 2010: 68). The underlying objective of performance appraisal is to improve individual’s performance leading to improved overall company performance. Employee will feel to be appreciated through positive feedback. Performance is a concrete, observable, and measurable work "(Irawan, 2006: 588). Therefore, the performance is the result of work achieved by employees in the implementation of tasks based on specified size and time. According Mangkunegara (2011: 7), performance is commensurate with the actual performance including their work quality and quantity achieved. According to Rivai (2009: 532) performance means the willingness of a person or group to perform an activity and to refine it based on its responsibilities with the expected results.

The performance appraisal of a bank is based solely on financial information. However, this kind of performance appraisal method is considered to have less attention to the external sector and unable to fully guide the company to develop better (Kaplan and Norton, 2000: 75). This paradigm shift will certainly change the measuring tool or reference used by the company to measure its performance. Performance appraisals are also required to make non-financial performance appraisals, such as customer satisfaction levels, internal business processes, learning, and organizational growth.

According to Sri Sularso (1998: 201), the Bank's business and health performance appraisal currently used by Indonesia Bank (BI) have weaknesses, such as: financial aspects, business strategy achievement and implementation of the plan. According to Kaplan and Norton (2000: 241), the performance appraisal of financial performance has weaknesses and limitations, including: historical
performance appraisal approach, less work orientation of performance appraisal leading to strategic management, and unable to present intangible assets performance.

One of the new concepts of management accounting developed by Kaplan and Norton (2000: 127) to assess a company's performance is Balanced Scorecard (BSC), a performance appraisal system that seeks to outline business unit objectives and strategies into operational action, as well as balancing target aspects. Its concept formulates more conclusive approach model that is able to measure the company's performance in various dimension and balance, not only measuring the financial aspects and outcomes but also incorporating the intangible aspects, such as the technology, skills and entrepreneurship, consumer loyalty, corporate culture, and final driver activities. The Balanced Score Card (BSC) concept theory is a strategy approach that balances the growth financial, customer, internal business processes and learning. BSC has transformed the performance of many companies around the world, helping many top management, setting company goals and strategies and translating them concretely into a process that not only belongs to top management but also to individuals at every level within the company.

Kaplan and Norton (2000: 75) proposed a corporate performance evaluation system called the Balanced Scorecard. Balanced Scorecard by Kaplan and Norton (2000: 126) is not only used as a performance appraisal tool, but as a strategic management system used to translate vision, mission, goals and strategies into strategic goals and strategic initiatives that are comprehensive, coherent, balanced and measurable. The Balanced Scorecard is also a system that focuses the organization to improve communication, determine organizational goals and provide continuous feedback for strategic decisions (Mahmudi, 2005: 321).

Corporate Scorecard established in PT. Muamalat Indonesia Bank for 2016 based on Board of Directors (BoD) meeting Date October 28, 2015 is as displayed figure below:

<table>
<thead>
<tr>
<th>BSC</th>
<th>Sub BSC</th>
<th>KPM</th>
<th>Performance Indicator</th>
<th>WEIGHT Key Parameter (BSC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Profit</td>
<td>Profit</td>
<td>Profitability</td>
<td>PBT</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>Cost</td>
<td></td>
<td>CiR</td>
<td>30%</td>
</tr>
<tr>
<td>Sustainability</td>
<td>Portfolio Quality</td>
<td></td>
<td>- Gross NPF</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Cash Provision (LLC)</td>
<td></td>
</tr>
<tr>
<td>Excellent Service</td>
<td>Market Share</td>
<td></td>
<td>BMI Assets / Sharia Ind.</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>Service Level</td>
<td></td>
<td>MRI Rating</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>Branch Performance</td>
<td></td>
<td>Branch Financial Perf.</td>
<td>30%</td>
</tr>
<tr>
<td>Efficient Process</td>
<td>Standards</td>
<td></td>
<td>Agreement Quality</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>Compliance</td>
<td></td>
<td>SLA</td>
<td>50%</td>
</tr>
<tr>
<td>Enabling People</td>
<td>Competency</td>
<td></td>
<td>Development</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>Investment</td>
<td></td>
<td>Development Spending</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>Productivity</td>
<td></td>
<td>PPE</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>Discipline</td>
<td></td>
<td>Time</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>Innovation</td>
<td></td>
<td>AbsenteeismRate on time</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Corporate Bank Muamalat Scorecard Year 2016
Source: Performance Management System of Muamalat Bank 2016

Similar previous study been done by Tirta (2008) who mentioned that the variables used as measuring tools are work satisfaction, training, turnover and employee productivity. According to Mavrinac (1999: 190) most companies have difficulty to detect the alignment of activities and corporate strategy with goals to achieve Competence is one of the factors that affect employee’s performance and provide results which is appropriate with corporate goals and objective. It concerns the authority of each individual to perform or to take decisions based on its role in the organization relevant to the expertise, knowledge and capabilities possessed. The competencies of individual employees must be able to support the implementation of organizational strategy and able to support any changes made by management. In other words, the competence of individuals support work system based on team. Asumantri (2003: 105) argued that competency is a treasure of mental wealth that directly or indirectly enrich human life. Human can solve various problems faced through competency. According to Hutapea and Thoha (2008: 28) the competence is the ability and willingness in performing the duties effectively and efficiently to achieve corporate goals. Employee competence consists of knowledge, skills, attitude, situation.

Supiyanto (2015: 48) explained that employees who have a good competence will successfully predict the performance of individuals in the work. Competence related to the role of human resources (HR) in an organization whose meaning is the work itself. The quality of human resources owned by employees can be determined by the high competencies of each HR in an organization that will ultimately determine the competitive quality of the organization itself. Pandaleke (2016) stated that competence has a positive effect for employee performance. Competence is individual’s characteristic that underlies workplace performance or behavior. Dewi (2015) stated that the true competence has a relationship with employee performance where the performance of employees will increase as well as the increasing of the employee’s competence in a company.

Attendance, productivity and accuracy to do duties are another indicators to assessed employee’s performance. Nasution (2000: 91) argued employee’s performance appraisal can also be used to determine the behavior and employee’s target achievement reflected by work discipline, knowledge, communication, leadership, supervision, plan, and coaching. While the target achieved by an employee can be assessed from the quantity and quality of his work. Hence, performance appraisal can be said to have a relationship with employee’s work discipline. It is an action or attitude of employee’s obedience to the rules of work that exist within the organization. Rivai (2009: 153) argued that work discipline is a tool used by managers to communicate with employees so that they are willing to change a behavior as well as an attempt to raise a person's awareness and willingness to abide rules and to prevail social norms. Simamora (2006: 141), as well as Rivai also stated that work discipline is a procedure that corrects or punish subordinates for violating rules or procedures. The formation of work discipline is an absolute thing for every employee because it will increase employee performance itself.

Additionally, Rivai (2009: 259) added that without any discipline, all activities done will bring less satisfactory result. As the result, company will have lack of goal achievement. Research on performance appraisal and its relation to competence, work discipline, and performance has been widely practiced before. Sundari (2010) stated in her study that the performance appraisal directly have positive and significant effect to the competence of BKD staff of Kab. Lamongan. Aprianti (2013) conducted a study on the effect of performance evaluation in the field of Basic Education Department of West Java Provincial Education Office against employee work discipline. The results stated that performance appraisal affects employees' work discipline. Nugroho (2015) showed that the discipline of work has a positive and significant effect on the performance of employees of the Yogyakarta Special Territory of Tourism.

Based on the previous explanation regarding the implementation of balanced scorecard, this study the improved the research by completing the previous studies gap, such how balanced scorecard is being implemented in PT Muamalat Indonesia Bank to measure the employee’s work evaluation and human resource development focusing on their work discipline and competency.

II. LITERATURE REVIEW
Employee Performance supporting Factors

According to Nitisemito (2008: 117) there are various factors supporting employee performance, such as: compensation, training, welfare, promotion and good communication to either leader and other employees. Thus, factors affecting employee’s performance is from both internal and external factors. According to Bernardin and Russel (2000), employee performance appraisal based on quality, quantity, timeliness, cost effectiveness, supervisor needs, and relationships among employees. Simamora (2001: 418) argued that some dimensions of employee performance are absenteeism, delay, length of service, relief of task completion, minimum quantity and quality benchmarks fulfillment, cooperation, protective actions, constructive ideas, self-training, and attitudes profitable. Based on some experts’ opinion, the performance appraisal in this research consist of: Quality Work, Quantity Work and Timeliness. According to Sedarmayanti (2007: 262) specifically the use of the performance appraisal system is the basis for decision-making to promote the work of achievers.

Conceptual Balanced Scorecard (BSC)

The Balanced Scorecard (BSC) is an approach to management strategies developed by Kaplan (Harvard Business School) and Norton in the early 1990s. It was originally used to improve the executive performance appraisal system measured only in financial terms. However, it was then developed to measure the whole elements performance of an organization. According to Mulyadi (2001: 45), BSC approach as a strategy that has been formulated at the stage of strategy formulation is translated into strategic targets that includes four comprehensive perspective such as finance, customers, internal business processes, and learning and growth. Comprehensive and coherent strategic plans generated through the BSC approach affect of the next planning process, programming and budgeting. Both programs are used to further elaborate selected strategic initiatives containing a comprehensive and coherent long-term and short-term plan. Lubis and Sutopo in Muhammad (2015: 18) suggested that a good BSC must meet several criteria as shown in the following figure:

Figure 2: Corporate Bank Muamalat Scorecard 2016
The scorecard balance framework has several important elements including:

1. Financial performance offers the strongest definition of organizational success. Strategy explains the organization's intention to create sustainable growth for shareholders' value.

2. Components of the principal to improve financial performance resulting from the achievement of target customers. The customer perspective defines the value of the proportion for the targeted customer segment.

3. Internal processes create and provide value of proportion or customer. Internal process performance is an important indicator for subsequent developments in total customer and financial results.

4. Assets that can not be assessed are the ultimate source for sustainable value creation. The purpose of training and development explains how unified people, technology, and organizational climate support strategy. Development in training and developmental performance appraisals are important indicators for internal, customer and financial process performance.

**Competence**

Competence is an ability to perform a job based on skills and knowledge supported by the work attitude. It is as a person's ability to produce satisfactory level in the workplace also demonstrates the characteristics of knowledge and skills that individuals possess or need that enables them to perform their duties and responsibilities effectively.

There are two terms that arise from two different streams about the concept of conformity in work. The rifest is "Competency" which is a description of the behavior, and "Competence" which is the description of the task or work result (Palan, 2007: 5). Although the different meanings of both terms are generally accepted, their use is still often interchangeable, which causes everyone to have a different understanding. Generally people use the term competence and the like to create their own understanding based on their interests.

Palan (2007: 6) argued that "Competence, competency model and competency-based training are word that can be interpreted in various definition. The difference in meaning does not stem from the ignorance or greed of the market, but from some fundamental procedures and philosophical differences among those who are competing to define and shape those concepts and set models for those of us who will use competence in our day-to-day efforts.

Palan (2007: 6), suggested that competence refers to the underlying characteristics of behaviors that describe the motives, personal characteristics, self-concept, values, knowledge or skills that a superior performer performs in the workplace. Furthermore, Palan (2007: 6), outlined five characteristics that make up the competence, are: Knowledge, Skills, Self-concept and values, Personal Characteristics, Motives.

**Work Discipline**

Discipline according to Simamora (2006: 610) is a procedure that corrects or punishes subordinates for violating rules or procedures. Discipline is a form of employee self-control and regular implementation and shows the level of seriousness of work teams within an
organization. According to Handoko (2008: 208) discipline is a management activity to run organizational standards. There are two types of disciplinary activities, preventive and corrective discipline. Preventive discipline is an activity undertaken to encourage employees to follow various standards and rules, so that frauds can be prevented. The main goal is to encourage self-discipline among employees. Corrective discipline is an activity undertaken to deal with violations of the rules and to try to avoid further violations. Corrective activity is often a form of punishment and is called disciplinary action. For example, disciplinary action may be a warning or suspension.

Based on the above opinion it can be said that the discipline of work is the attitude of employees to behave based on the established rules he worked for. While the act of discipline itself is a reduction imposed by the leader on rewards given by the organization because of a case (Gibson et.al., 2009: 119). This disciplinary action does not include temporary dismissals or the inclusion of labor numbers caused by specific employee behavior events that result in low productivity or violations of agency rules. According to Rivai (2004: 25) work discipline is a tool used by managers to communicate with employees so that they are willing to change a behavior as well as an effort to raise awareness and willingness to comply with all corporate rules and prevailing social norms.

Alike the previous point, discipline also has two types of division, are: preventive and corrective. Preventive discipline is an activity undertaken to encourage employees to follow standards and rules, so that frauds can be prevented. Corrective discipline is an activity undertaken to deal with violations of the rules and to try to avoid further violations (Handoko, 2008: 227). The disciplinary objective is to improve the violation, to prevent other employees from performing similar activities, and to keep the various group standards consistent and effective (Handoko, 2008). The purpose of the discipline is to prepare an atmosphere in which the discipline itself can be developed (Handoko, 2008: 267). According to Dessler (2010: 243-244) the performance appraisal factors are: Quality of work, Quantity of work, Supervision required, Presence, Conservas.

III. METHODOLOGY

This research is confirmatory research. Data collection techniques used were questionnaires, interviews and observations. The population in this research was all employees of Muamalat Indonesia Bank in Java Area. The status of employees consists of contract employees and permanent employees of 420 people. Sampling technique in this research use Simple Random Sampling. The number of samples in this study set at 81 respondents refers to the opinion of Slovin and Umar (2005: 78).

IV. DISCUSSION

The effect of Balance Scorecard implementation on competence

The perception of most respondents who stated "good" about the application of Balance Scorecard variables has succeeded in increasing the competence of employees at PT Muamalat Indonesia Bank. This is evidenced by the provision of extensive opportunities for employees to take the initiative in the completion of work. In addition, the successful implementation of Balanced Scored on the competence is seen from most employees who already have the knowledge and work skills that can support the implementation of duties, employee's good behavior good and experience to serve customers. According to Zakir (2006: 98), the concept theory of The Balanced Score Card (BSC) is a strategy approach by balancing between four perspectives: financial, customer, internal business processes and learning and growth. BSC has transformed the performance of many companies around the world, helping many top management, setting company goals and strategies and translating them concretely into a process that not only belongs to top management but also to individuals at every level within the company. A framework that describes an organization's strategy, division, business unit or department by linking performance appraisal that plays an important role in maintaining a company's performance. The assessment of work can detect weaknesses or deficiencies that still exist in a company which will then lead to make improvements in the future.

The influence of the Balanced Scorecard on the discipline of work

Similar to previous points, this point is also based on the perception of most respondents who stated "good" with the sense that the application of Balance Scorecard variables has managed to improve employee work discipline. This is proven from all employees are always in place / office during working hours, employees always work based on the established standards. Then, employees always obey all applicable regulations and always carry out work based on the authority and responsibility that have been determined. This is in line with the opinion of Kaplan and Norton (2000: 75) which proposed a company performance evaluation system called the Balanced Scorecard which is not only used as performance appraisal tools but also as a strategic management system used to translate

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vision, mission, goals and strategies into strategic goals and strategic initiatives that are comprehensive, coherent, balanced and measurable. The Balanced Scorecard is also a system that focuses the organization to improve communication, determine organizational goals and provide continuous feedback for strategic decisions (Mahmudi, 2005: 321). According to Nasution, performance appraisals with the implementation of Balanced Scorecard implemented to determine the quality and quantity of employees.

In that opinion, performance appraisals with the application of Balanced Scorecard generally can be said to have a relationship with employee discipline. Work discipline is an action or obedience of employees to the rules of work within the organization itself. Rivai (2009: 153) argued that work discipline is a tool used by managers to communicate with employees so that they are willing to change a behavior as well as an attempt to raise a person's awareness and willingness to abide by all company rules and prevailing social norms.

**The influence of competence on employee performance**

Respondents who stated "good" to the terms of good employee competence have managed to improve employee performance. As the fact that the majority of employees who already have the knowledge and work skills to support the implementation of tasks in the office, employee’s behavior is good in providing services to customers and work experience owned by employees has supported the implementation of services for customers which is a factor that can determine employee performance at PT. Muamalat Indonesia Bank. Competence is the characteristics associated with superior performance. Armstrong (2006: 46) stated that competence is what people bring to a job in the form of different types and levels of behavior. Sudarmanto (2009: 87) defined competence as the ability and characteristics of an employee in the form of knowledge, skills, and attitudes to do the duties, so that employees can perform their duties professionally, effectively and efficiently.

Employee performance is closely related to performance appraisal. It is needed to determine the outcome or level of employee success. Performance is a concrete, observable, and measurable work "(Irawan, 2006: 588), therefore, the performance is the result of work achieved by employees in the implementation of tasks based on the size and time specified. According Mangkunegara (2011: 7), performance is commensurate with the performance performance of actual performance, which is the result of quality and quantity achieved by an employee in performing their duties based on their responsibility.

**The influence of work discipline on employee performance**

High work discipline of employees has managed to improve employee performance. The proof that all employees who are always in place / office during working hours, employees always work in based on the established standards, regulation, authority and responsibility. Discipline, according to Simamora (2006: 245), is a procedure that corrects or punishes subordinates for violating rules or procedures. Discipline is a form of employee self-control and regular execution and shows the level of earnestness of work teams within an organization. However, Hasibuan (2009: 145), stated that performance is the result achieved by a person in carrying out tasks assigned to him based on skill, experience, and sincerity. A good performance improvement must be balanced with the existence of an embedded discipline in each employee’s self.

V. CONCLUSION

Based on the descriptions that have been disclosed in the discussion, then the conclusion of this study is that the balance scorecard (BSC) gives a significant influence on the competencies that then affect the work discipline and employee performance. Moreover, PT. Muamalat Indonesia Bank has long applied this system which facilitate the company to improve the quality of the human resource. Thus, the implementation of balanced scorecard is useful to value employee’s work performance.

**ACKNOWLEDGMENT**

This paper is wholly presented for my parent who always support me completing this study.

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Radiation Protection Measures Taken In Designing Of The X-Ray Room And Installation Of The X-Ray Machines At The Departments Of Radiography Of Private Hospitals In The Municipal Area Of Kandy-Sri Lanka

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Abstract- Ionizing radiation is used in medical examinations. It causes microscopic damage to living tissue. Radiation protection in medical radiography provides vital information on radiation protection. The general objectives of this study were to describe the measures taken for radiation protection in the x-ray rooms at the departments of radiography of selected private hospitals in the municipal area of Kandy and the specific objectives were to find out the details of room designing with relevance to radiation protection and to compare above with the standard guidelines. This was a descriptive study. Three departments of x-ray of the private hospitals of the Kandy municipal area were selected as the sample of the study. Measurements were taken by using standard measuring tape. Data collection was done in a quantitative manner. Data analysis was done by comparing the measurements which were taken in hospitals with the AEA(Atomic Energy Authority, Sri Lanka) standards. Some of the major noncompliance was: x-ray room situated in high occupancy area at Hospital 1, Inadequate wall thickness of the x-ray room at Hospital 1 and Hospital 2, Entrance door opening to the occupancy area at Hospital 1, Interlock system or warning indicator was not attached to the door at three departments, Inadequate wall thickness of the control panel at Hospital 1, Incorrect construction material of the wall of the control panel, Erect bucky fixed as primary beam directed towards the occupied area at Hospital 2 and Hospital 3, Patient waiting area is provided in front of the entrance door at Hospital 2 etc. Compatible measurements with AEA standards at the three departments of radiography under study were: Room dimension was compatible with AEA standards, Material of the wall of the x-ray room, Type of the door, Lead thickness of the door, Number of doors kept minimum as described by the AEA standards, Lead glass thickness of the control panel. Radiation protection measures taken in designing of the x-ray room and installation of the x-ray machines at the departments of radiography of private hospitals in the municipal area of Kandy revealed that some important measurements in the departments under study are incompatible with AEA standards and most of them are compatible with AEA standards.

Index Terms- Ionizing radiation, x-ray room, radiation protection, AEA

I. INTRODUCTION

Radiation is a process where energy emitted by one body traveling in a straight line through a medium or through space. Radiation comes from the sun, nuclear reactors, microwave ovens, radio antennas, X-ray machines, and power lines, to name a few. Radiation can be classified as either ionizing or non-ionizing[1][2]. Ionizing radiation is used in medical examinations such as Plain radiography, Computed tomography, Nuclear medicine and Mammography. Ionizing radiation can cause biological damage to living tissue at high exposures and statistically elevated risks of cancer, tumors and genetic damage at low exposure for longer period of time.[3] Radiation protection is the science of protecting people and the environment from the harmful effects of ionizing radiations.[4][5] Radiation protection can be divided into three categories. One is occupational radiation protection, which is the protection of radiation workers. Second one is medical radiation protection, which is the protection of patients and the third one is public radiation protection, which is protection of individual members of the public and of the population as a whole[6].

II. MATERIAL AND METHOD

The study was carried out at the three departments of x-ray of the private hospitals of the Kandy municipal area, Sri Lanka. This was a descriptive study. Questionnaire was used to record the data. The study was carried out at the three departments of x-ray of the private hospitals of the Kandy municipal area. Location of the x-ray room, Room dimension(length, width), shielding of the...
entrance door, Construction of the wall of the x-ray room, Lead glass thickness of control panel, Location of the erect bucky, Patient waiting area were checked for this study. Measurements were taken by using standard measuring tape. Data analysis was done by comparing the measurements which were taken in hospitals with the AEA standards.

III. RESULTS

Below table, contain the variable measurements of three x-ray departments

**Table 1. Location of the room in the hospital under study**

<table>
<thead>
<tr>
<th>Hospital</th>
<th>High occupancy area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Hospital 1</td>
<td>✔</td>
</tr>
<tr>
<td>Hospital 2</td>
<td></td>
</tr>
<tr>
<td>Hospital 3</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2. Room dimensions in the hospitals under study**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Hospital 1</th>
<th>Hospital 2</th>
<th>Hospital 3</th>
<th>AEA standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>5.7m</td>
<td>5.64m</td>
<td>6m</td>
<td>5m</td>
</tr>
<tr>
<td>Width</td>
<td>3.4m</td>
<td>5.05m</td>
<td>3.4m</td>
<td>4m</td>
</tr>
<tr>
<td>Room size</td>
<td>19.4m²</td>
<td>28.5m²</td>
<td>20.4m²</td>
<td>20m²</td>
</tr>
</tbody>
</table>

**Table 3. Construction of the wall in the hospitals under study**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Hospital 1</th>
<th>Hospital 2</th>
<th>Hospital 3</th>
<th>AEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Brick</td>
<td>Brick</td>
<td>Brick</td>
<td>Brick</td>
</tr>
<tr>
<td>Thickness</td>
<td>28cm</td>
<td>26cm</td>
<td>32cm</td>
<td>30cm</td>
</tr>
</tbody>
</table>
Table 4. Control panel

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Hospital 1</th>
<th>Hospital 2</th>
<th>Hospital 3</th>
<th>AEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension of the viewing glass</td>
<td>36x46cm²</td>
<td>65x32cm²</td>
<td>20x20cm²</td>
<td>30x30cm²</td>
</tr>
<tr>
<td>Lead glass thickness of control panel</td>
<td>1.5mm</td>
<td>2.5mm</td>
<td>1.5mm</td>
<td>1.5mm</td>
</tr>
<tr>
<td>Material of the wall</td>
<td>Brick</td>
<td>concrete</td>
<td>lead</td>
<td>20cm thick concrete wall or 1.5mm lead sheet</td>
</tr>
</tbody>
</table>

Table 5. Location of the erect bucky

According to AEA standard, the erect bucky should be fixed to ensure that the primary beam is directed to less occupied area.

<table>
<thead>
<tr>
<th>Hospitals</th>
<th>Primary beam direction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Towards occupied area</td>
</tr>
<tr>
<td>Hospital 1</td>
<td>✓</td>
</tr>
<tr>
<td>Hospital 2</td>
<td>✓</td>
</tr>
<tr>
<td>Hospital 3</td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 6. Patient waiting area

Patient waiting areas must be provided outside the x-ray room according to AEA standard.

<table>
<thead>
<tr>
<th>Hospitals</th>
<th>Outside from the x-ray room</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Hospital 1</td>
<td>✓</td>
</tr>
</tbody>
</table>

IV. DISCUSSION

According to AEA standards, the room location should be as far away as feasible from area of high occupancy and general traffic such as maternity and pediatric wards and other departments of the hospital that are not related to radiation and its use. The x-ray room location of one hospital is directly related with high occupancy area. It is not compatible with AEA (Atomic Energy Authority) standards.

The dimension of the room in an x-ray department should aim at providing integrated facilities so that handling of X-ray equipment and related operation can be conveniently performed with adequate protection. The minimum room dimensions of a standard x-ray room are as follows:

<table>
<thead>
<tr>
<th>Hospital 2</th>
<th>But in front of the entrance door</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital 3</td>
<td></td>
</tr>
</tbody>
</table>

Width of the room 4m
Length of the room 5m
Dimension of the room 20m²

The dimensions of all the x-ray rooms are acceptable with standard values.

The walls of the x-ray room should have additional shielding, especially in relation to radiation protection of members of the general public. If it is concrete, thickness should be 20cm and Brick should be 30cm. The thickness of wall of the one hospital has adequate shielding by comparing AEA standards. The thicknesses of wall of the others have less shielding.

The number of the doors for entry to the X-ray room should be kept as minimum and shielding should be provided. Doors and door frames leading to x-ray should be lined with 1.5mm of lead to protect from leakage and scatter radiation main entrance door should be opened to high occupancy area. Shielding of the entrance door of three hospitals is acceptable with AEA standards.

The operators control station for all radiography procedures should be either in a separate room or in a protected booth or behind a fixed shield which will intercept the primary x-ray beam and scatter radiation. Cubicle should be made either with 20cm thick concrete walls or 1.5mm lead sheets. 1.5mm lead equivalent glass should be fitted to the control panel to observe the patient. Window frames must have same lead equivalent of lead sheet in contact with the lead glass and must have an overlap of at least 1cm. The minimum dimensions of the viewing window is 30x30cm.

Control panel of the Hospital 3 is located inside the x-ray room cubicle is made up of 3mm thickness of lead sheet. Control panel of the Hospital 1 is attached to the x-ray room. Cubicle is made up of 28cm thickness of brick wall. Control panel of the Hospital 2 is inside the x-ray room. Cubicle is made up of 26cm thickness of concrete wall. Wall thickness of the control panel of Hospital 3 and Hospital 2 are compatible with the AEA standards. But wall thickness of the control panel of Hospital 1 is slightly below the AEA standards.

Dimension of the viewing windows of Hospital 3 control panel, Hospital 1 control panel and Hospital 2 control panel are 20x20cm, 36x46 cm, 65x32 cm. Hospital 1 and Hospital 2 both have acceptable value for dimension of the viewing window as describe by the AEA standards. But Hospital 3 has fewer dimensions for the viewing window. And all three hospitals have 1.5mm thickness of lead in viewing window as described by the AEA standards.

The erect bucky of the Hospital 3 and Hospital 2 are fixed that the primary beam is focused on occupied area. The erect bucky of the Hospital 1 is fixed that the primary beam is focused on unoccupied area. Location of the erect bucky of the Hospital 1 x-ray room is only acceptable to AEA standards.

Patient waiting area of the three hospitals is provided outside the x-ray room. But waiting area of the Hospital 2 is located in front of the entrance door. That door has space between door panels. Therefore patients can get exposed. Patient waiting area of the Hospital 1 and Hospital 3 are compatible with AEA standards.

V. CONCLUSION

Radiation protection measures taken in designing of the x-ray room and installation of the x-ray machines at the departments of radiography of private hospitals in the municipal area of Kandy revealed that some important measurements in the departments under study are incompatible with AEA standards and most of them are compatible with AEA standards.

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7. IAEA safety standards, Specific safety guide, No. SSG-11
The State of Guidance and Counseling Services in Southwest Ethiopia Secondary Schools

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(Department of Psychology, College of Education and Behavioral Sciences, Jimma University- Ethiopia)

Abstract: - The purpose of this study was to examine the state of guidance and counseling at secondary schools of southwest Ethiopia. The study followed a qualitative design approach in which the respondents of the study selected by availability sampling technique. A total of 24 participants (8 school guidance and counseling officials, 8 school principals and 8 weredas education bureau experts) were interviewed on the current state of guidance and counseling services to students. In this study, data were analyzed using qualitative techniques. As the result of the study show, among the selected 18 secondary schools only 8 had counseling centers, and among the 8 secondary schools which have guidance and counseling centers, only 4 schools had professionally trained service providers. Thus, significant numbers of secondary school students were in a disadvantage to benefit the services of school guidance and counseling for many of the problems they encounter in relation to personal and academic matters. The qualitative data obtained by interviewing the school principals, counselors, and weredas education bureau experts revealed that the services of school guidance and counseling to be highly threatened by the lack of furnished counseling office, required equipment, professionally trained counselor, support from stakeholders, manuals and job descriptions that clearly indicate the services of guidance and counseling officers. Therefore, this study suggests the staffing of secondary schools with professionally trained guidance and counseling officers, making the services of guidance and counseling available to all students who encounter problems related to academic and personal lives. Moreover, attention should be given to the preparation of service manual and job description for school guidance and counseling personnel. In addition, there need to be continuous professional development training, transparent performance appraisal schemes and service improvement strategy for the personnel working in the field of school guidance and counseling.

Index Terms: Guidance and counseling services, trained professional, secondary schools

Introduction

The purpose of guidance and counseling service is to impart specific skills and learning opportunities in a proactive and preventive manner which ensures that all students can achieve school success through academic, career, and personal/social development (American School Counselor Association, 1997). Guidance and counseling service at schools is believed to be effective when it solves the students academic, social and personal problems and also contributes in improving academic performance. High quality school counseling services can help to address students' mental health needs. As discussed by Arudo, Tobias Opiyo Okeyo (2008), school guidance and counseling interventions positively contributes to school behaviors; specifically, students on-task and productive use of time and students in-class discipline. Therefore, guidance and counseling services play a pivotal role in helping students gain the knowledge and skills necessary for them to be able to make good decisions regarding their post-secondary plans. When guidance and counseling services are absent in schools, students adaptation and having better performance becomes difficult thus leading to low performance, misbehavior and dropout. According to Odeke's (1996), opinion without sound guidance and counseling, many students loose direction and engage themselves in bad behaviors such as drug abuse and alcohol indulgence, missing classes and dropout. On the other hand, guidance and counseling services gain only when necessary materials and required resources fulfill. In the words of (Wahib, 1974 p. 25) the manpower role of the school guidance and counselor is best fulfilled when he/she provides the student with the type of help that can allow the student to understand oneself, abilities, and future career interests. According to the US Department of Education (2003), the availability of program schedule and staff roles and responsibilities are very crucial for the effective implementation of guidance and counseling programs. Adediran, (1995) stressed that before the organization and administration of guidance and counseling units in schools, the counselor must be fully aware of the functions of the services and other significant programs of the school. The American School Counseling Association (2007) states that for the success on the functions of services, school counselors should spend at least 70 % of their time offering direct service to students guidance and counseling needs. On the other hand, the implementation of contemporary school counseling programs can be difficult without the appropriate amount of support from administration and faculty. Many times, school counselors are told what to do by principals who fail to understand the contribution of the service to school improvement and student well-being (House & Hayes, 2002). School
principals show a tendency to assign guidance officers on a non-guidance and counseling duties. In this regard, Beale (2004) points to one factor that contributes to the difficulty in program implementation the pressure on guidance and counseling personnel to perform non-counseling duties.

Another big obstacle to the service of guidance and counseling at schools is the lack of formal professional training and continuous in-service skill upgrading training for school counselors. As Oladele (1987) asserts, the quality of school guidance and counseling service to depend a great deal on the professional preparation and training of the counselors. For school counselors to become contributors to educational reform and enhance student success, counselor training programs will require a transformation of both preparation and practice (Paisley & Hayes, 2003). Kafwa (2005) suggests the need for systematic short term in-service courses which should be conducted on a continuous basis, more so in the wake of any revision of national development objectives and priorities.

A professional guidance counselor has a significant role to play in the design and delivery of the Comprehensive School Guidance and Counseling Program. The guidance counselor must be a licensed teacher with graduate-level training in counseling who assists students, parents, teachers, and school administrators by providing counseling, consulting, coordinating and program management (Comprehensive guidance and counseling program, 2007). As research reports show, professional school guidance and counseling are not well developed in many developing countries including Ethiopia (Erguner-Tekinalp, Leuwerke, and Terz, 2010; Low, Kok and Lee, 2013). In Africa in particular, it is still at an early stage of development (Mahlangu, 2011). It faces many problems, such as lack of proper understanding of its contribution for school improvement and success and there is also an acute shortage of professionally trained counselors. Until recently, the situation in Ethiopia was not much different than other African countries.

According to Ifelunni (2005) in secondary school setting there are problems related with non-professionalization of counselors, low counselor/student ratio and lack of recognition from the school administrators toward guidance and counseling services. In the words of Adane (2015), lack of commitment and creativity by professionals to promote the profession in the school is mentioned as the major challenge. In line with this Yusuf (1998) has said that in schools some professionals lack professional preparations and motivation to render guidance and counseling services.

As many scholars have show, school counselors help to make learning a positive experience for every student. They are sensitive to individual differences. They know that a classroom environment that is good for one child is not necessarily good for another. Counselors facilitate communication among teachers, parents, administrators, and students to adapt the school environment in the best interests of each individual student. They help individual students make the most of their school experiences and prepare them for the future.

It has been pointed out that no school system in Africa can claim to provide quality education when the majority of secondary school students have no access to guidance and counseling services as integral component of their curriculum (Mwanwenda, 2004, p.463). When guidance and counseling services are missing in schools, the student’s adaptation becomes difficult, thus leading to low academic performance, misbehavior and dropout of school.

As a number of research results indicated school guidance and counseling services are challenged in different ways. Among the challenges faced lack of separate guidance and counseling room with necessary materials, lack of coordination from stakeholders and lack of clear rule and regulation on how to provide the services. Therefore, the current questions in the context of the study area are (1) Whether guidance and counseling office and service providing personnel are available at the secondary schools and (2) the extent of which guidance and counseling service providers at the secondary schools are professionally trained.

**Research Method of the study**

**Study design**

In the current study, a qualitative design was used to investigate the state of secondary schools Guidance and Counseling services provisions in south west Ethiopia.

**Study area**

The study area was four zones (Bench Maji, Kefa, Jimma and Iluabborb zone) south west Ethiopia secondary schools.

**Study population**

The population of the study were include experts working on guidance and counseling services, secondary school principals and educational bureau experts working in study area.

**Sampling and sampling techniques**

8 guidance and Counselors, 8 secondary school principals and 8 educational bureau officers were selected using availability sampling techniques.

**Instruments of data collection**

**Interviews**

Three research instruments were used, namely, in-depth interviews with guidance counselors and school heads and in-depth interview with weredas education bureau experts. Through the in-depth interview, guidance counselors were estimated to address a number of issues which included their own preparedness for leading the development and implementation of the guidance and counseling programme, the content of the programme, activities developing out of the programme, and how they documented the guidance-related curricula and other guidance-related activities in the school. The interviews also sought to establish what impact the guidance counselors believed their programmes had on student behavior and performance.

For the heads of schools, the in-depth interviews sought to gather information on the role they played in the origin and management of the guidance and counseling programme in their schools. These interviews were also interested in what the heads of schools believed were the benefits and disadvantages of the guidance and counseling programmes, their attitudes to guidance and counseling programmes, and the resources the school put aside for supporting the guidance and counseling programmes.

In addition, weredas education bureau experts were interviewed concerning the guidance and counseling services
provisions, policies, rules and responsibilities professions and performance evaluation and mechanism supporting professions.

Data collection procedures
To conduct the research on selected secondary schools found in south west Ethiopia; permission to carry out the study was obtained from Jimma university education and behavioral Sciences college research and post graduate coordination office. This was followed by visits to selected weredas education office to inform aims of research and to request permission to conduct the study in the schools. The wereda education experts were interviewed. The wereda education administrators were ordered supervisors to contact schools principals then the principals were interviewed. Lastly the heads of schools were then asked to connect the researchers with the guidance counselors in their respective schools.

Data analysis
Qualitative analysis was done for data collected from counselors, school principals and zonal/weredas educational bureau experts.

Ethical consideration
The collection data from respondents were based on willingness. Then, the purposes of the study were explained for the participants and they were asked their consent in responding to question in the questionnaire. The participants were also informed that the information provided would only be used for the study purposes and that it would not be given to a third part. Accordingly, information which the participants provide would be used only for the study purposes. In addition, the researchers would be insured confidentiality by making the participants anonymous.

RESULT AND DISCUSSION
The Aim of the current study is to investigate the stateof guidance and counseling services in South West Ethiopia Secondary Schools. In the present chapter, the data generated from the current study is presented and discussed in line with of the -research questions.

PRESENTATION ANALYSIS AND DISCUSSION OF THE STUDY
The main research questions raised in the study were:
1. Whether guidance and counseling office and service providing personnel are available at the secondary schools?
2. The extent of which guidance and counseling service providers at the secondary schools are professionally trained.

Availability of guidance and Counseling Centers and Professional Counselors
Table below showed the Existences of guidance and counseling services programs as well as professional experts in respected school.

<table>
<thead>
<tr>
<th>Schools</th>
<th>Counselin g center</th>
<th>Counseling officer Education background</th>
<th>Current Duty</th>
<th>On Job Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>School 1</td>
<td>Yes</td>
<td>Psychology*</td>
<td>Teaching and Counseling</td>
<td>No</td>
</tr>
<tr>
<td>School 2</td>
<td>Yes</td>
<td>Civic</td>
<td>Teaching and Counseling</td>
<td>No</td>
</tr>
<tr>
<td>School 3</td>
<td>Yes</td>
<td>-</td>
<td>Teaching and Counseling</td>
<td>-</td>
</tr>
<tr>
<td>School 4</td>
<td>Yes</td>
<td>Psychology*</td>
<td>Teaching and Counseling</td>
<td>-</td>
</tr>
<tr>
<td>School 5</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>School 6</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>School 7</td>
<td>Yes</td>
<td>Afan Oromo</td>
<td>Teaching and Counseling</td>
<td>-</td>
</tr>
<tr>
<td>School 8</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>School 9</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>School 10</td>
<td>Yes</td>
<td>Special Need</td>
<td>Counseling</td>
<td>No</td>
</tr>
<tr>
<td>School 11</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>School 12</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>School 13</td>
<td>Yes</td>
<td>Psychology*</td>
<td>Counseling</td>
<td>No</td>
</tr>
<tr>
<td>School 14</td>
<td>Yes</td>
<td>Psychology*</td>
<td>Counseling</td>
<td>No</td>
</tr>
<tr>
<td>School 15</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>School 16</td>
<td>Yes</td>
<td>Information Science</td>
<td>Teaching and Counseling</td>
<td>-</td>
</tr>
<tr>
<td>School 17</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>School 18</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

As above table reveled, among selected 18 secondary schools only 8 secondary schools have counseling centers. Among secondary schools having guidance and counseling center, only four secondary schools have psychology background personnel while in remaining four schools civic and ethical study, Afan Oromo, Special Need and Inclusive education and Information Science backgrounds teachers working as Guidance and counseling Officers respectively. Other 10 secondary schools didn't have both counseling center and guidance and counseling officers. The students in the ten schools were in a disadvantage because they were not benefitting the services of guidance and counseling for both personal and academic related problems they encounter. This again, is very common in most of the public secondary schools in the area. The majority of practicing school counselors and teachers as counselors reported still have teaching responsibilities over and above counseling duties.

All counselor and teachers as counselors did not have any on job training that help to improve the profession. This data revealed that in most of sample selected secondary schools of study had no counseling center as well as professional counselor who assist students regarding to their personal, academic and social/relationship problems. The interview held with educational bureau and secondary schools principals indicated that governments not assigning school guidance and counselor officers at current time.

Counselor Readiness
To address issues related with the readiness of guidance and counseling service personnel the interview were conducted with school principals and counselors and the interview result showed that secondary schools guidance and counseling services were not established. Schools that have the guidance and counseling services programs, the programs officers were not actively working due to lack of knowledge, supports and training and skills that make them effectives. The interview held
with wereda educational bureau confirmed that they know only the name guidance and counseling but no any written documents and manuals as well as how to supervise and assess the program at all. The interview results from school principals, counselors and wereda education bureau officers shows as there is no clear mission and legislation that guide, rule and assess the effective the guidance and counseling services and also there is no professional readiness like having skills, knowledge and abilities to provide effective services from programs offices.

The interview results gathered data from principals and counselor were showed their schools guidance and counseling services was challenged by lack of separate guidance and counseling room with necessary materials, lack of coordination from teachers and lack of clear rule and supervision mechanisms from Ministry of education as general and specifically lack guide and support from wereda educational bureau and school community.

Discussion of the Study
Research Question 1: What is the existence of guidance and counseling services centers and professional counselors?

Among selected 18 secondary schools only 8 secondary schools have counseling centers. Among secondary schools having guidance and counseling center, only four secondary schools have psychology background personnel while in remaining four schools guidance and counseling officers were from different fields of study. The current study is similar with Yirgalem Alemu (2013) finding that revealed almost all of secondary schools of east harerge (except one) not had guidance and counseling officer. Also Comfort (2013) reported that on evaluation of the status of guidance services in secondary schools in rivers state, Nigeria show out of the secondary schools in the state almost all does not have a counseling center.

The majority of practicing school counselors and teachers as counselors reported still have teaching responsibilities over and above counseling duties. This finding agree with findings of Yirgalem, (2013) mentioned that most school guidance and counselors reported that they did not have private counseling room as well as most school principals and other officials wanted the Guidance and Counseling program to focus on education related issues like study skills, discipline and late coming. With the absence of clear roles and responsibilities of Guidance and Counseling programs, most visited guidance and counselors were expected to serve as unit leaders. Rashid, Salima ,Mubashir, Ali and Kashif (2011) also stated the role and responsibility of the counselor in educational institutions is much complex as compared to other organizations since there are legal, professional and organizational issues involved in counseling process.

Interview conducted with school principals and teachers counselors reported that teachers who were working as guidance and counseling programs officers were not actively working because while most of them were not trained in counseling profession they lacked understanding, skills and knowledge that make them effective in enhances students’ academic, career and personal competencies. One of the strengths of Guidance and Counseling program in schools was availability of trained counselors. Most visited school counselors had no training related to guidance and counseling. This is in line with what Oladele (1987) observed. According to him the quality of counseling services rendered depends a great deal on the training of the counselors. However, comprehensive guidance and counseling program, (2007) underline secondary schools guidance counselor must be a licensed teacher with graduate-level training in counseling who assists students, parents, teachers, and school administrators by providing counseling, consulting, coordinating and program management.

Research Question 2: What are the extents of professional preparation among guidance and counseling officers at the secondary schools?

Most of sample selected schools guidance and counseling officer were not actively working due to non professionalism and lack of knowledge, support, training and skills that make them effective. In other hand all counselor and teachers as counselors did not have any on job training that help to improve the profession. Grace and Teresa, (2015) mentioned the essence of the guidance and counseling program consists of knowledge and attitudes. Training therefore is a central theme. He also described as from training; counselors acquire skills and knowledge which they should be able to use in the school guidance and counseling situation. The founding also supported with Ifelunni (2005) saying in secondary school setting there are problems related with non-professionalization of counselors, low counselor/student ratio and lack of recognition from the school administrators toward guidance and counseling services. In the words of Adane (2015), lack of commitment and creativity by professionals to promote the profession in the school is mentioned as the major challenge. In line with this Yusuf (1998) has said that in schools some professionals lack professional preparations and motivation to render guidance and counseling services. But according to words of Paisley & Hayes, (2003) for school counselors to become contributors to educational reform and enhance student success, counselor training programs will require a transformation of both preparation and practice.

Conclusions

Among selected 18 secondary schools only 8 secondary schools have counseling centers. Among secondary schools having guidance and counseling center, only four secondary schools have psychology background personnel while in remaining four schools guidance and counseling officers were from different fields of study. This implies that most secondary schools find in south west Ethiopia were not providing effective G&C services because most of secondary schools were the lack of G&C centers and programs officers.

While most of secondary schools guidance and counseling officer were non professional; existed G&C officers were not actively working due to non professionalism and lack of knowledge, supports and training and skills that make them effective. Thus non-professionalism and lack of training for G&C personnel leads to limited practices of G&C services in south west Ethiopia secondary schools.
**Recommendations**

Based on the finding of this study, the following recommendations are forwarded:

- Since most schools lack professional counselors and counseling centers, the respective educational bureaus should work on the means of making the services accessible to all schools.
- Among secondary schools having guidance and counseling centers majority of G&C centers were run by non-professional without any training. So, responsible educational bureau should arrange and give them on job training that help to improve their skills.
- More resources both financial and non-financial should be availed to schools by the Ministry of Education and Sports, parents, the community and Non-Governmental Organizations especially to schools in rural areas to enable teachers offer counseling services to the students.

**References**

6. Arudo, Tobias Opiyo Okeyo, (2008 p.). *Peer Counseling Experience Among Selected Kenyan Secondary Schools*

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Abstract: The study is intended to investigate parental involvement, teachers’ support, and achievement motivation as predictors for students’ academic performance. This study employed quantitative research design. For the study 10th and 12th grades students selected because they were candidates of standardized national examination for 2013/14 academic year. Purposive sampling was used to select two schools, Sheiy Benchi and Mizan Teferi secondary and preparatory schools from Benchi Maji zone. We selected these two schools purposely because preparatory schools are found only at these schools. And then Stratified random sampling method was used in selecting study participants. Strata were made based on sex and field of studies (social science and natural science) particularly for grade 12th. Hence, based on the proportion the required number of sample was drawn from each stratum. The instrument of data collection was four point scale, 1(strongly disagree) to 4(strongly agree) Questionnaires. The analysis of quantitative data was done using different statistical measurements. Among total 192 of study participants 240 (61.2%) of them were males and 152 (38.8%) were females and about 73.6% of the respondents were grade 10 students while the rest 26.4% of them were from grade 12 students. The results of study regarding to parents’ involvement and student academic achievement; the relationship was very weak, which was r(138)=0.061,p=0.473. This means student academic performance was not related with whether parents were involved or not. Concerning student perceived teacher support and academic performance; teachers support does not guarantee students better exam score which was only 5% of the variance in students’ performance is accounted for by support they received from their teachers. The result of study also indicated there was positive relationship between achievement motivation and students’ academic performance which was r=0.45 and 0.511 respectively. Hence, the relationship is just significant at alpha 0.01. From these results it was recommended that since even though students’ perception of parental involvement in their education was weak, parents need to be aware of how much their support is invaluable to their children education and encouraged to support their children at home and school. Motivation is the indispensable condition for learning to occur and for students perform better in their education. Hence, all the concerned bodies particularly parents and teachers need to play enormous role to motivate their students. Finally, professional advice and guidance is recommended to teachers and students to improve the performance.

1. Introduction

1.1. Background

The standard of education in any country is measured against several dimensions that are related to the stated goals and aims of education. One of these dimensions is the students’ academic performance that is observed directly from classroom tests/teacher made tests or national examination scores and indirectly from the development in knowledge, skills, and attitude gained by students.

Academic performance of students at any grade level can be influenced by numerous explicit and implicit factors. Every stakeholder has its own share in influencing students’ academic achievement. Students’ motivation and academic achievement is affected by several factors. Among others, factors related to teachers, parents, school, and learners themselves contribute crucial roles in motivating students for academic success. Parental involvement is directly related to the children’s motivation to learn. Great number of studies revealed that children of parents who are more involved in school activities do better in school than children with parents who are less or never involved (Wiley, 1987).

Not only parents but also teachers and students themselves play paramount role in enhancing students’ academic achievement. In Nigeria, For instance, several studies have been done in the area of teacher factors (Adediwura and Bada 2007), and school environments as they relates to poor students’ academic performance (Babalola, 2000). Regarding teacher related variables, Ehindero and Ajibade (2000) asserted that some teachers lack the necessary professional (not academic) qualification (that is, skills, techniques, strategies, temperament
etc.) required to communicate, concepts, ideas, principles etc. in a way that would facilitate effective learning.” On the other hand, Yahaya (2003) and (Umoh, 1987) stressed that the high rate of maladjusted behaviors among students (e.g. cultism, examination malpractice’s, drug and sex abuse) are attributable for the mass failure in some core school subjects.

Motivation, as it relates to students, is very important. The term motivation has been defined in several ways by different scholars in the area. For instance, Wlodkowski and Jaynes (1990) explain that in the broadest sense, motivation is “a value and a desire for learning.” Similarly, According to Mangal (2008), Motivation may be regarded as something, which prompts, compels, and energizes an individual to act or behave in a particular manner at a particular time for attaining some specific goal or purpose.

Some psychologists theorize the construct motivation in terms of internal drive within an individual that pushes him/her to do something where as others explain motivation as external forces that pull or attract somebody to do something or to behave in some way(Steers, 1996).

The notion of intrinsic motivation is based on the intensity of our need to achieve, as well as our enjoyment of achieving. Students who are intrinsically motivated participate in learning activities for their own sake; they desire the outcome. They do not need rewards or praise; they find satisfaction in knowing that what they are learning will be beneficial later. They want to master the task, and they believe it is under their control to achieve mastery. The work may reflect personal interest or be a new challenge. “Academic intrinsic motivation has been shown to be positively and significantly related to students’ achievement and perception of their academic competence, and inversely related to their academic anxiety” (Eskeles-Gottfried, Fleming, Gottfried, 1998, p. 1448).

Extrinsically motivated individuals are those who participate to receive a reward or avoid a punishment, they typically do not want to do the task and believe that it is out of their control on whether they succeed or not. If they do the task, they expect some sort of gain other than knowledge, such as praise, rewards, or avoiding punishment (Keefe and Jenkins, 1993). Students who have high motivation to achieve generally do well academically. Students with low motivation do not do well academically. But motivation does not guarantee achievement. Similarly, achievement does not reflect motivation (Keefe and Jenkins, 1993).

Ethiopia has expanded access to secondary education (grades 1-8) dramatically in the last 15 years. Despite this achievement, expanding enrolments have contributed to stagnating or Academic performance only one aspect of education quality. The two are not equivalent, especially in the context of severely limited resources (Amare Asgedom, Daniel Desta, Derebssa Dufera, and Wanna Leka, 2006).

Mulu (2009) conducted a study on the standards and pre-university preparation and assessment. The findings have lead to a conclusion that students at the secondarily education levels have low academic preparation and the majority of those students transferring from one educational level to the next tier are without adequate grounding in terms of requisite academic achievement levels. This obviously affects the quality of education provided at all levels. However, little is known about the influence of teachers support, parental involvement, and students’ achievement motivation on academic performance of secondary school students. Hence, this study is aimed to investigate the influence of perceived parental involvement, teachers’ support, and students’ achievement motivation on Academic performance in selected secondary schools found in Benchi Maji zone.

1.2. Statements Of The Problem

Students’ academic achievement is influenced by the extent to which parents are involved in their children education; teachers provide regular support and individual students’ motivation for learning. These three factors are not mutually exclusive but interrelated to one another directly or indirectly. The combined effects of them enhance students academic performance or success and absence of one or two of them negatively affects academic achievement. Inline with this issue, Epstein (1997) discussed how children learn and grow through three overlapping spheres of influence. Family, school and community, these three spheres must form partnerships to best meet the needs of the child.

On the other hand, student motivation and academic performance are assumed to be the result of the teacher’s diligence and hard work. Accordingly Goddard, Hoy, & Hoy (2000) proposed that highly efficacious teachers motivate students and boost academic achievement even among difficulty students.

Whether financial/material or moral, parental involvement plays great role in enhancing students academic motivation and lack of parental support lead students to lack academic motivation which in turn affects academic performance. For instance, Awanbor (2005) reported that, students who lack sufficient level of academic motivation exhibit a weak drive towards the pursuit of academic goals so that they manifest sign and symptoms of indifference and apathy towards school.

Factors affect students academic performance is countless yet the role of parents, teachers and students themselves are directly influential. however, the level of academic performance as well as factors associated with students’ academic success in Benchi Maji secondary schools is not clearly identified so far. So, the present research is interested in answering important questions such as to what extent parents are involved in their students education?, do teachers carry out all of supports expected from them to their students?, what is degree of students academic motivation? And what is the status of students academic performance in Mizan Teferi and Shei Benchi secondary schools?

1.3 Research Objectives

General objective: the general objective of this study is to investigate the influence of parental involvement, expectation, and teachers support on secondary school students academic motivation and performance.

Specific objectives:  
- To identify the relationship between students’ perception of teachers’ support and students academic motivation  
- To examine the relationship between parental involvement and students academic motivation
To describe the relationship between students’ academic motivation and academic performance
To identify whether there is gender difference in students’ perception of parents’ involvement in their education

2. Research Methods
This study employed quantitative research design as data was conducted by using questionnaires. The target population of this study was grade 10 and 12 students found in Benchi Maji zone secondary schools. The researchers were interested in 10th and 12th graders because they were candidates of standardized national examination for 2013/14 academic year. Purposive sampling was used to select two schools, Sheiy Benchi and Mizan Teferi secondary and preparatory schools from Benchi Maji zone. We selected these two schools purposely because preparatory schools are found only at these schools. And then Stratified random sampling method was used in selecting study participants. Strata were made based on sex and field of studies (social science and natural science) particularly for grade 12th. Hence, based on the proportion the required number of sample was drawn from each stratum.

The instrument of data collection was four point scale, 1(strongly disagree) to 4(strongly agree) Questionnaires. The reliability and validity of each instrument was checked by conducting pilot test one month before final data collection. In addition, forward and backward translation was made to minimize meaning differences in the two languages. After data collection items reliability were checked again and the reliability coefficient of achievement motivation was cronbach’s alpha of 0.963 which was ideal.

Different statistical analysis was run to examine obtained data from respondents. Accordingly descriptive statistics such as mean and standard deviation was computed to see differences among respondents against the variables under study. Independent sample t test was used to examine whether there is gender differences in perceived parental involvement. Moreover, correlation coefficient was calculated to describe the relationship between achievement motivation and academic performance for each group of respondents. Finally linear regression analysis was implemented to detect the significance of the predictors’ variables for students’ academic performance.

3. Results

Table 1 Gender & Grade level

<table>
<thead>
<tr>
<th>Sex</th>
<th>F</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>80</td>
<td>57.1</td>
<td>57.1</td>
<td>57.1</td>
</tr>
<tr>
<td>female</td>
<td>60</td>
<td>42.9</td>
<td>42.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>grade 10</td>
<td>103</td>
<td>73.6</td>
<td>73.6</td>
<td>73.6</td>
</tr>
<tr>
<td>grade 12</td>
<td>37</td>
<td>26.4</td>
<td>26.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

The table shows that 80(57.1%) of respondents were males and 60(42.9%) are female respondents. In addition, about 73.6% of the respondents were grade 10 students while the rest 26.4% of them were from grade 12 students. Note that among 192 students completed the questionnaires about 52 respondents missed the necessary information during completion of each items. Therefore the researcher discarded them because they contain incomplete information to the study.

Table 2. Gender Difference in Parental Involvement

<table>
<thead>
<tr>
<th>Sex</th>
<th>N</th>
<th>Mean</th>
<th>Std. Devi</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>parental Male</td>
<td>80</td>
<td>30.92</td>
<td>14.52346</td>
<td>1.62377</td>
</tr>
<tr>
<td>Female</td>
<td>60</td>
<td>39.150</td>
<td>13.99858</td>
<td>1.80721</td>
</tr>
</tbody>
</table>

Levene's Test for Equality of Variances

<table>
<thead>
<tr>
<th>parental</th>
<th>T</th>
<th>Df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances assumed</td>
<td>-3.368</td>
<td>138</td>
<td>.001</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>-3.385</td>
<td>129.622</td>
<td>.001</td>
</tr>
</tbody>
</table>

Table2 shows that there is statistically significant difference in parents’ involvement for the education of male child and female child, t(138)=-3.368, p=0.001.parents were more involved in the education of their female child than male child. The mean (M) score for female respondents is 39.1500 with the standard deviation (SD) of 13.99858 and that of male respondents is 30.9250 with standard deviation of 14.52346.

Table3 Relationship between motivation and performance

<table>
<thead>
<tr>
<th>GPA</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
<td>82.6786</td>
<td>19.67004</td>
<td>140</td>
</tr>
<tr>
<td>GPA</td>
<td>1.7643</td>
<td>.64161</td>
<td>140</td>
</tr>
</tbody>
</table>

Correlations

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Pearson Correlation</th>
<th>GPA</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.62</td>
<td>.0003</td>
<td></td>
</tr>
</tbody>
</table>

The result shows that correlation between motivation and performance, r(138) =0.62, p=0.0003. This means that there is moderate relationship between motivation and students exam score. Relatively high level of motivation is related with better exam performance.

Table 4 Parental involvement and academic performance

<table>
<thead>
<tr>
<th>GPA</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parental</td>
<td>1.7643</td>
<td>.64161</td>
</tr>
<tr>
<td>N</td>
<td>140</td>
<td>140</td>
</tr>
</tbody>
</table>

Correlation

<table>
<thead>
<tr>
<th>GPA</th>
<th>Pearson Correlation</th>
<th>GPA</th>
<th>Parental</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>140</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.473</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The result shows that the relationship was very weak; r(138)=0.061,p=.473. This means that students perceived their parents involvement in their education very much less than they
performed at school. That means students academic performance was not related with whether parents were involved or not.

### Table 5 Teacher support and performance

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.045*</td>
<td>.002</td>
<td>.05</td>
<td>.64327</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), teacher support

The result showed that only 5% of the variance in students’ performance is accounted for by support they received from their teachers.

### Table 6 the difference between Mizan and Sheiy Benchi School in performance

<table>
<thead>
<tr>
<th>Schools</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP A Sheyi Benchi</td>
<td>67</td>
<td>1.716</td>
<td>.64681</td>
<td>.07902</td>
</tr>
<tr>
<td>Mizan Teferi</td>
<td>72</td>
<td>1.805</td>
<td>.64216</td>
<td>.07568</td>
</tr>
</tbody>
</table>

The table reveals that there was no statistically significant difference between Mizan Teferi secondary school and Shiey Benchi secondary school in students’ academic performance. That means the mean difference was insignificant, t (138) = -0.815, p= 0.417.

### Table 7 Parental involvement and students’ Achievement motivation

<table>
<thead>
<tr>
<th>Model Summary</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.511a</td>
<td>.261</td>
<td>.256</td>
<td>16.96877</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), parental involvement

| Correlations |

<table>
<thead>
<tr>
<th>Pearson Correlation</th>
<th>Motivation</th>
<th>Moral support</th>
<th>Material support</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.000</td>
<td>.450</td>
<td>.511</td>
</tr>
<tr>
<td></td>
<td>.450</td>
<td>1.000</td>
<td>.812</td>
</tr>
<tr>
<td></td>
<td>.511</td>
<td>.812</td>
<td>1.000</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

The table shows that parental involvements moderately predict students’ level of motivation. That means nearly 25% students achievement motivation was determined by the extent to which they received support from parents. Parental involvement in terms of moral and material support, the table reveals there was positive moderate relationship between parents’ moral support and material support to their students and students’ achievement motivation with Coefficient of r=0.45 and 0.511 respectively. Hence, the relationship is just significant at alpha 0.01.

### 4. Discussion

#### 4.1 The relationship between achievement motivation and academic performance

There may be no doubt that there is fairly positive to strong positive relationship between achievement motivation and students’ academic performance. Motivation is goal directed behavior which directs and energizes people’s behavior to the things they want to do. Hence, highly motivated students are more likely to be engaged in their education than less motivated students. This implies that highly motivated students work harder; read their textbook now and then, visit their library very often, do their assignments on time and strive to be the best in the class. Therefore, the result of this study shows that there is moderate positive relationship between students’ achievement motivation and their academic performance or exam test score.

Similarly as explained by Eskeles-Gottfried, Fleming, Gottfried (1998) achievement motivation is positively and significantly related to students’ performance and perception of their academic ability. This notion can be generalized to students at any school level. But sometimes students with high degree of learning motivation can perform less due to different factors such as in appropriate testing environment, test anxiety, and poor health condition during exam time. Generally, under normal circumstances students with high learning motivation are more effective in their education and exam performance than those students with low degree of learning motivation.

#### 4.2 Parental involvement and students’ motivation

Parental involvement was measured in two ways: material support and moral support. Both have moderately positive relationship with students’ achievement motivation. This indicates that students need both moral and material involvement of their parents in order to have motivation to their education. In the same way Pomerantz (2005) also argued that they both contribute invaluable roles in increasing students’ achievement motivation which in turn perk up their academic performance. Moral support includes verbal praise like saying very good or excellent!, giving them advise, protecting them from undesirable behavior, following them at school, consulting their teachers and controlling their time after school and being at home when they are in. such support were very much needed by students so as to engaged them in their education and endeavor to became clever at school.

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On the other hand material support includes fulfilling all the necessary facilities in the home like chair, table, books, exercise books, cloths, shoes pens, pencils, pocket money and so on. Awanbor (2005) reported that inadequate remuneration, lack of basic materials, poor teaching, and learning environment result in poor academic motivation. Therefore, it is believed that parental support was positively associated with students’ better performance and motivation to be engaged in their education with their maximum potential and very little difficulties. Similarly, Singh et al (1995) explored that parental aspirations for children’s education, parent-child communication about school; and home-structure were among the necessary components of parental involvement need to be implemented by every family for the wellbeing of their children.

Consistent with this finding (Epstein, 1997) suggested that it was not optional for parents to produce such atmosphere at home which does not affect the growth and Education of their children. The idea was that every family must take care of their children education and encourage them with whatever they have at hand. Helping students to learn at home should not be considered as optional but it should be perceived as compulsory. Pope (1999) discussed that parents who were involved in their child’s academic life have a profound effect on the child’s ability to learn and establish strong base for a lifetime.

The more parents involved the more achievement motivation possessed by their children. In this context we can list tremendous number of benefits obtained from parental involvement in their children learning. For instance, achievement motivation raised by parental support reduces the rate of dropout at elementary and secondary school. This in turn enhances the opportunity for students to be free from undesirable behaviors such as substance abuse, alcoholism, and many other antisocial behaviors. In addition, if children are monitored by their parents whether at home or school, the probability that they engage in unacceptable activities such as risk behavior will be minimized.

### 4.3 Teacher support and performance

Even though teachers’ role in students’ achievement motivation and academic performance is undeniable, the finding of this study disclosed that teachers support does not guarantee students better exam score. This implies that the end result of good academic performance is in the hands of every individual student self-efficacy. While teacher support was perceived as very high by respondents of this study their achievement motivation and academic performance were reported lower. The question is why lower exam scores may not necessarily be attributed to teachers at both schools in the context of the study environment. However, Goddard, Hoy, & Hoy (2000) proposed that highly efficacious teachers motivate students and boost academic achievement even among difficulty students. This may be true in the context of eager students who are always in fond of knowledge and achievement but it does not characterize less motivated students who have no clearly stated life goal or for those students who expected low value from their own education.

Generally, no matter how students’ performance may be affected by several factors attributed internally or externally, teachers support should be underlined and continuously accompany with parental support that directly influence students’ motivation.

### 5. Summary, Conclusion and Recommendations

#### 5.1 Summary

The purpose of this study was to investigate parental involvement, achievement motivation and teachers’ support as predictors of students’ academic performance. The data was collected using questionnaires from randomly selected students from Mizan Teferi secondary and preparatory school and Sheiy Benchi secondary school. About 192 students participated on this study but final data analysis was made on only 140 students due to incomplete response obtained from about 52 students were discarded. There were different statistical tools like mean standard deviation, coefficient of correlation, t-test and linear regression used in analysis of data collected from respondents. The finding of this study reveals that there is moderate relationship between achievement motivation and students’ academic performance. There is statistically significant difference between female and male students perception of parental involvement in that parents are more involved in education of their female students than male students.

Teacher support is least predictor of students’ academic performance. Parents are involved in their students’ education both in terms of moral and material support. The level of motivation of students at both Mizan Teferi and Sheiy Benchi schools were not this much good as their mean score was the minimum. There was no statistically significant difference in Parental demographic background with regard to involvement in education of their children.

#### 5.2. Conclusion

Based on the findings of this study the following conclusions are made as follows:

- Achievement motivation has moderate relationship with students’ academic performance. Therefore, it very important to motivate students so as to enable them performs better.
- Both moral and material support of parents is highly related with students’ motivation and this in turn better predicts students’ academic performance. Teachers support is not this much related to students performance yet it has to be there.
- Students’ academic performance is somehow low as the sample mean is below the mean of the national level.

#### 5.3. Recommendations

Even though students’ perception of parental involvement in their education is positive, parents need to be aware of how much their support is invaluable to their children education and encouraged to support their children at home and school.

Motivation is the indispensable condition for learning to occur and for students perform better in their education. Hence, all the concerned bodies particularly parents and teachers need to play enormous role to motivate their students.

Finally, professional advice and guidance is recommended to teachers and students to improve the performance of students at both schools.

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The effect of service quality and brand trust on loyalty and the intervening role of customer satisfaction in transportation service

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Abstract- This study aims analyze the effect of service quality and brand trust on loyalty and the intervening role of customer satisfaction in transportation services like Go-Ride of Go-Jek in Palembang city. Questionnaires were distributed to target respondents. Using a purposive sampling technique, a total of 100 respondents were obtained. Analysis was performed using Structural Equation Modeling (SEM). The result proved that service quality and brand trust had a significant effect on loyalty through customer satisfaction. It is suggested that the Go-Ride of Go-Jek management conduct a survey to determine the needs of the desired customer and provide promotions related to the desired needs. Further research on pricing policy and word of mouth may be necessary.

References- brand trust, customer satisfaction, loyalty, service quality

I. INTRODUCTION

The advancement of information technology has resulted in major shocks in all business worlds. One of these shocks to businesses that use online applications. There is no one of business not touched by advances in information technology. The presence of application technology in smartphones based on andriod, windows or ios operating systems has brought significant changes in all areas, including transportation.

Smartphone application technology able to answer the needs of the community will make it easy access mode of transportation in major cities, especially the city of Palembang. By using mobile phone customers can directly choose what mode of transportation will be present in front of the customer's home. Online application technology makes it easy for consumers to save time. Customers no longer need to walk to find the modes of transportation used, simply by using online application the consumer can already be picked up by the drivers in place. Complete with driver self data, vehicle type, phone number and travel rate. Customers can also see the journey to be skipped through GPS (Global Positioning System).

According to a survey conducted by YLKI (Indonesian Consumer Foundation) on the site http://ylki.or.id/2017/07/warta-konsumen-transportasi-online-kawan-atau-lawan/, to respond the growing dynamic of online transportation exist in some big cities in Indonesia involving 4,668 respondents. It can be concluded that survey respondents are dominated by working age or in other words that the presence of online transport is widely utilized by those who are productive.

In addition, the selection of modes of transportation of cars and motorcycles is still a consumer choice in using transportation. The number of 4,668 customer respondents, 55 percent used online transportation of cars and motorcycles; while by using motorcycles as much as 21 percent and by using car as much as 24 percent. While the reason customers choose or use online transportation, generally can be seen in the table below.

<table>
<thead>
<tr>
<th>Table 1. The Customers Reasons Use Online Transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secure</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>61,4%</td>
</tr>
</tbody>
</table>

From the table above can be seen that the reason customers use online transport for 84.1%. This indicates that the price factor becomes the consideration of most customers. Customers assume that online transportation is cheaper than conventional transportation.

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Table 2. Customer Perceptions of Online Transport Services

<table>
<thead>
<tr>
<th>Very good</th>
<th>Enough</th>
<th>Less good</th>
<th>Very bad</th>
</tr>
</thead>
<tbody>
<tr>
<td>77.7%</td>
<td>21.8%</td>
<td>0.4%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

From the results of the survey dominant customer opinion that assessed the positive service of online transportation, does not seem to automatically remove customer disappointment, as many as 41 percent of customers claimed to have been disappointed.

The elaborated, the form of disappointment or customer complaints against the online transportation services is divided into two types; related to technology applications and human resources (drivers). From this two types of disappointment the shape is very diverse. Based on the results of this survey indicates that the absence of minimum service standards provided by the transport operator concerned. The potential impact of customer loss is enormous. The number of customer complaints against online transport operators, indicating that; Firstly, online transport operators do not yet have a measurable minimum service standard. This resulted between the driver with each other in one operator is not the same in providing services to customers.

Second, the online transport operator does not have a complaint handling mechanism. As mandated by Law No. 8 of 1999 on Customer Protection, the customer has the right to be heard of complaints over the use of goods / services (article 4).

The operators' competition in the online transport is also evident from the YLKI survey which says Go-Jek occupies the highest rated customer rating, 72.6 percent; then Grab as much as 66, 9 percent; Uber is used by 51 percent and BlueBird as much as 4.4 percent. This result is not surprising given the three operators who master the application of online transport.

According to Zeithmal and Bitner (2000: 75) satisfaction are: Response or response of consumers regarding the fulfillment of needs. Satisfaction is an assessment of the characteristics or features of the product or service, or the product itself, which provides the level of customer pleasure associated with the fulfillment of customer consumption needs.

In a competitive environment, an indicator that can indicate customer satisfaction is whether the customer will buy back and use the product in the future. Customers will be loyal to a brand if they get satisfaction from the brand. Therefore, if customers try several brands that are then evaluated whether the brand has exceeded their satisfaction criteria or not. If after a try and then a good response then it means that the customer is satisfied so he will decide to buy back the brand consistently all the time. This means that customers have created loyalty to the brand.

Zohaib (2014) in his research entitled "Effect of brand trust and customer satisfaction on brand loyalty in Bahawalpur" shows that brand trust variables are the most important factor of brand loyalty. These results indicate that the customer is already fulfilled in return for brand trust. In this study illustrates the positive and significant relationship between brand trust variables to loyalty. Other research conducted by Bakti and Sumaedi (2017) in his research entitled P-TRANSQUAL: a service quality of public land transport services, in the quality of service proved to have good validity and stability to measure the quality of paratransit services in Indonesia.

However, in a study conducted by Berlianto (2016) in his research entitled the influence of e-service quality, e-satisfaction and e-trust on e-loyalty, Go-jek found that ease of use, e-escape, responsiveness, customization and assurance which is the fifth quality of electronic services used in this research has no positive effect on e-satisfaction, e-satisfaction has effect on e-trust, e-trust has no effect on behavioral loyalty, affective loyalty, cognitive loyalty and conative loyalty.

Similarly, research conducted by Kiswara (2017) in his research entitled analysis of service quality, customer satisfaction, trust, commitment and customer loyalty in e-commerce services (study on traveloka customer service) shows that brand trust does not affect loyalty. High brand loyalty can increase sales and attract new customers, because they have confidence that buying branded products can minimize the risk at least.

The existence of loyal customers on the brand is necessary for companies to survive. Keeping brand loyalty a strategic effort is more effective than attracting new customers. According Rangkuti (2002) brand loyalty is a measure of customer loyalty to a brand. The importance of brand loyalty is that customers do not move to other products and always make purchases on the brand.

Based on the above, this research is conducted with the aim to analyze the quality of service and brand trust on loyalty through customer satisfaction. Quality of service and brand trust on an online transportation service is important to be analyzed, because based on the research stated that the quality of service and brand trust affect the loyalty and satisfaction of the consignment.

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II. LITERATURE REVIEW

Service Quality
Service quality is an abstract and elusive construct because of three features for service: intangibility, heterogeneity, and the inability of production and consumption (Parasuraman et al., 1985, 1988). Meanwhile, according to Zeithaml (1988) service quality is the assessment of the customer to the superiority or overall service excellence. Therefore, the quality of land transport services is an overall passenger evaluation on the performance of public transport. The higher the public transport service performance, the more positive the perception of passengers on the quality of service from public transport services and vice versa.

Brand Trust
According to Chi, Yeh, and Chiou (2009, p231) say that Brand trust means customers who believe that a specific brand will offer a highly reliable product, such as complete functionality, quality assurance, and after sales service to them.

Customer Satisfaction
The definition of customer satisfaction by Kotler (2014: 150) is the feeling of pleasure or disappointment that comes after comparing the performance of the thought product to the expected performance (or outcome). From the definition if the services provided are not in accordance with the expectations of customers Go-Ride and if expectations are set too low, then consumers will feel dissatisfied and disappointed, if the performance in accordance with expectations then customers will feel satisfied, which is given beyond expectations, then the customer will feel happy and very satisfied. According to Giese and Cote in Literature and Customer View Satisfaction contains significant differences in the definition of satisfaction, all definitions share some common elements. When examined as a whole, three common components can be identified: 1) customer satisfaction is response (emotional or cognitive); 2) the response is related to a particular focus (hope, product, consumption experience); and 3) response occurs at a given time (after consumption, after selection, based on accumulated experience). Customer responses follow a common pattern similar to literature. Satisfaction consists of three basic components, a response related to a particular focus that is determined at a given time.

Customer Loyalty
The opinion of Oliver in Chauduri and Holbrook (2012: 27) defines customer loyalty as a strong commitment to repurchase a product or service consistently in the future. According to Griffin (2010: 291) There are five factors that cause customers loyal to products / services used are: 1) Brand value ; Customer perceptions that compare between the cost or the price to be borne and the benefits it receives. 2) customer characteristics; Characteristics of customers in using the brand. In fact, every individual has different characteristics than the other invidus. 3) Service Quality; Customer perceptions concerning the quality of service experienced, if qualified then have a positive effect. 4) Customer satisfaction ; Associated with the consumer experience when making contact with the brand he uses. This factor is very important, but customer satisfaction alone is not enough to cause a customer to remain faithful to a brand. 5) Trust ; It concerns the extent to which the competitive competition between trust in a category of product or service.

Relationship Quality of Service and Customer Loyalty
Wijayanti (2007) states that customer satisfaction can increase the buying intensity of the customer. The creation of an optimal level of customer satisfaction then encourages the creation of loyalty in the minds of customers who feel satisfied. Customer loyalty is seen as the strength of the relationship between the relative attitude of a person and a repeat business. Hallowell (1996) states that satisfaction has a positive influence on customer loyalty. The same is expressed by Darsono Weellyan (2007) that satisfaction has a positive association with loyalty, but with a note of increased satisfaction does not always result in increased loyalty in the same degree.

H1 = Service Quality positively affects Customer Loyalty

Brand Trust Relationship and Customer Loyability
Morgan and Hunt (1994) say that trust and commitment are key in building loyalty. According to Aaker (Maylina, 2003), customer loyalty will arise when there is trust from customers to the product brand so that there is communication and interaction among customers is by talking about the product. The relationship between variables with customer loyalty is, the higher the customer's confidence in a product, the higher the level of customer loyalty to a brand. The commitment of customers to the product is a trust in using a product that includes recommendations and beliefs. Thus the higher the level of consumer loyalty to a brand. Customer commitment to the product is a belief in using a product that recommendations and trust. Indirectly companies can utilize contact relationships, specialization, and scale economic operations of employees with customers to increase customer commitment to the product brand (Aaker in Maylina, 2003).
H2 = Brand Trust has a positive effect on Customer Loyalty

**Relationship of Service Quality and Customer Satisfaction**
Customer satisfaction is a stand-alone construct and influenced by the quality of service, as well as customer satisfaction influenced by the quality of service (Oliver, 1980 in Aryani and Rosinta, 2010). Aryani and Rosinta (2010) states there is a strong and positive influence between the variable quality of service to customer satisfaction. Service quality can also influence customer loyalty directly (Zeithaml et al, 1996; Japrianto et al, 2007) and indirectly affect customer loyalty through customer satisfaction (Samuel and Wijaya, 2009). The same opinion was expressed by Hallowell (1996) that satisfaction has the potential to build loyalty. Customer satisfaction is key in creating customer loyalty. Akbar and Parvez (2009) stated that the factors that form customer loyalty are the quality of service, trust and customer satisfaction. A similar opinion is also put forward by Hallowell (1996) which suggests that customer satisfaction is a prerequisite of customer loyalty. Loyal customers have a lower tendency to switch brands, less price sensitive, buy more frequently and / or more, become strong word of mouth, create business referrals.

H3 = Service Quality positively affects Customer Satisfaction.

**Relationship of Brand Trust and Customer Satisfaction**
Asseal (1998), customer satisfaction arises when customer expectations are in accordance with the purchase decisions that have been made. Satisfaction can be felt after individuals buy and use products or services provided by a company (Ritonga: 2011). While the belief of a brand comes after customers buy and consume and feel satisfied with a product. Brand belief emerges from past experiences and consumer interactions with products (Garbarino and Johnson: 1999). Trust is a collection of knowledge and experience with the brand. If customers are satisfied with a product or service based on past experience, then customers will feel confident in the brand they buy. Based on research conducted by Singh and Sirdeshmukh (2009) on the theory of social change, satisfaction after consuming a product or service has a positive relationship directly to customer confidence in the brand of the product or service.

H4 = Brand Trust has a positive effect on Customer Satisfaction

**Relationship of Customer Satisfaction and Customer Loyalty**
Customer satisfaction is an encouragement of individual desire directed to the goal to obtain satisfaction. Customers will be loyal to a product or service offered when he gets satisfaction from the product or service. This is in accordance with the proposed Dick and Basu, et al (1994) in Lupiyoadi (2006) that customer satisfaction is a factor affecting customer loyalty. The relationship between Customer Satisfaction with Customer Loyalty is, The higher the customer satisfaction, the higher the loyalty of the customer to remain loyal to use the product. Supported from previous research by Suryanti (2007), where satisfaction has a significant influence on customer loyalty.

H5 = Customer Satisfaction has a positive effect on Customer Loyalty

**Relationship of Quality of Service to Loyalty through Customer Satisfaction**
According to academics, customer satisfaction is a stand-alone construct and is influenced by the quality of service (Rosinta et al, 2010). Service quality can also affect customer loyalty directly (Zeithaml et al, 1996) and indirectly affect customer loyalty through satisfaction (Caruana, 2002)

H6 = Service Quality positively affects Loyalty through Customer Satisfaction

**Relation of Beliefs to Loyalty through Customer Satisfaction**
Trust and commitment are the mediating variables in the long-term relationship between the company and the customer (Morgan and Hunt, 1994). Based on research conducted Tezinde et al (2001) that trust and satisfaction will affect the relationship with customers and loyalty.

H7 = Brand Trust has positive influence Loyalty through Customer Satisfaction

**III. METHOD**
The writer used a causal design to conduct this study. The population of this study was college students who have Go-Jek application. This research used purposive sampling technique. Purposive sampling is sample determination technique with certain consideration. The criteria in the sampling in this study were: 1) Students who are conducting studies in public and private universities. 2) Have a Go-Jek application and already have a user ID. 3) Have used Go-Ride services at least three times. The samples used in this study were 100 respondents. The data types in this study were used: a) Quantitative data, comes from questionnaires given to customers who use Go-Jek services especially Go-Ride, b) Qualitative data, Qualitative data used in this study are: Go-Jek-

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related data especially Go-Ride. The data sources in this study using primary data and secondary data. The primary data used in this study were obtained from questionnaires distributed through surveys. The questionnaire includes questions relating to service quality, brand trust, consumer satisfaction, and Go-Jek (Go-Ride) customer loyalty in Palembang City. Meanwhile, the secondary data used in this study is Go-Jek user data, the number of consumers who have used Go-Ride and Rating provided by the customer to the driver. Survey to field is a method in this research. The writer distributed the questionnaire is a list of questions asked to students of UNSRI Palembang campus and Tridinanti University of Palembang to obtain data relating to research. The respondents asked to fill out questionnaires according to the guidelines that have been provided. This questionnaire is intended to obtain data in testing the hypothesis. The data analyzed by using SEM (Structural Equation Modeling) program AMOS 16. Some of the steps done through AMOS program is to test SEM assumption (normality test, multicollinearity test, and outliers test). The data analysis is also done by using SPSS program.

IV. RESULT

Based on the Table 2 obtained Chi-square value of 141.007 with p-value 0.160. Because the p-value generated is greater than α = 5%), then the model is said to be fit. The GFI fit index, AGFI, TLI and CFI yielded values of only 0.979; 0.906; 0.971 and 0.916. Due to GFI, and TLI greater than 0.90, it indicates that the model is fit. The value of CMIN / DF obtained is 1.609, the value is <2.00 and indicates that the fit model and RMSEA value is 0.162. Because this value is smaller than 0.8 then the model is said fit. According to Haryono & Wardoyo (2012: 116), from several models feasibility test, the model is said to be feasible if at least one of the feasibility test methods of the model is fulfilled. While AMOS test results from the Full Model is already fit in Table 2 below:

<table>
<thead>
<tr>
<th>Table 2. The test results from Amos Full Model Fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression Weights Results</td>
</tr>
<tr>
<td>Customer satisfaction ← Service quality</td>
</tr>
<tr>
<td>Customer satisfaction ← Brand trust</td>
</tr>
<tr>
<td>Customer loyalty ← Service quality</td>
</tr>
<tr>
<td>Customer loyalty ← Customer satisfaction</td>
</tr>
<tr>
<td>Customer loyalty ← Customer loyalty</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standardized Regression Weights results</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer satisfaction ← Service quality</td>
<td>.453</td>
</tr>
<tr>
<td>Customer satisfaction ← Brand Trust</td>
<td>.322</td>
</tr>
<tr>
<td>Customer loyalty ← Service quality</td>
<td>.114</td>
</tr>
<tr>
<td>Customer loyalty ← Brand trust</td>
<td>.015</td>
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<tr>
<td>Customer loyalty ← Customer satisfaction</td>
<td>.100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Correlation results</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service quality ← Brand trust</td>
<td>.727</td>
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</tbody>
</table>
Based on the results from Table 2 it can be seen that for the first hypothesis obtained value of t-Value or C.R amounted to 3.659 > 1.967 or P value 0.001 < 0.05 then H1 accepted, so it can be concluded that Service Quality affects Customer Loyalty. The results of this study are in harmony with Hallowell (1996) which states that satisfaction has a positive influence on consumer loyalty. The results of the second hypothesis test obtained t-Value or C.R 0.117 < 1.967 or P value 0.735 > 0.05 then H2 rejected, so it can be concluded that Brand Trust does not affect the Customer Loyalty. This study corroborates research Kiswara (2017) where the results of his research said that trust does not significantly affect customer loyalty. The third hypothesis testing result obtained that t-Value or C.R 2.235 > 1.967 or P value 0.021 < 0.05 then H3 accepted, so it can be concluded that the Quality of Service influence on Customer Satisfaction. The results of this study are consistent with the results of previous research, where the Quality of Service has a positive and significant impact on Customer Satisfaction. The research was conducted by Aryani and Rosinta (2010), Kassim et.al (2009), Omar Cashier (2011), Wendha, et al. (2013) and Kiswara (2017.) Fourth hypothesis in get t-Value or C.R 2.635 > 1.967 or P value 0.021 < 0.05 then H4 accepted, so it can be concluded that the Brand Confidence effect on Customer Satisfaction. This result is in line with research conducted by Kiswara (2017). From Table 2 we get the result for the fifth hypothesis that is t-Value or C.R 2.651 > 1.967 or P value 0.026 < 0.05 then H4 is accepted, so it can be concluded that Customer Satisfaction has an effect on Customer Loyalty. The findings of this study are in accordance with the proposed Dick and Basu et al (1994) in Lupiyoadi (2006) that customer satisfaction is a factor affecting customer loyalty. The results of the sixth hypothesis obtained the result that the value of indirect effect of Quality of Service to Customer Loyalty through Costumer Satisfaction, obtained value t arithmetic for Hypothesis 1 of 3.659 x 2.128 = 7.7863 and the value of t arithmetic Hypothesis 3 of 2.235 x 2.128 = 4.756. Results of the second calculation t hypotesiss > 1.96, so the hypothesis accepted. This result is in line with Caruana (2002). The seventh hypothesis obtained result that the value of indirect influence of Brand Trust to Customer Loyalty through Customer Satisfaction, obtained t value for Hypothesis 2 of 0.117 x 2.128 = 0.2489 and the value t arithmetic Hypothesis 4 of 2.651 x 2.128 = 5.641, Hypothesis 5 2.128 x 2.128 = 4.528. The results of the third calculation t arithmetic hypothesis is only two that the value of t >> 1.96, so the hypothesis accepted. This result is in accordance with research conducted Tezinde et al (2001) that trust and satisfaction will affect the relationship with customers and loyalty.

V. CONCLUSION

This study aims to identify the effect of service quality and brand trust on loyalty through customer satisfaction. The results of this study indicate that of the seven hypotheses prepared, there is one hypothesis that is rejected the influence of brand trust on loyalty. Based on the research results can be concluded into short-term and long-term suggestions. For short-term suggestions, 1) management is expected to conduct socialization to the drivers by explaining how the importance of customers to continue to use Go-Ride services, 2) Conduct continuous updates to the customer promo, 3) Provide knowledge of route to drivers, 4) Conducting a customer survey of the prime activities the customer wants. As for long-term advice, 1) Go-Jek must improve the network of online applications, 2) Management should involve Go-Ride partners in decision-making, especially on the online motorcycle taxis, 3) Go-Jek must improve the ability to understand customer needs and more proactive (making the service as a corporate culture).
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Towards a More Secure Mobile Banking System: The case of Iran

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Abstract- Mobile devices have penetrated most aspects of our daily life activities ranging from the hedonic to utilitarian use. Businesses have invested in benefiting from the opportunities offered by the pervasive nature of mobile technologies to enhance their products and services and therefore improve their customers’ satisfaction. The banking sector, in common with other industries, has invested in such mobile solutions to facilitate banking transactions for both themselves and their customers. The growth of mobile banking provides significant benefits in terms of delivery speed and quality of services to customers. However, like other technologies mobile banking faces several challenges, in particular security. This paper addresses the main factors that affect the usage of mobile banking transactions and the related security issues, with a particular emphasis on the case of the Iranian banking system. After a thematic analysis of qualitative data we were able to identify the main factors that affect both mobile banking security and usage, namely: security level, security threats, security policy and standards, transactional risks and awareness. As a result, this study proposes a framework that explains the relations among these factors with a view to enhance the understanding of the current status of such technology.

Index Terms- mobile technology, mobile banking, information security

I. INTRODUCTION

Wide-expansion of information technology and telecommunication systems and also collaboration between mobile operators and banks have reshaped traditional banking services and offered new ways for banks to interact with their customers. The pervasiveness of technology and the rapid growth of mobile commerce led to a greater innovation in the banking system. Developments in mobile and telecommunication technologies such as Implementation of new operating systems, availability of wireless network, improved hardware capabilities, user-friendly web browsers have revolutionised the way people use mobile devices in their daily life.

These developments have enabled mobile banking to provide significant benefits in terms of delivery speed and quality of services. However, these advantages come with challenging security threats. The provision of mobile banking requires data to travel over networks, or to be saved on banks’ server databases and mobile devices (Narendiran, Rabara & Rajemdran, 2008), which can pose a security risk that needs to be handled properly.

Developing countries, such as Iran, are not immune to this increasingly prevalent use of mobile devices. Flexibility and convenience of use by these devices are an important reason for their attractiveness. Mobile clients are able to transfer funds between accounts, to make electronic payment, to request and receive information about a personal account by using applications installed on their mobile devices (Elkhodr et al., 2012). Mobile banking transactions can be exposed to risks at different levels of the “supply chain”. That is because customers, banks, network providers and other parties are all involved in this service (Ghotbi and Nassir Gharechedaghi, 2012).

It is therefore imperative that banks and other service providers ensure an acceptable level of security that protects the customer’s sensitive information. This paper looks at security challenges of the private mobile banking system in Iran and provides a framework that improves the understanding of such systems by identifying particular factors and their relations and impact on confidentiality, integrity and availability of the service. For this, and in addition to these introductory notes, section two covers the existing work in relation to mobile banking and security issues. The section deals with mobile banking security challenges and barriers in Iran and developing countries. The Iranian bank structure is explained, before outlining the security challenges and barriers in online banking and mobile banking in Iran. Section three describes research findings and data analysis and explains the result. The proposed mobile banking risk management framework is presented in section four. Finally, we discuss the conclusions and future work in section five.

II. MOBILE BANKING AND SECURITY ISSUES

Mobile banking service refers to a set of applications that enable people to use their mobile device to manipulate their digital banking service. Nie and Hu (2008) mentioned that mobile banking has two security zones: a mobile security zone and a banking security zone. Different security challenges are associated with each zone, as depicted in figure 1.

Figure 1 Security Zones of Mobile banking (Nie and Hu, 2008)

Khan et al., (2015) state that the security risks associated with mobile devices include:
1. High-level of risk in data loss through losing mobile devices or interruptions by malicious applications
2. Multiple User Logging
3. Weak Authentication
4. Client Side Injections
5. Application-Based Threats (malware, spyware)
6. Network-Based Threats (Operating system, MMS, SMS, WI-FI)
7. Web Based Threats (Browser Exploits, Phishing Scams) Mobile Vulnerabilities (Trojan Horse, worm, botnet, social engineering) Lack of maturity of fraud tools and controls (lack of adequate monitoring, detection or prevention tools)

Mitigating against the above risks requires a multi-faceted endeavour involving creating mobile device security policies, increasing awareness about risks associated with the use of mobile devices, providing authorised access to sensitive data, and continuous monitoring and assessment of the vulnerability risk of all devices.

Other security risks emanate from the physical mobile network infrastructure itself. Mobile network weaknesses and transport frequencies have their own security challenges as listed by (Islam, 2014):

1. Wireless carrier infrastructure
2. Weakness of global system for mobile communication (GMS)
3. SMS vulnerabilities (clear text on mobile network)
4. SIM attacks
5. HTTP, WAP, TCP/IP, OTA, USSD, Bluetooth

The above presents only one element of the security component. The other element is related to how the infrastructure is organised within the bank itself. Khan et al., (2015) claimed that the security risks associated with the bank side include:

1. Unsecure design and implementation of hardware, software and networks
2. Poor application design and configuration
3. Weak telecommunication infrastructure
4. Poor e-commerce security system and fraud prevention
5. Poor client authentication mechanisms
6. Use of unsecure algorithms for data encryption
7. Lack of adequate implementation of digital payment security protocols
8. Lack of physical security at data centres
9. Weak database backup and recovery mechanism in unexpected situations (network failures, radio failures and natural physical disasters)

The above security challenges do not apply specifically to any geographical area. However, they pose a particular difficulty for developing countries trying to set up a secure mobile banking service. The barriers and obstacles facing developing countries in this context are very well documented (e.g: Alafeef et al., 2012; Rumanyika and Mashenene, 2014). We list here some of the main ones:

1. Lack of network and telecommunications Infrastructure
2. Lack of sufficient system security
3. Legal barriers
4. Economic barriers
5. Social-cultural barriers
6. Political barriers
7. Insufficient knowledge of IT and lack of training

In attempting to address these barriers efforts are made to improve the security of financial transactions; for example, the Mediterranean Partner Countries issued a set of Banking Supervision Rules, which identifies the cyber security controls that banks must follow. Each country’s Central Bank is responsible for monitoring and ensuring the security of payment systems and related standards (European Investment Bank, 2012). In addition, most developing countries have established security policies and standards for addressing information security risks and maintaining data confidentiality, integrity, authentication and non-repudiation (Jin and Fei-Cheng, 2005).

A. The Mobile Banking System in Iran

In 2003, SHETAB (Interbank Information Transfer Network) was introduced to handle Automated Teller Machine (ATM), point of sale purchase (POS) and other card based transactions between all financial organisations and banks all over Iran. Today, most banks are interconnected through the SHETAB system and they have access to some parts of customers’ account information. This interconnection has created a path for mobile banking to become the next big phenomenon in the Iranian banking system (Central Bank of Iran, 2016).

The Iranian banking sector includes public banks, private banks and private financial institutions. Central Bank of Iran (CBI) is responsible for the design and implementation of monetary and credit policies, and the supervision of public and private banks and other financial institutions. Private banks provide high quality services and standards at lower cost in order to create a competitive advantage in global banking systems (Peymane, 2014). It is widely believed that they have been more successful than the public banks in service delivery and in the introduction of modern banking systems.

The National informatics Corporation (NIC) has cooperated with the Central Bank of Iran since 1990. NIC is a holding company with several subsidiaries including the Informatics Service Corporation (ISC), Shaparak electronic card Payment Company, Kashef Banking Security Governance Company and Fardis Alborz Info Corporation. All these companies have been established under central bank supervision. The aim of cooperating with these companies is to offer reliable online banking services and implement effective cyber security requirements for protecting data confidentiality, integrity and availability (National Informatics Corporation, 2011).

Informatics Service Corporation (ISC) implemented Information Security Management Systems (ISMS) based on international standard ISO/IEC 27001. The aim is to enhance secure electronic banking services and minimise security breaches (Way2pay, 2014).

In addition, other Iranian banks were awarded the ISO/IEC 27001 security certification in Online Banking and Mobile Banking (Informatics Service Corporation, 2016). As with other parts of the world, Iran faces similar barriers in its quest for implementing an effective and secure mobile banking system. An audit of existing work (e.g. Ghotbi and Nassir Gharechedaghi,
2012; Ghazinoory et al., 2016; Charkhandaz, 2014) has identified a number of barriers affecting the implementation of an effective mobile banking system/service in Iran. Such barriers include:

1. Inappropriate technical infrastructure such as telecommunication networks, hardware and software
2. Low speed of communication network
3. Weak internet connection and low bandwidth with high cost
4. Poor mobile phone coverage
5. High cost for upgrading current telecommunication networks and infrastructures
6. Lack of a policy making body
7. Lack of legal regulation with standardised procedures in the field of mobile Banking
8. Political challenge and some limitations to the use of credit cards and international corporation due to sanction

In order to have an appreciation of the risks associated with the varied nature of the challenges inherent to mobile banking in Iran there is a need for a risk assessment framework that enables managers in the banking sector to be in a position to make informed decisions about risk mitigation. The next section explains how the framework was designed.

III. DESIGNING THE FRAMEWORK

We used a combination of primary and secondary data collection techniques. In addition to an investigation into existing work some qualitative interviews were conducted with six IT bank managers, who were selected by subjective sampling from three different private banks in Iran (two from each bank).

The findings reveal some information about the usage and nature of mobile banking, in addition to a number of security challenges and obstacles that are already present in the mobile banking system in Iran.

A. Research finding

The findings confirm that mobile banking provides a new opportunity in terms of delivery speed and quality of services to customers. However, these advantages come with several security issues that customers are concerned about. With regard to the barriers and security challenges in Iran, CBI and Fardis Alborz Company could address the technical problems by providing more advanced banking IT infrastructure. Moreover, the government’s cooperation with internet service providers and network service providers could be useful in improving internet connection speed and coverage and providing an appropriate network and communication infrastructure. Furthermore, the CBI should pay closer attention to bank operations when it comes to applying security policy and standards in online banking and mobile banking, and enforce a greater adherence to policy and standards.

One of the findings of this study is the negative effect that previous Western sanctions had on Iran, which resulted in slowing down development in the information technology sector. It was not permissible to set agreements with some well-known IT companies such as IBM, Oracle, CISCO and HP. Organisations (including banks) were unable to import any advanced equipment or software. This is in addition to difficulties in signing agreements to install security protection software and other related applications such as firewalls and anti-viruses. This research recommends that both Iranian government officials and banking sector officials utilise the recent lifting of sanctions to enter into negotiations with international companies such as those mentioned above, and to import new updated and advanced tools and equipment to enhance the protection of privacy and security within the banking sector in Iran. This will enable customers to have greater trust in the banking service and will therefore lead to greater use of the service, and will in turn benefit both banks and customers in terms of efficiency and effectiveness.

According to the findings, many factors can affect customer’s trust for mobile banking such as reliability, cost and ease of use (convenience), technological barriers and security issues.

![Figure 2 Relationship between the security level and the usage of mobile banking](http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7960)
Figure 3 shows the percentage of security policies and standards, mobile banking security, online banking security, security measures, compensation and security risks in three private banks in Iran. According to the chart, many attacks are possible during mobile banking transactions. Roughly, 68% of participants agreed with medium level of security in mobile banking services and the same percentage given for safe enough transaction in online banking. Another security issue is the absence of unified standards/Protocol or agreed policy to manage and control the mobile banking security among the Iranian banks. There is a difference in using security policies and standards, for example, only 17% of participant mentioned that they followed international security policies and standards such as ISO27001, while 34% of respondents mentioned PCI/DSS. The remaining participants confirmed that they follow CBI and local bank policies and standards.

There is also evidence for some security challenge related to cryptographic mechanisms and authentication methods, which are very important security measures to mitigate the threat of mobile banking. Comparing to banks in developed countries, they use some advanced authentication methods such as fingerprint, passcode generators and one-time-passcode (OTP). Based on the above findings a framework was put together to help with understanding current security issues and barriers of mobile banking in Iran. The next section gives a brief description of this framework.

IV. RISK ASSESSMENT FRAMEWORK

The framework aims at facilitating and managing the risks of mobile banking services in Iran. The focus is on security objectives such as confidentiality, integrity and availability of mobile banking services in private banks.

The framework also attempts to improve the usage rate of mobile banking by covering aspects such as security policy and standards, perceived security level, security measures, transactional risks and security awareness.

The different elements of the proposed risk assessment framework are shown in figure 4.

A. Security policy and standards

In order to protect information resources, banks need to implement high-level management instructions and rules to manage and organise banking transactions.

As mentioned above, the CBI established the Kashef Company recently as a policy maker for designing information security standards (Kashef, 2016). However, many banks and financial institutions are using their own standards and policies and they do not follow CBI security policy and standards or even international information security policy and standards. CBI could support banks and financial institutions to evaluate their risks and choose an appropriate level of security measures and technological infrastructure.

In addition, CBI should manage and control all banks’ security policy and standards and enforce CBI policy or international standards.

Perceived security level

Customers’ perception of security and privacy are factors that affect mobile banking usage. Security is a combination of controls, technologies, standards, methods and measures that are used to secure a particular system and ensure confidentiality, authentication, integrity, authorisation and non-repudiation (Akbari, 2013). There are several non-technical mechanisms such as policies, strategies, and information listed on websites, which represent ways to overcome the security threats facing such services (Law, 2007).

We found that the main concern that participants cited about mobile banking is trusting the security of accessing financial data on a mobile device. 68% of participants claimed the overall rate of mobile banking security for protecting customer’s information was at a medium level. In addition, they gave the same percentage for ‘safe enough transaction’ in online banking, while 34% were not sure of the security of online banking. Therefore, customers’ perception of a lack of security is one of the obstacles to mobile banking use in Iran.

Security measures

Security measures should make it easy to implement, manage and operate defensive controls to detect and stop attacks in the banking sector.
In order to protect customer information and address security challenges and fraud management in the banking industry, researchers recommend a few security measures, including: (Akbari, 2013; Luvanda, 2014; Cognizant, 2014)
1. Implement Intrusion Detection Systems (IDS)
2. Implement physical security measures such as firewalls
3. Implement malware and virus detection and protection methods, system auditing controls, patch management, back up servers
4. Monitor and evaluate security controls
5. Track mobile banking transactions
6. Control physical access to databases and servers
7. Upgrade management software and system security
8. Apply real time detection services
9. Check Operating System security periodically
10. Carry out data validation to verify uncorrupted transmission

**Transactional risks**

Banks and financial institutions use different types of technology such as Short Messaging Service (SMS), Unstructured Supplementary Service Data (USSD), Wireless Application Protocol (WAP), Near Field Communication (NFC) and mobile applications to offer mobile transactions.

Some Iranian banks offered simple services via SMS, which can pose security problems during data transmission. Furthermore, USSD is another method for providing mobile banking transactions in some private banks in Iran. This is not necessarily a safe technology, because communication could be interrupted while the data is travelling between the USSD gateway and the information server. Fortunately, CBI has managed and minimised this risk by limiting the value of transactions that can be performed over USSD. They should, perhaps, focus on mobile banking applications, which provide a more secure type of transactions.

In any technology-based transaction, the possibility always exists that the transaction does not take place as expected or in a timely manner, which can represent a transactional risk that a bank needs to protect itself from. For instance, any delay in a transaction can make customers nervous about security and affect their perception of mobile transactions. The risks associated with this service includes network risks (Man-in-the-middle attack, network snooping, Bluetooth, Wi-Fi, automatic backup of sensitive data to a cloud), observation risks (information or passwords being observed while a device is being used), device risks (theft, loss, malware, hacking, access by unauthorised person, storage of sensitive data without encryption) and remote service risks (Web site) (Trewin et al., 2016).

Banks and financial institutions should identify the security risks and promote secure requirements to mitigate against transactional risks in mobile banking services. Some of this could be done through training and awareness as explained in the next section.

**Security awareness**

The human factor is hugely important in the security chain. This research found that lack of technical education and general awareness amongst banks’ employees, as well as lack of security awareness amongst customers were key barriers to the Iranian banking system. Whilst the creation and maintenance of secure information systems is crucial for banks’ credibility, they also need to be aware of mistakes or oversights by their employees and other users of their systems (PCI Security Standards Council, 2014). Therefore, it is important that banks and financial institutions have a security awareness and continuous training programme in place, aimed at both employees and users of the services.

CBI, banks and financial institutions need to establish security awareness teams for creating and maintaining security awareness programmes based on three levels: in-depth security awareness; intermediate security awareness for specialised roles and some managers, also general security awareness for customers and banks' employees who are customer-facing by formal training, computer-based training, e-mails, web sites, text and posters (PCI Security Standards Council, 2014). According to Trewin et al. (2016), customers who are well informed about the risks of mobile banking, and have a perception that these risks are easy to detect and control, are more willing to trust transactions to mobile systems.

**V. Conclusion**

The purpose of this study was to examine the security challenges of the private mobile banking in Iran. An attempt is made to provide a better understanding of the current status of security in mobile banking in Iran and identify the main factors that affect the level of security of mobile banking transaction, which then led to the development of a new framework. The Risk Assessment Framework aims to alleviate the existing security challenges with a view to achieve the security objectives of confidentiality, integrity and availability. The research focused on mobile banking technologies, security measures and security standards and policies.

It is hoped that the risk assessment framework will help manage the risks of mobile banking services and enhances the security that impacts on mobile banking usage. There is still more work to evaluate the framework involving the key stakeholders within the Iranian banking sector.

**References**


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Development of Mangrove Ecotourism Wonorejo Surabaya Based on Productive Landscape and Community Participation

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Abstract- Indonesia has the widest mangrove ecosystem in the world which is about 4.25 million Ha. However, 48% of mangrove forest area in Indonesia is moderate and 23% suffered severe damage. Mangrove ecosystems are scattered in several islands in Indonesia, one of them in Surabaya. Data from the Agriculture Department of Surabaya City shows the depreciation of mangrove forest area from 2010 to 2011 covering an area of 20.47 Ha, centered in Wonorejo Subdistrict, Surabaya. Surabaya City Government tactics to maintain the mangrove ecosystem by making it as ecotourism has not been met. Almost, the mangrove ecosystem in Wonorejo is proclaimed to be the Surabaya City Botanical Garden. This research using tracing analysis and cognitive mapping. Method of research design includes analysis, synthesis, assessment and decision to draft and design schematic.

This study aims to develop EMW into a multifunctional and attractive ecotourism by involving community participation. The results of the context are the factors that influence the development of EMW namely aspects of ecotourism development, productive aspects and aspects of community participation. To meet all that required a facilitative strategy that is able to handle various needs activities. In the aspect of ecotourism development, there are three zones to organize community activities, namely the main conservation zone, the main zone and the supporting zone.

Index Terms- Community Participation, Mangrove area development, Mangrove Wonorejo Ecotourism, Productive Lansdscape.

I. INTRODUCTION

Indonesia has the largest mangrove ecosystem in the world. The area of mangrove forest in Indonesia is about 4.25 million Ha spread over several islands, such as Sumatra, Java and Bali, Nusa Tenggara, Kalimantan, Sulawesi, Maluku, and Irian. Approximately 48% of mangrove forest area in Indonesia suffered moderate damage and 23% suffered severe damage. Mangrove ecosystem in the city of Surabaya, East Java has been damaged by 40% of the total area of mangrove [1]. Based on data from Surabaya Agriculture Department [2] he amount of depreciation of mangrove area can be described in the following table:

<table>
<thead>
<tr>
<th>Districts</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mulyorejo District</td>
<td>74.47</td>
<td>34.41</td>
</tr>
<tr>
<td>- Kaliurang</td>
<td>17.50</td>
<td>17.50</td>
</tr>
<tr>
<td>- Kepanget</td>
<td>4.03</td>
<td>3.03</td>
</tr>
<tr>
<td>Amount</td>
<td>96.49</td>
<td>41.94</td>
</tr>
<tr>
<td>Sukolilo District</td>
<td>14.94</td>
<td>14.94</td>
</tr>
<tr>
<td>- Gading Anyar</td>
<td>47.64</td>
<td>47.64</td>
</tr>
<tr>
<td>- Medokan Anyar</td>
<td>73.54</td>
<td>73.54</td>
</tr>
<tr>
<td>Amount</td>
<td>73.54</td>
<td>73.54</td>
</tr>
<tr>
<td>Total</td>
<td>126.39</td>
<td>73.54</td>
</tr>
</tbody>
</table>

The total depreciation of mangrove forest area from 2010 to 2011 is 20.47 hectares. Particularly the depreciation of mangrove forest area occurred in District Rungkut, Wonorejo Village that is shrinkage of 0.47 hectares in just over a period of 1 year. If this continues, then within 5 years there can be a significant decrease of 2.35 hectares.

An ecotourism should have several characteristics: strong local environmental and environmental considerations, positive local environmental and socio-economic contributions, and education as well as a good understanding for service providers or visitors regarding nature and environmental conservation [3]. However, there is a problem on Mangrove Ecotourism Wonorejo so that these characteristics do not materialize. Some of these problems are the unfamiliar area of Mangrove Ecotourism Wonorejo become a tourist attraction or Botanical Garden that attracts and has minimal impact on the environment. The distribution of tourism zones, research, education and other supporting activities is directly adjacent to the main protected zones, which may lead to major protected zones functioning for mangrove conservation disrupted by tourism activities and other activities.

Mangrove Wonorejo Ecotourism area has only a few ecotourism attributes such as parking, mosque, toilets, gazebos, docks, simple map contents, jogging track, fishing gear and street vendors. The existence of this facility is not supported by the shape and condition of the manicured. Thus, as ecotourism looks unattractive and boring. In addition, ecotourism does not have

Table 1. Land area of Mangrove (in acres)

<table>
<thead>
<tr>
<th>Districts</th>
<th>Beach</th>
<th>Ponds</th>
<th>Riverside</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malangrejo District</td>
<td>2010</td>
<td>2011</td>
<td>2010</td>
<td>2011</td>
</tr>
<tr>
<td>- Kaliurang</td>
<td>17.50</td>
<td>17.50</td>
<td>5.55</td>
<td>5.55</td>
</tr>
<tr>
<td>- Kepanget</td>
<td>4.03</td>
<td>3.03</td>
<td>5.55</td>
<td>5.55</td>
</tr>
<tr>
<td>Amount</td>
<td>96.49</td>
<td>41.94</td>
<td>97.52</td>
<td>97.52</td>
</tr>
<tr>
<td>Sukolilo District</td>
<td>14.94</td>
<td>14.94</td>
<td>47.64</td>
<td>47.64</td>
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<tr>
<td>- Gading Anyar</td>
<td>73.54</td>
<td>73.54</td>
<td>116.91</td>
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</tr>
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<td>73.54</td>
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http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7961
www.ijsrp.org
facilities that accommodate the procurement of special programs for visitors / the public in conducting conservation activities. This research proposes mangrove ecotourism by using the concept of productive landscape. Where a productive landscape means an integration of productivity within a city through a landscape medium. Mangrove Ecotourism Wonorejo has the potential as an active and productive land for the local community. This research has done a lot of research on the mangrove ecosystem which states the need for knowledge for the community to encourage participation in mangrove conservation, but there has been no research that combines the concept of productive landscape and community participation in its development. Therefore, this research will focus on the development of Mangrove Ecotourism Wonorejo Surabaya as an attractive and productive ecotourism area. The emphasis of the discussion is to develop schematic concepts and design that have minimal environmental impact and become an independent landscape-based landscape supported by community participation.

II. RESEARCH ELABORATION

2.1 STUDY AREA

This research was conducted at Mangrove Ecotourism located at Jl. Wonorejo Timur No.1, Wonorejo, Rungkut, Surabaya City, East Java with an area of 700ha. Mangrove Wonorejo Ecotourism is included in the East Coast Region of Surabaya located at coordinates 7°15'19.60" S - 7°17'13.25" S 112°48'35.69" E - 112°48'40.72" East wide area ± 2,503.9 Ha. The soil type is alluvial hydromorph.

Figure 1. Location map of study area.

The boundaries of the study area are as follows:
- North : Sukolilo, Wonorejo
- South : Rungkut Medokan Ayu, Pandugo Street
- West : Sea Wonorejo
- East : Lotus Hotel, Regency Housing.

2.2 METHOD OF DATA COLLECTION AND ANALYSIS

The primary data in this study included a survey of a group of individuals conducted through a questionnaire. Then proceed with physical and non-physical observation with observation done at the time of working day (Monday-Friday) and weekend (Saturday-Sunday). Data mapping technique is done by behavioral mapping technique. Behavioral mapping is presented in the form of sketches or diagrams of an area where humans perform various activities.

In this study the analysis technique consists of:
a. Walkthrough Analysis
Walkthrough Analysis technique is an assessment of urban quality that is done by walking through the area with observation and see the impression that is felt along the way through the recording of images [4]. This analysis purpose is to know the internal physical conditions in a region so as to get the aspects of the perceived impressions from the starting point to the end point of observation that can be poured into the criteria of development design Mangrove Wonorejo ecotourism is attractive.
b. Cognitive Mapping Analysis
This technique is used to process behavior observation and cognitive map data.
This data is obtained through surveys and observations. The data will be processed into the mental map that contains the linkage of cognitive mapping preference, ie cognition about how humans translate the built environment through spatial signs to remember it, and cognitive distance, that is about how humans have different perceptions about the existing spatial environment.
The purpose of this analysis technique is to get aspects in the design criteria of Mangrove Ecotourism development based on Wonorejo productive landscape as an ideal tourist destination from the perspective of the needs of community space utilization and researchers based on existing factual conditions.

III. RESULT

A. Walkthough Analysis

Figure 2. Walkthough Analysis Lane 1

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**Connected:** Overall within the ecotourism area has provided a path with a wooden footbridge that is able to reach every destination point. However, there are only two shortcut lanes. This causes ecotourism visitors to go through a long route to reach each destination point.

**Conspicuous:** No map of where visitors are found on this line. With a considerable route should be able to add the presence of information boards and destination directions for visitors. In addition, there are also no warning signs for visitors not to throw garbage carelessly and how to treat mangroves in the area.

**Comfortable:** On the comfort aspect, found that Line 1 has some features that can make visitors ecotourism comfortable, namely the shelter, gazebo, and shady trees so that visitors do not feel hot. However, there are still some points like in visual direction 6 that have no shade whatsoever.

**Convivial:** On this path, there is no street furniture like lights or chairs for visitors. This is probably due to the path size only 3m. In addition, this path is also not friendly to disable users because it has no ram and catwalk made of wood that is not tightly arranged to the fullest. However, there are many trash cans along the path, so visitors can throw the garbage in its place. In this path also has been equipped with a wooden railing so that visitors can hold and feel safe. Other things like the mural on the path of the catwalk also add the value of hospitality on this path.

**Convenient:** The line is identified as easy to navigate because it has clear directions and routes. In addition, most of the lanes have used material that is quite easy to pass by visitors. Only in visual directions 6 and 7 that use the bamboo material with different heights. The use of these materials causes ecotourism visitors is quite difficult to pass through and not infrequently there are tripping.

**Figure 3. Walkthrough Analysis Lane 2**

**Connected:** To reach this path visitors must use boat transportation mode first. As the origin point is provided a small dock as an area to raise and lower passengers. On this path from the origin point to the destination point can connect well.

**Conspicuous:** On this path has a signpost to reach a particular destination point. In addition, there are also warning signs to not litter. With the existence of facilities, such information boards make this path is considered to have a fairly good clarity.

**Comfortable:** All the way from the point of origin to the visual direction 2 has lush mangrove trees so pedestrians can comfortably pass through when the weather is hot. At the visual point 3, the mangrove population is reduced and no shelters are available so pedestrians become less comfortable as they pass through the path. However, there are many shelters along the visual direction 4 to the destination point. Shelter and gazebo contained in this path using wood material that does not contaminate the mangrove ecosystem.

**Convivial:** Condition of the bridge along this path using wood and bamboo materials so that the structure is less sturdy and endangers visitors who are through it. On this path is also not available street furniture and attractions so that the journey to the destination point was tiring and boring. There is a railing made of bamboo material but not designed optimally. Thus, the railing is not the maximum and dangerous for visitors who are still children. This path also does not have facilities for disabled users. Based on the analysis, this path is considered less friendly to ecotourism visitors.

**Convenient:** The journey to this path requires a certain fee and different modes of transportation. When compared with the extent of the path in this area to the physical condition of the bridge that is less friendly to the visitor it can be concluded that this path still does not meet the aspect of ease.

**B. Cognitive Mapping**

There are several activities on the ecotourism of mangrove wonorejo spread in several areas. The spread of the activity can be described in the following figure:

**Figure 4. Spread of Activity Map on Segmen A**
User movement on weekdays usually begins by entering at the main entrance on the south side of the area. In the middle area, there are some facilities such as photo studio and gazebo or management office. Visitors will usually stop at the facility to take pictures and take a break. Then, visitors will continue the journey which is divided into 2 directions. The first direction leads to the culinary center 1 and the second direction to the main dock and main track jogging area.

In the first direction, visitors will usually enjoy spot views on a small dock located near the center area. Then the movement continues towards the culinary center. However, the movement towards that direction is rarely done by visitors. Instead, visitors usually choose to move back and move on to the next destination.

Meanwhile, the movement towards the second is more often done because visitors are usually interested to browse the area of Mangrove Ecotourism Wonorejo further and want to travel along the river to ecotourism area in the segment B. In addition, there is a culinary center and jogging track area which became the destination point from the direction this.

Visitors who go through the second direction are usually dominated by certain families and groups/communities. Only a handful of female visitors - men, women, men, and individuals will move up to the end of the jogging track.

After going through the destination each visitor will usually move towards the beginning of the movement in the south of the ecotourism area. Before leaving the ecotourism area visitors will rest for a moment on a large gazebo located near the parking area. Then visitors will leave the Mangon Wonorejo Ecotourism through the main entrance / out.

Visitors with family and community categories are scattered throughout most ecotourism areas. The presence of visitors with this family category dominates the number of ecotourism visitors. Family visitors are usually happy to be at points that have stopover facilities such as culinary centers, gazebos, and jogging tracks.
The entire movement towards this segment starts from the dock which will then proceed to the path of the wooden pavement. There is an intersection that divides the flow of movement into two kinds. Direction 1 towards the gazebo located on the north side of the area. Visitors will usually choose to move in this direction compared to direction 2. So that the movement contained in the direction 1 along with the gazebo located in the north of the area is usually more crowded with visitors. While the direction 2 is the path that makes visitors move to the gazebo located in the middle of the area and the gazebo located in the south of the area. However, only gazebos in the middle of the area are more often the destination visitors. Movements to the gazebo located on the south side of the area are very rare and usually only done by individuals and categories of male visitors. Visitors with the family category still dominate in segment B. However, it will only be found in the gazebo located in the north of the region and the middle of the area. This is because of the path to each gazebo far enough. And usually, visitors will not move around the destination.

Visitors with categories of groups/communities have characteristics similar to family visitors. However, group visitors can usually move from one gazebo to another gazebo.

**Figure 8. Movement Traces Segment A on Weekend**

Visitors start the movement from the south of the area which is divided into 2 directions. The first direction enters the main parking area located in the reception area of Mangrove Wonorejo Ecotourism. While the direction 2 will go directly to the main dock that will connect segment A to segment B. The second direction is an alternative condition if the 1st direction is not able to meet the capacity of vehicles and visitors. The majority of visitors entering from the 1st direction tend to move towards the middle area of ecotourism. Although the middle area will be split into two directions towards the culinary center and towards the main pier. Unlike the conditions during weekdays (weekday), visitors have a similar quantity of movement towards both directions.

Visitors moving towards the main pier often pause in the culinary center area before continuing their movement towards the main dock and jogging track area. Following from the area there are some visitors who rest in the area around fishing. Then, leave the Mangrove Ecotourism Wonorejo through the main in/out circulation. Meanwhile, visitors who start the movement through an alternative pathway directly to the main dock tend to go directly to segment B or enter the jogging track area. After doing tours in segment B or jogging track area, visitors will move towards ecotourism area located on the west side of segment A. Because segment A is also divided into 2 directions then there are visitors who will do the movement around the path to the new main culinary center and then back to the starting point of the movement. Then there are also visitors who move towards the middle area then immediately back to the starting point of the movement.

**Figure 9. Movement Traces Segment B on Weekend**

All visitors will start the movement from the dock. The movement of visitors will be divided into 2 directions leading to
the main gazebo or towards the central and southern gazebos. The majority of visitors will move towards the northern gazebo then continue moving towards the central gazebo then return to the starting point of the movement of the dock.

The second line of movement tends to make the visitor towards the middle gazebo. However, there are some visitors who are moving towards the southern gazebo though with less quantity. After resting and enjoying the nature tour, visitors will move towards the starting point of the movement on the dock.

Visitors to the family category are visitors who dominate on the starting point of the movement on the dock. Visitors in the family category are rarely encountered in the southern gazebo of the area.

Meanwhile, visitors with categories of group/communities crowded almost in the entire region. The quantity of group/community visitors is equivalent to the family category visitors. The presence of visitors with the male-female category is generally spread in the direction to the northern gazebo and central gazebo. However, the presence of visitors of this type also spread to the southern gazebo. Visitors of this type are the third most visitors after family and group/community.

The results of the analysis of aspects of research will be linked to the factors that influence in the research described in the following table:

<p>| Table 2. Assessment of Research Aspects |
|-----------------------------|------------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Evaluation Factor</th>
<th>Research Aspects</th>
<th>Development of Natural Ecotourism</th>
<th>Productive Landscape</th>
<th>Community Participation</th>
<th>Total Value</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Natural Beauty</td>
<td>Natural Beauty</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>12</td>
<td>Excellent</td>
</tr>
<tr>
<td>2.</td>
<td>Culture</td>
<td>Culture</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>12</td>
<td>Excellent</td>
</tr>
<tr>
<td>3.</td>
<td>Education</td>
<td>Education</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>Good</td>
</tr>
<tr>
<td>4.</td>
<td>Attractiveness</td>
<td>Attractiveness</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>7</td>
<td>Good</td>
</tr>
<tr>
<td>5.</td>
<td>Accessibility</td>
<td>Accessibility</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>7</td>
<td>Good</td>
</tr>
<tr>
<td>6.</td>
<td>Infrastructure</td>
<td>Infrastructure</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td>Good</td>
</tr>
<tr>
<td>7.</td>
<td>Promotion</td>
<td>Promotion</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>7</td>
<td>Medium</td>
</tr>
<tr>
<td>8.</td>
<td>Extension program</td>
<td>Extension program</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>10</td>
<td>Good</td>
</tr>
<tr>
<td>9.</td>
<td>Facility</td>
<td>Facility</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>7</td>
<td>Medium</td>
</tr>
<tr>
<td>10.</td>
<td>Aesthetic form</td>
<td>Aesthetic form</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>12</td>
<td>Excellent</td>
</tr>
<tr>
<td>11.</td>
<td>Conservation of ecosystem</td>
<td>Conservation of ecosystem</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>13</td>
<td>Excellent</td>
</tr>
<tr>
<td>12.</td>
<td>Economics</td>
<td>Economics</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>Good</td>
</tr>
<tr>
<td>13.</td>
<td>Accommodation</td>
<td>Accommodation</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>7</td>
<td>Medium</td>
</tr>
<tr>
<td>14.</td>
<td>Thermal</td>
<td>Thermal</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>8</td>
<td>Good</td>
</tr>
<tr>
<td>15.</td>
<td>Urban ecology</td>
<td>Urban ecology</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>11</td>
<td>Excellent</td>
</tr>
<tr>
<td>Score Point</td>
<td>51</td>
<td>44</td>
<td>44</td>
<td>140</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description: The assessment is done in the range 1-5. Where the rating is 1 = Horrible, 2 = Bad, 3 = Medium, 4 = Good, 5 = Excellent

Table 3. Scoring Analysis Results

<table>
<thead>
<tr>
<th>No.</th>
<th>Factors</th>
<th>Quality</th>
<th>Rate</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atraktivness</td>
<td>1. As Ecotourism that relies on natural conditions</td>
<td>30</td>
<td>5</td>
<td>Excellent</td>
</tr>
<tr>
<td>2. As a recreational / tourism facility (including attractive tourism attributes)</td>
<td>30</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>3. Availability of infrastructure</td>
<td>10</td>
<td>2</td>
<td>Bad</td>
<td></td>
</tr>
<tr>
<td>4. Management as an ecotourism facility</td>
<td>30</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>5. Promotion</td>
<td>15</td>
<td>2</td>
<td>Bad</td>
<td></td>
</tr>
<tr>
<td>Productive Landscape</td>
<td>6. To support the conservation of mangrove ecosystem (referring to community participation in managing ecosystem)</td>
<td>20</td>
<td>3</td>
<td>Medium</td>
</tr>
<tr>
<td>7. To support people’s productivity</td>
<td>15</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>8. As an educational tourism facility</td>
<td>20</td>
<td>2</td>
<td>Bad</td>
<td></td>
</tr>
<tr>
<td>9. Capital support from government/certain parties</td>
<td>10</td>
<td>3</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>10. Availability of flora and fauna vegetation</td>
<td>20</td>
<td>4</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>30</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Description: The assessment is done in the range 1-5. Where the rating is 1 = Horrible, 2 = Bad, 3 = Medium, 4 = Good, 5 = Excellent

Based on table 2 and table 3 can be identified that aspects that need attention are the availability of infrastructure, accommodation, promotion, and educational tourism facilities. Other factors that can be further developed are recreation facilities, ecotourism management facilities, strategies to encourage community participation in managing ecosystems and supporting community productivity, and capital support from government / certain parties.

The only factor that has a good score is ecotourism conditions that have excellent quality as the main attraction in the region. The mangrove ecosystem within the area has the potential to increase the productivity of the landscape and become a habitat for flora and fauna.

IV. CONCLUSION

From the research that has been done, it can be concluded several things:

Some of the influential aspects of this research are aspects of ecotourism development which include ecotourism management facility of mangrove Wonorejo, productive landscape aspect and community participation aspect which includes tourism education facility, conservation supporting facility of the mangrove ecosystem. The availability of an infrastructure capable of accommodating all these aspects creates an 'ecological community'.

Based on synthesis theory and field analysis results indicate that a facilitative strategy is needed to promote an attractive ecotourism development and as a productive landscape supported by local community participation.

To support the ecotourism development aspect, it is necessary to divide the zoning of the area into 3 which is the main conservation zone, transition zone, and the support zone. The benefit of the zone division is 'organizing community activities' that take place within the region so as to be sustainable with each other.

To support the area into a productive landscape, some facilities are needed to improve the landscape capability to be more productive ie laboratory facilities that are used as a place to research mangroves in order to review the techniques of planting or researching the quality of mangrove processed products.

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addition, a productive garden is needed which contains various other productive crops that can grow on adjoining land to the mangrove ecosystem. The area becomes more productive by providing facilities that involve community participation. One of them is to provide gallery facilities, workshops for community development programs on how to mangrove processing and sales outlets. To increase the attractiveness in the area it is also necessary alternative transportation modes such as bicycles and the cable car that can connect between zones. The existence of such infrastructure can also be one of the attractions within the region.

REFERENCES


Impact of Corruption, Defense Spending and Political Instability on Economic Growth: An Evidence from Pakistan

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Abstract- The defense expenditures of the Pakistan economy remain high to sustain a credible deterrence, due to the significant geopolitical position, regional instability as well as a constant conflicting with India since the independence. This study will analyze the effect of defense expenditures on economic growth with some other political factors, such as corruption, defense spending and political-instability. The empirical results of the study observed that there exist positive defense expenditures positive relationship between defense expenditure and economic development which caused expansion of aggregate demand, production and employment generation in the economy which is also suggested by the Benoit (1973, 1978), and Faini et al. (1984). The empirical result shows the negative, statistically significant relationship between inflation, exchange rate and economic growth of the Pakistan economy. The empirical results also show that there exist negative association between political instability and economic growth of the Pakistan. Corruption is the one of the important social factor, which has a positive effect on the economic growth due to weak institutions and function poorly.

Index Terms- credible deterrence, regional instability, political-instability, statistically significant relationship.

I. INTRODUCTION

The neoclassical school had key focused on the supply side policies and explained the positive effect of defence on economic growth in form of modernization positive externalities from infrastructure as well as technological spin offs, while some of them enlighten the negative effect of the defence expenditures on economic growth. There exists inverse relationship between defence expenditures, economic growth, employment and investment in case of developed countries explained by the Smith (1977); Boretsky (1975) and Sivard (1977). The political instability leads to increased defence spending and reduce the share of government expenditures allocated to education as well as other productive sectors were decreased explained by the Ades and Chua (1997). While there were two channels through which defence expenditure may affect economic growth of the economy. Firstly, any positive shock in the defence expenditure may lead to increased total demand for goods in the economy by stimulating output, increased the employment and ultimately lead to increased economic growth. Secondly, positive shock in defence expenditure may lead to improve the infrastructure in the economy found by the Shahbazz et al (2013).

The neoclassical based on Feder (1982), Ram (1986) and Biswasand Ram (1986) which explained the relationship of defence expenditures and economic growth. But the Feder–Ram model derived the effect of defence on economic growth based on a single equation aggregate production function, but there were a number of theoretical as well as empirical problem while estimating the Feder-Ram model of defence expenditures on economic growth, like simultaneity problem, identification problem, multicollinearity problem and model is static. While Keynesian which work based on the demand and supply side policies explained the effect of defence expenditures with the seminal contribution of Smith (1980), which overcomes the problem of simultaneity, developed the simultaneous equation model with a Keynesian aggregate demand.

There exists positive relationship between defence expenditure and economic development which caused expansion of aggregate demand, production and employment generation in the economy according to the Benoit (1973, 1978), and Faini et al. (1984). There exist a negative impact of defence expenditures on growth of an economy according to the Smith (1980) and Rasler and Thomson (1988).

Since the beginning of human life, the defence had remained priority of governments in order to protection their citizens. The literature also supports that spending on citizens protection is one of the political mandates of every government. Defence expenditures can be described as a type of expenditures that a country utilizes to internal and external security of the citizens, and the countries which more unstable political environments need higher defence expenditures. Hence defence expenditure had been an important budgetary allocation in the political economy of any country and her economic growth. There diversified available literature that explained the relationship

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of defence expenditure and economic growth described by neoclassical and Keynesian school of thought.

The Pakistan military forces are the seventh largest military forces in the world. The Pakistan large portion of GDP is being used for defence expenditures due to regional instability as well as instability in neighbouring countries, hostile relationships and constant conflicting with India. Pakistan and India governments do not accept each other since the independence (Tibbett and Akram-Lodhi, 1997). They were in an arms race allocated large proportion of their budget for defence expenditures. Pakistan and India had risen their defence expenditures continually in real terms, especially the period 1998 to 2010 Pakistan’s defence expenditures $4 billion to slightly more than $5 billion and India’s defence expenditures increased $20 billion to $45 billion. The substantial increased in the defence expenditures lowers economic performance heard opportunity cost in form of increased in poverty. There were too many other factors which effect the defence expenditures due to the internal and external security issues of the Pakistan economy, while defence expenditures also support in form of increased in the aggregate demand, production and employment in the Pakistan economy. So in this study we will explore the economic, social as well as political determinants of defence expenditures for Pakistan economy empirically.

Most existing empirical literature focused on the relationship of defence expenditures and economic growth with some economic variables, they explored political factors much less. Present study fills the gap and designed to check the relationship between defence expenditures and economic growth with some economic variables as well as political variables.

II. REVIEW OF LITERATURE

Khilji and Mahmood (1997) empirically estimated the impacts of defence expenditures on economic growth with some other economic variables in case of Pakistan over the period 1972 to 1995. The estimated results of this study based on four different equation models, three single equation models and one model based on system, which explained bi-directional relationship between the defense expenditure and GDP growth of Pakistan. The estimated result shows that savings to GDP ratio is affected positively by the defense to GDP ratio, and negatively by the inflation rate in case of Pakistan economy. But if all these models estimated as a system all above effects are diminished and also statistical significance.

Dunne et al. (2002) estimated the effect of military expenditures and investment on economic growth of Small industrial countries during the period 1980 to 1999. The study estimated the investment and output equations, where investment was a function of growth and military expenditure in the Small industrial economies. To estimate the dynamics of military expenditure, growth and investment, a pooled OLS model was estimated which also followed by Smith (1980) after 2nd world war there were evidence decreased in the defense expenditures and estimated results also suggested that there exist negative relationship between defense expenditures, economic growth and investment.

Dunne et al. (2011) estimated the effect of defense expenditures on economic growth of European Union 15 countries by using augmented Solow-Swan model, during the period 1961 to 2007. The study used log linear re-parameterized general first order dynamic model with dependent variable log of GDP per capita. The study used both time series and panel data estimation methods, using fixed effect and random effect in panel data, long run relationship in time series data. The estimated results suggested that military expenditures did not promote economic growth in European Union 15 countries which also consistent with neoclassical augmented Solow-Swan growth model.

Anwar et al. (2012) empirically explored the effect of the nexus of the defense expenditures and the economic growth of Pakistan during the period 1980 to 2010. The estimated results were obtained by using the Johansen and Juselius (1990) cointegration and Granger Causality tests. The estimated result of the study shows that there exist positive long run relationship between defense expenditures and economic growth of Pakistan with some other variables (total exports, total imports, and gross domestic investment). Gross domestic product (GDP) Grander caused military expenditures but military expenditures did not Granger caused GDP of the Pakistan economy.

Kalim(2013) estimated the long run as well as short run effect of Military expenditure on poverty growth along with some other control variables (Inflation, Industrial sector, services sector and foreign direct investment) which effects the poverty in case of Pakistan during the period 1972 to 2009. The empirical results of the study explained that military expenditure and inflation pro-poverty factors which lead to increase the poverty. Industrial sector growth, services sector and foreign direct investment anti-poverty factor which lead reduced the poverty in the economy of Pakistan.

Shahbaz etal.(2013) estimated the long run and short run relationship between defense expenditures and economic growth of Pakistan by using Keynesian model during the period 1972 to 2008. The empirical results of the study were obtained by using autoregressive distributive lag approach to find out the long run and short run dynamic of defense expenditures and economic growth, as well as Granger causality technique to test the causal relationship between defense expenditures and economic growth. The empirical result found that there exist unidirectional causality between defense expenditures and economic growth, also suggested there exist positive relationship between defense expenditures and economic growth, and increased the growth through increases aggregate demand by stimulating output. And there exist negative relationship between interest rate and economic growth of Pakistan.

Akbulut (2014) empirically investigated the Barro (1990) endogenous growth model also estimated the dynamics of the military and health expenditures in 30 developing economies over the period 1995 to 2011. The results of the study were obtained by two staged system generalized method of moment that were presented by (Arellano and Bover, 1995). The results of the study indicated that military and health expenditures had a statistically insignificant effect on economic growth of developing countries, so the estimated results of the models concluded that expenditures on both military and health expenditures had no effect on economic growth developing economies.
Mosikari (2014) empirically investigated the long run and short run dynamics of defense expenditures and economic growth of South Africa by using Johansen co-integration and Engel-Granger causality techniques over the period 1988 to 2012. The estimated results suggested that defense expenditure effect the per capita gross domestic product, there exist unidirectional relationship. Per capita gross domestic product had not affect the defense expenditures at 5 percent level of significance. The study also concluded that there exists positive relationship between defense expenditures per capita gross domestic product with some other control variables (population growth, general government expenditure on health, general government expenditure on education) in South Africa.

### III. DESIGN AND IMPLEMENTATION

#### 3.1 Theoretical Framework

To estimate the dynamics of economic growth and defense expenditures in developing countries have followed different approaches in the literature, these models which is used in the literature are based on neoclassical production functions In order to estimate the effect of Corruption, Defense expenditures and Political Instability on political economy of Pakistan, in this study we will extend the neo-classical growth model of Solow-Swan (1956). The production function of the economy depends on the factors of productions Capital (K) and Labor (L) as well as Exogenous technological parameter (A) as:

\[ Y = AF(K, L) \]  

Where K = Capital  
L = Labor (Aggregate Labor)  
A = Solow residual or productivity other than labor and capital which is also called Total Factor Productivity.

Now, the Cobb-Douglas Specification is given as:

\[ Y = AK^v L^{1-v} \]  

Where 0 < v < 1 is capital's share and 1 - v is Labor share

Intensive form of the equation (2) is as:

\[ y = A \alpha \]  

Note that \[ f'(k) = Ak^{v-1} \delta \]  
\[ f'(l) = -A\alpha(1-\delta)k^{\alpha-1} \delta \]

With standard model-Conditions:

\[ \Delta y = \alpha \Delta(k) - \alpha \delta \Delta L \]

This shows that Cobb-Douglas production function satisfies the properties of neoclassical production function.

The equation of motion of Capital stock series is given below:

\[ k' = f'(k) - (n + \delta)k \]

Substitute in the equation (4) \[ y = f(k) = \Delta k + \]  
\[ k' = A\Delta k^v -(n + \delta)k \]

The term \( n + \delta \) on the right hand side of equation can be thought as the effective depreciation rate for Capital-Labor ratio \( k = K/L \).

Rearranging equation (5) will result in

\[ k' = \frac{1}{\Delta k} \Delta k + (n + \delta) \]

Since we know that \( y = A k^\alpha \), \( y' = A\alpha k^{\alpha-1} \)

Rearranging again and get the following equation:

\[ y' = A\alpha k^{\alpha-1} \]

\[ y' = A\alpha \Delta k^{\alpha-1} \]

\[ y' = \alpha f'(k) - (n + \delta) \]

(6)

Where \( f'(k) = A\alpha k^{\alpha-1} \)

The above model generality mimics the following form of growth rate of output per capita which depends on the parameters of the model as:

\[ \alpha = g(\alpha, \alpha, \alpha, \alpha) \]

(7)

In addition Kalim R.(2013), Anwar et al. (2012), Khilji and Mahmood (1997), Shahbaz et al. (2013) it is assumed that aggregate productivity (A) depends defense expenditures, Informal Activities, Corruption, Openness, Education, etc. Therefore, we will assume the following:

\[ \Delta y = g(Def. Exp. CPI, PI, Corr, ER) \]

(8)

Therefore,

\[ \Delta y = g(Def. Exp. CPI, PI, Corr, ER) \]

### 3.2 Data

To estimate the model parameters in order to test hypothesis, data over the annual frequencies from 1975 to 2015 will be collect from the websites of World Bank. World Bank and hand book of Statistics published by State Bank of Pakistan, International country risk guide published by IMF and Center for Systemic Peace (CSP) Web site. The variables are: Real Gross domestic product (RGDP), Defense expenditure (Def. Exp), Political instability (PI), Corruption (Corr), Consumer price index (CPI) and exchange rate (ER).

### 3.3 Econometric Modelling Framework

To test long run and short run dynamics of defence expenditures with its possible deeper determinants, its relationship with growth rate and then its impact on poverty alleviation, we will use Auto Regressive Distributed Lag Model. The beauty of the ARDL modelling approach is that it is irrelevant whether time series or of same order or have different order integration. The detail of this modelling approach is given as: The first test applied to the data is the one suggested in 1999 by Smith. This test is for a long run relationship between the variables and is applicable irrespective of whether the regressors are I (0), I (1) or mutually co-integrated. The test is based upon the estimation of the underlying VAR model, re-parameterized as an ECM (error correction model).

The VAR (p) model

\[ z_t = b + \alpha t + \sum_{i=1}^{p} \beta_i z_{t-i} + \varepsilon_t \]

(3.7)
Where \( z \) represents a vector of variables. Under the assumption that the individual elements of \( z \) are at the most I(1), or do not have explosive roots, equation (3.7) can be written as a simple Vector ECM.

\[
\Delta z_i = b + c_i + \sum_{j=1}^{k} \Pi_{j-1} \Delta z_{i,j-1} + \sum_{j=1}^{k} \Gamma_{j} \Delta z_{i,j} + \varepsilon_i, \quad (3.8)
\]

Where

\[
\Pi = -\left( I_{k+1} - \sum_{j=1}^{k} \beta_j \right) \quad \text{and} \quad \Gamma = -\sum_{j=1}^{k} \beta_j, \quad i = 1, \ldots, p-1
\]

Where \((k+1)(k+1)\) matrices of the long run multipliers and the short run dynamic coefficients. By making the assumption that there is only one long run relationship among the variables, Pesaran, focused on the first equation in (3.7) and divide \( z \) into a dependent variable \( y_t \) and a set of other variables \( x_t \). Under such conditions, the matrices \( b, c_t \) and most importantly, the long run multiplier matrix can also be divided comfortably with the division of \( z \).

The key assumption, that \( x \) is long run variable for \( y \), which implies that the vector \( \gamma_2 = 0 \), and that there is no feedback from the level of \( y \) on \( x \). As a result, the conditional model for \( y \) and \( x \) can be written as:

\[
\Delta y_t = b + c_t + \sum_{j=1}^{k} \beta_{j} \Delta y_{t,j-1} + \sum_{j=1}^{k} \gamma_{j} \Delta x_{t,j-1} + \varepsilon_t, \quad (3.9)
\]

\[
\Delta x_t = b + c_t + \Pi_{j-1} \Delta x_{t,j-1} + \sum_{j=1}^{k} \gamma_{j} \Delta y_{t,j-1} + \varepsilon_t, \quad (3.10)
\]

Under standard assumption about the error terms in equations, Pesaran, re-write (3.9) eq. as:

\[
\Delta y_t = a_0 + a_1 \Delta y_{t-1} + \sum_{j=1}^{k} \beta_{j} \Delta y_{t,j-1} + \sum_{j=1}^{k} \gamma_{j} \Delta x_{t,j} + \varepsilon_t, \quad (3.11)
\]

Note that in the given eq., a long run relationship exist among the level of variables if the two parameter \( a_1 = 0 \) and \( a_0 \) are both non zero in which case, for the long run solution (5.5), Obtain

\[
y_t = a_0 + \frac{a_1}{\phi} x_t, \quad (3.12)
\]

Pesaran, choose to test the hypothesis of no long run relationship between \( y \) and \( x \) by testing the joint hypothesis that \( \phi = 0 \) in the context of above equation. The test which they develop is a bound type test, with a lower bound calculated on the basis that the variables in \( x \) are I(0) and an upper bound on the basis that they are I(1). Pesaran, provide critical values for this bounds test from an extensive set of stochastic simulations under differing assumptions regarding the appropriate inclusion of deterministic variables in the ECM. If the calculated test statistic (which is a standard F test for testing the null hypothesis that the coefficients on the lagged level terms are jointly equal to zero) lies above the upper bound, the result is conclusive and implies that a long run relationship does exist between the variables. If the test statistic lies within the bounds, no conclusion can be drawn without prior knowledge of the time series properties of the variables. In this case, standard methods of testing have to be applied. If the test statistic lies below the lower bound, no long run relationship exists.

Econometric Model is given as:

ARDL Long Run equation for the model:

\[
\Delta GDP_t = \alpha_0 + \sum_{i=1}^{k} \beta_{i} \text{Def} \_t + \sum_{i=1}^{k} \beta_{i} \text{CPI} \_t + \sum_{i=1}^{k} \beta_{i} \text{Oil} \_t + \sum_{i=1}^{k} \beta_{i} \text{Ex} \_t - \sum_{i=1}^{k} \beta_{i} \text{ER} \_t + \sum_{i=1}^{k} \beta_{i} \text{DET} \_t + \sum_{i=1}^{k} \beta_{i} \text{DEF} \_t + \sum_{i=1}^{k} \beta_{i} \text{CPI} \_t + \sum_{i=1}^{k} \beta_{i} \text{Oil} \_t + \sum_{i=1}^{k} \beta_{i} \text{ER} \_t + \sum_{i=1}^{k} \beta_{i} \text{DET} \_t + \text{ER} \_t, \quad \forall i = 1 \text{ to } m
\]

F test of the null that:

\[
\beta_{1} = \beta_{2} = \beta_{3} = \beta_{4} = \beta_{5} = \beta_{6} = 0, \quad \forall i = 1 \text{ to } m
\]

ARDL Short Run equation for model:

\[
\Delta GDP_t = \alpha_0 + \sum_{i=1}^{k} \beta_{i} \text{Def} \_t + \sum_{i=1}^{k} \beta_{i} \text{CPI} \_t + \sum_{i=1}^{k} \beta_{i} \text{Oil} \_t + \sum_{i=1}^{k} \beta_{i} \text{Ex} \_t - \sum_{i=1}^{k} \beta_{i} \text{ER} \_t + \sum_{i=1}^{k} \beta_{i} \text{DET} \_t + \sum_{i=1}^{k} \beta_{i} \text{DEF} \_t + \sum_{i=1}^{k} \beta_{i} \text{CPI} \_t + \sum_{i=1}^{k} \beta_{i} \text{Oil} \_t + \sum_{i=1}^{k} \beta_{i} \text{ER} \_t + \sum_{i=1}^{k} \beta_{i} \text{DET} \_t + \text{ER} \_t, \quad \forall i = 1 \text{ to } m
\]

IV. RESULTS

4.1 Unit Root Results

According to the classical linear model assumption data should be stationary (mean and variance of the series should be constant), otherwise we cannot apply the OLS. For this purpose we have to estimate the relationship among the variables. So the first step in the empirical estimation to investigate the persistence of the unit root (stationarity) in the time series data to overcome the problem of the spurious regression. The unit root problem, presented in the data mostly due to the time trend, sometime due to intercept and sometime due to both time trend and intercept, they are named non-stationary series if they exhibit the trend. That’s why first we investigate the stationarity problem in the data as well as their level of stationarity. If they have a unit root (Stationary) at their level 1(0) than we can apply OLS, otherwise we will move toward suitable Econometric techniques to obtain the significant and reliable empirical results.
Table 4.1 ADF Unit Root Results at the Level

The dependent variable (gross domestic product) and all independent variables defence spending, consumer price index (which is the proxy of the inflation, that is used to measure the inflation), political instability, exchange rate, and corruption examined to test the problem of unit root over the period 1975-2015. ADF unit root used to check the order of integration among the variables. Table 4.3 presented the results of augmented Dickey Fuller (ADF) unit root test at the level in case of with constant only, with constant and trend. The null hypothesis of the augmented Dickey Fuller (ADF) unit root test is all dependent and independent variables have unit root problem (data is non-stationary at level). The ADF test statistics = 3.341 (at p=1.000) for variable GDP is significant at level (1%, 5%, 10%) without trend, however CPI is non-stationary with trend at levels (5%, 10%) so we rejected null hypothesis and CPI becomes stationary with trend. The ADF test statistics = -1.977 (at p=0.295) for variable Political instability is non-significant at levels (1%, 5%, 10%) without trend and with trend also so we accepted the null hypothesis and PI still non-stationary. The ADF test statistics for variable Corruption is non-significant at all levels, so we accepted the null hypothesis and Corruption is non-stationary without trend and with trend. The ADF test for variable Nominal exchange rate is insignificant at all levels and probability more than the criteria so we accepted null hypothesis and Nominal exchange rate is non-stationary without trend and with trend. So the results concludes that all variables (RGDP, PI, NER) are non-stationary at their level but log of consumer price index (which is the proxy of the inflation), defense spending and corruption index are stationary at level. This states that three variables are non-stationary at their level but three variables are stationary.

Table 4.2 ADF Unit Root Test Results for the first Difference

The empirical results of the augmented Dickey fuller unit root test are presented in the above in case of with and without trend. The results shows that the absolute values of the ADF statistics are greater than the critical values at 1%, 5%, 10% level of significance for all remaining variables real gross domestic product (RGDP), nominal exchange rate (NER), and political instability (PI). So we can rejected null hypothesis and concluded that gross domestic product (RGDP), nominal exchange rate (NER), and political instability (PI) are stationary at the first difference with and without trend.

Finally, Augmented Dickey Fuller unit root test result shows that all variables are non-stationary at the level except the consumer price index, defense and corruption; which are stationary at the first difference. In such situation, we can only employ Auto-regressive Distributed Lagged techniques to investigate the long run and short run relationship among the dependent variable (real gross domestic product) and independent variables [nominal exchange rate (NER), political instability (PI), consumer price index (CPI), defense expenditures (Def), and Corruption (Corr)].

4.2 Empirical long run results of the ARDL model
This section explains the empirical long run results of the ARDL model that shows empirical relationship between foreign direct investment and exchange rate with some other macroeconomic and political variables for Pakistan economy. Nevertheless, Ouattara (2004) exclaimed that during the presence of I (2) variables the computed F-statistics provided by PSS (2001) become invalid because bounds test is based on the assumption that the variables are I (0) or I (1) only. Therefore, it is necessary to ensure that before applying the ARDL method none of the variable is integrated of order I (2) or away from.

4.3 The empirical results of the ARDL model

The table 4.5 presented the results of the autoregressive distributed lag (ARDL) model. The beauty of the ARDL model is that it can apply for mixed order of integration like I(0), I(1). The table 4.5 results based on the three regression models of the ARDL to check the significance of the political situation of the economy and Defence spending. In the first model Defence spending, political instability, Consumer price index, Corruption, Nominal exchange rate are included, but in the second model political instability variable is missing and in the third model Corruption variable is missing to check one by one significance of the Political instability and Corruption. Models run without trend and intercept.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-Stat</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnDEF</td>
<td>3.871</td>
<td>5.334</td>
<td>0.000</td>
</tr>
<tr>
<td>LnCPI</td>
<td>-0.023</td>
<td>-0.675</td>
<td>0.500</td>
</tr>
<tr>
<td>P</td>
<td>-0.061</td>
<td>-4.572</td>
<td>0.000</td>
</tr>
<tr>
<td>LnGDP</td>
<td>0.485</td>
<td>2.079</td>
<td>0.024</td>
</tr>
<tr>
<td>LnER</td>
<td>-0.230</td>
<td>-2.078</td>
<td>0.006</td>
</tr>
<tr>
<td>R-Square</td>
<td>0.8012</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There is relationship of the defense spending and economic growth is controversial. According to the Benoit (1973, 1978) and Faini et al. (1984) investigated that there exist positive relationship between defense spending and economic growth. The defense spending expend the aggregate demand of the economy, lead to increase the production as well as employment of the economy. While on the other side Smith (1980), Rasler, Thomson (1988) and Anwar et al. (2012) explains that Defense spending is undesirable expenditures of the economy which deters the resource allocation of that economy from development and negatively affect the economic growth of the economy. The results of my research in the table 4.5 shows that exist long run positive and statically significant relationship between defense spending and the economic growth of Pakistan. In the model empirical results shows that one percent increase in the defense expenditures lead to increase the 3.871 percent in the economic growth of Pakistan.

Inflation stability is one of the indicator of the macroeconomic stability of a country. High inflation in a country can reduce the investment as well as the economic growth of the economy. So sustained economic growth of the economy with low inflation rate is the fundamental objective of the macroeconomic policy makers. The empirical results of my research in the model shows the negative, statistically significant relationship between inflation and economic growth of the Pakistan economy. The estimated result shows that one percent increase in the consumer price index which is the proxy of inflation lead to decrease the -1.925 percent in the economic growth of the Pakistan economy.

According to the economists and political thinkers, political instability is one of the factor which seriously affect the economic growth of the developing countries. Political instability is likely to shorten policymakers’ horizons leading to suboptimal short term macroeconomic policies. It may also lead to a more frequent switch of policies, creating volatility and thus, negatively affecting macroeconomic performance. Alesina et al. (1996) empirically estimated by using data on 113 countries from 1950 to 1982, the results shows that GDP growth as well as total factor productivity growth is significantly lower in selected countries and time periods with high political instable regimes. The estimated result shows that there exist negative, statistically significant relationship between economic growth and Political instability. According to the estimated results one unit change in the index value of the political instability lead to decrease the -0.061 unit in the gross domestic product of the Pakistan economy?

The debate on the effects of corruption is particularly fervent. The literature shows that corruption affect negatively economic growth through investment and level of efficiency at which the economies perform and the growth rate of total factor productivity. Some economist Shleifer and Vishny [1993] suggest that corruption would lead to lower the economic growth of the economy. Shleifer, and Vishny [1991] empirically estimated that countries where talented peoples are allocated to rent seeking activities tend to grow more slowly.

The estimated results of the model shows that the positive but statistically insignificant relationship of corruption on economic growth of Pakistan, one unit change in the corruption index lead to increase the -0.485 unit in the economic growth of Pakistan economy.

The exchange rate is the one of the policy variables which adversely affect macroeconomic stability, affect export sector competitiveness of the economy and lead to sizeable welfare cost.

Razin and Collins (1997), Rajan and Subramanian (2006), and Johnson, Ostry, and Subramanian (2007) real exchange rate misleading the economic growth because real exchange rate is believed to be one of the most important relative prices in an economy at international level in case of developing countries. The empirical results of my research in the model shows that exchange rate negatively affect the economic growth of the Pakistan economy. According to the model 1 one percent increase in the exchange rate lead to decrease the 0.0738 percent in the economic growth of the Pakistan.

4.4 ARDL Bound Test:

The table presented the ARDL bounds test empirical results [which explains the existence of the long run relationship between defence expenditures and economic growth with some other macroeconomic variables (corruption, cpi, ner, pi)]. ARDL bounds test based on the tests of the null hypothesis which shows that no long run relationship exist between defence expenditures

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and economic growth with some other macroeconomic variables by using F-Statistics. F-statistics calculated values must be greater than the critical values of upper bound and lower bound test.

<table>
<thead>
<tr>
<th>ARDL.Bounds Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
</tr>
<tr>
<td>Null Hypothesis: No long-run relationships exist</td>
</tr>
<tr>
<td>Test Statistic</td>
</tr>
<tr>
<td>F-statistic</td>
</tr>
<tr>
<td>Critical Value Bounds</td>
</tr>
<tr>
<td>Significance</td>
</tr>
<tr>
<td>10%</td>
</tr>
<tr>
<td>5%</td>
</tr>
<tr>
<td>2.50%</td>
</tr>
<tr>
<td>1%</td>
</tr>
</tbody>
</table>

K represent the number of parameters.

Table 4.3 ARDL Bounds Test

The above empirical results of the ARDL bound test verified that there exit long run relationship between defense expenditures and economic growth with some other macroeconomic and political variables that is my objective of research work. The value of the F-statistic=4.447639 for Model one at all levels of Bound test (10%,5%,2.50%,1%) is significant shows the rejection of null hypothesis, in the second Model F-statistics=10.07858 at all levels of bound test(10%,5%,2.50%,1%) and in the 3rd model F-statistics=8.26071 at all levels that is greater than the upper and lower bounds ,so we reject null hypothesis and results of F statistics is significant concluded that defense expenditures and economic growth with some other macroeconomic and political variables co-integration in long run exist in the all models, as suggested Pesaran,et al (1999).

Interpretation of short run Coefficients using the ARDL Approach model

The above table presented the short run results of the relationship between defence spending and economic growth with some other macroeconomic and political variables. To determine the short run relationship between the variables the study used the Error Correction Model (ECM). The empirical results of table shows that there exist the short run relationship between defence spending and economic growth with some other macroeconomic and political variables in case of Pakistan that’s my research objective. Error correction model (ECM) value showed the speed of convergence which was near about -0.04 (4 percent convergence take place in one year).

V. CO-INTEGRATION GRAPH

The graph of the co-integration also verified the existence if the short and long run relationship between the defence spending and economic growth with some other macroeconomic and political variables in case of Pakistan.

VI. CONCLUSION

The main objectives of the study is to explore the association among the economic growth and military spending in case of Pakistan with some other political, economic and social variables (corruption). To achieve the objectives of the study, the study use the secondary data of the defence expenditures, real gross domestic product, consumer price index as proxy of the inflation, political instability index (range from +10 to -10,) +10 prefect democracy in the economy, -10 mean prefect autocracy in the economy), corruption index (range from 0 to 6), 0 mean no corruption, and 6 mean prefect corrupt country), nominal exchange rate. The data on these variables collected from various
published sources (international country risk guide, systematic peace web side, and world development indicators) for the period 1975 to 2015. To estimate the relationship between defence expenditure and economic growth with some other variables (Consumer price index, exchange rate, political instability, corruption index) we used autoregressive distributed lag model (ARDL) which is mainly used in time series data econometrics to estimate the non-stationary models with mix order of integration. The estimated empirical results of the study confirmed that existence of the co-integration between defence expenditure and economic growth with some other variables (Consumer price index, nominal exchange rate, political instability, and corruption index) in case of Pakistan economy. The empirical results of the study shows that economic growth and defence expenditure have equilibrium in the long run. These study demonstrations that the defence spending is not presenting the negative influence on the economic growth while the other hand they play a positive atmosphere for the economy growth. Some studies examined that the causative relationship among the economic growth and military expenditure. The policy maker constructs a better policy and state increase the rate of tax, commercial tax and indirect tax are greatest support for the growth of the economy. Tax is the proper indicator which is support to the economy but the commercial tax ratio is decided with respect to the production of the industry. Secondly rise the income tax at aggregate level for overcome the gap of military spending and the economy growth of the state the addition in the tax ratio are reduce the production of the segment these are implement for the short period of time for eliminating the gap of defence spending and economic growth.

The empirical results of the study evaluated that volatility of the inflation lead to uncertainty which is also suggested by the Able (1980) and negatively affect the economic growth of the under developed consumption expenditures as well as private investment. Because uncertainty directly affects the cost of capital as well as reduce private investor confidence. According to the political thinkers and policy makers that volatility of the macroeconomic variables and political instability lead to uncertainty in the developing economies which has significant impact on economic growth and other economic outcomes (foreign debt, government consumption expenditures and private investment etc). Political stability play a key role for the economic growth of the developing economies, especially in case of Pakistan. Because Pakistan faces frequent government collapse since the independence of the Pakistan which negatively affect the economic growth and governance of the Pakistan economy, which is also suggested in the empirical results of the study. The estimated results of the study show that there exist negative co-integration between political instability and real gross domestic product of the Pakistan economy, so we have to maintain the political stability to enhance growth of economy.

The exchange rate play a key role for the determination of economic growth of the Pakistan economy, and volatility in the exchange rate directly a effect the economic growth through capital inflow (foreign direct investment, foreign debt, foreign aid and remittances) in case of Pakistan. The estimated result of the study shows that there exist negative relationship between nominal foreign exchange rate and the real gross domestic product in case of Pakistan. Due to the exchange rate depreciation of Rupee is taken as an incentive by the foreign investors and they are attracted to invest in Pakistan because of their relative increase in worth of their assets. Pakistan is following freely floating exchange rate system since 2000 which makes country more sensitive to the slight variations in the foreign exchange market. Nominal exchange rate volatility acts like a market friction for FDI in Pakistan as evident by our results. Future prone to risk and uncertainty provoked by exchange rate volatility hampers economic growth in Pakistan. This show that exchange rate associated negatively with real gross domestic product in case of Pakistan.

The overall outcomes of research thesis concluded that defence expenditures, political instability (PI), corruption, exchange rate and inflation significantly matters for the determination of economic growth in developing countries like Pakistan. We observed in our study that Pakistan experiences more volatility in political regimes which caused more fluctuation in economic growth and defence expenditure.

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Impact of video assisted teaching on knowledge regarding health effect of alcohol and tobacco use among non-teaching staffs of SVU


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Abstract- Background of the study: Health is wealth as it has a strong and lasting impact on one person as well as progress in life. People use tobacco and alcohol worldwide which creates dependency to tobacco and alcohol in people. Alcohol misuse not only harms the individual but damages relationships and society in general in terms of violence and crime & accidents. The knowledge of health effect of alcoholism & tobacco may be helpful to people of all ages.

Index Terms- Knowledge, Non-Teaching Staff, Video Assisted Teaching, SVU, Health Effect, Alcohol & Tobacco

I. AIMS AND OBJECTIVES

The aim of this study was to assess existing knowledge through pre test, to administer video assisted teaching, to compare pre test and post test knowledge scores & to find association of knowledge level with selected demographic variables of non teaching staffs of SVU regarding health effect of alcohol and tobacco use among non-teaching staff of SVU, Piparia, Vadodara.

II. MATERIAL AND METHODS

The evaluative approach & pre experimental-one group pre-test and post-test design was adopted to determine the impact of Video Assisted Teaching programme on knowledge regarding the health effect of alcohol and tobacco use among the non-teaching staff of Sumandeep Vidyapeeth University. The sample size was 50 non-teaching staff selected by using non probability convenient sampling technique. Data was collected through structured knowledge questionnaire. Video Assisted Teaching was conducted after the pre test as intervention. The collected data was tabulated and analyzed using descriptive and inferential statistics. The Bertalanffy’s General System’s Model was used as conceptual framework for this study. XV

III. RESULTS

The findings of the study represented that in pre test among 55 respondents, majority of the respondents(93.3%) had average & 6.7% had poor knowledge score and in post test majority of the respondents(81.7%) had good knowledge & 18.3% had average knowledge score. The ‘t’ value 25.55 was observed at 0.05 level & the P value =0.00 which is <0.05 that shows that there was increase in the post-test level of knowledge. This shows that the Video Assisted Teaching was effective on knowledge of non teaching staff regarding health effect of alcohol and tobacco use among non-teaching staffs of SVU. Among all socio demographic variables the obtained χ² value was less than the table of χ² at 0.05 level of significance. So there was no significant association between demographic variables and post test knowledge score of non-teaching staff regarding use of alcohol and tobacco.

IV. CONCLUSION

The study finding revealed that Video Assisted Teaching on health effect of alcohol and tobacco use was effective in improving knowledge among non-teaching staffs. The result of the present study represents that there is a great need for the non teaching staff of SVU to gain more knowledge regarding health effect of alcohol and tobacco use to prevent its harmful effects on their health.

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The Influence Of Online Shopping Motivation And Product Browsing Toward Impulsive Buying Of Fashion Products On A Social Commerce

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Abstract- The purpose of this study is to analyze the direct and indirect influence of online shopping motivation (i.e hedonic and utilitarian motivation), and product browsing on impulsive buying, where product browsing as a mediation variable between online shopping motivation and impulsive buying. This study is quantitative in nature. Questionnaires were distributed to women who have purchased fashion product in social commerce i.e Instagram as the target respondents. The type of research used for this study is causal research. Using a convenience sampling technique with non-probability sampling design, a total sample of 300 respondents were obtained. Hypotheses were tested using Structural Equation Model (SEM). The model development of this research applies second-order confirmatory factor (SOVF) technique which is two-level measurement model and estimation method used is Maximum Likelihood Estimation (MLE). The results showed that online shopping motivation on hedonic motivation variable has significantly direct effect on product browsing and impulsive buying, while utilitarian motivation variable has significantly direct effect only on product browsing. Other than that the product browsing variable has significantly direct effect on impulsive buying. In addition, online shopping motivation has indirect influence through product browsing on impulse buying meaning that the variable of product browsing is the variable that mediates between online shopping motivation and impulsive buying.

Index Terms- Online shopping motivation, hedonic and utilitarian motivation, product browsing, impulsive buying

I. INTRODUCTION

Generally, online shopping motivation can be categorized as hedonic and utilitarian motivations (Hoolbrook and Hirschman, 1982). Shopping motivation is an important aspect to understand consumer behavior which plays a role in making purchasing decisions. One form of consumer behavior is an unplanned purchase called impulsive buying (Schiffer and Kanuk, 2012).

Rook and Fisher (1995) define impulsive buying as consumer’s tendency to buy spontaneously, without a second thought, which is driven by the emotional and psychological aspects of a product and is tempted by the persuasion of marketers. During online shopping, consumers are more spontaneous than offline shoppers (Park et al., 2012). Furthermore, several studies have found that many online consumers make impulsive buying (Floh and Madlberger, 2013; Jeffrey and Hodge, 2007; Parboteah et al., 2011).

Impulsive buying often occurs because of the hedonic motivation (Park et al., 2012), in which consumers tend to behave impulsively when they have hedonic motivation such as trying to meet self-satisfaction, pleasure, fantasy, social and emotional satisfaction. Shopping pattern of hedonic motivation usually occurs in the social commerce environment, due to the simplicity and convenience of exploring, searching, and paying (Hansen and Olsen, 2006). In addition to hedonic motivation, impulsive buying can also occur because of the encouragement of one’s utilitarian motivation in shopping (Lee, Namho, 2017). This utilitarian motivation relates to functional value such as cost saving, convenience and practicality (Mikalef et al., 2012; Babin et al., 1994). The more consumers consider the functional value in online shopping sites, the greater the desire to make impulsive buying in the online shopping environment (Ha and Jang, 2010).

In addition to hedonic and utilitarian motivations, product browsing is also one factor that can lead to impulsive buying. According to Bloch et al. (1989); Park and Lenon (2006), during product browsing, consumers can make impulsive buying. Product browsing also relates closely to one’s hedonic and utilitarian motivations in shopping. Consumers conducting shopping with hedonic motivation will have longer product browsing and they enjoy the process as a pleasure in fulfilling their passions which can further enhance impulsive buying (Erkip, 2005). Besides, consumers who have high impulsivity rates can consider utilitarian value in conducting product browsing so they are willing to buy the product (Lee, Namho, 2017).

Currently, the phenomenon of impulsive buying does not only occur in one country but in some countries. Harris’ interactive survey findings showed that more than 60% of American consumers make purchases impulsively (Lim, Se Hun et al., 2017). Another survey
conducted by ING to 12,403 people in 13 European countries, found that 42% had made impulsive buying. In Indonesia, there is also the same phenomenon in which individuals make impulsive buying. Handi Irawan stated that Indonesian consumers mostly have the characters of doing without planning and during shopping they often become impulsive buyers (Ida and Dewi, 2016). Based on the data from Indonesian Research Company, The Nielsen Company in 2011, which had been conducting research on people in five big cities in Indonesia, as much as 21% of shoppers never plan what they want to buy. The findings of this research indicated that the trend of impulsive shoppers in Indonesia is increasing every year (bisnis[tempo.co]). Some types of consumption of products derived from impulsive buying, the most common is on the purchase of fashion products such as clothing, accessories and jewelry (Park and Kim, 2006). It is supported by research conducted by Dittmar et al. (1995) which states that impulsive buying are often made on fashion products such as clothing, accessories and jewelry.

This research was conducted based on the phenomenon of impulse buying that has been described above as well as the differences in the research findings conducted by previous researchers. The research aims to analyze: (1) direct influence of online shopping motivation and product browsing to impulsive buying of fashion products on social commerce, (2) direct influence of online shopping motivation toward product browsing of fashion products on social commerce (3) indirect influence of online shopping motivation through product browsing to impulsive buying of fashion products on social commerce.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

There are several researches that have been conducted by academics in studying the relationship between online shopping motivation and product browsing of impulsive buying behavior. For example, researches conducted by Martje, (2016); Febe et al., (2016); Maha and Samreen (2015); Lia and Citra (2015); Kosyu et al., (2014) their researched found that hedonic motivation has a significant direct influence on impulsive buying behavior. Furthermore, researches by Lim, Se Hun et al. (2017) and Rezaei et al. (2016) showed that hedonic and utilitarian motivations in online shopping has a direct influence on impulsive buying. However, there are differences in the findings of research conducted by Cahyono et al. (2016) which stated that hedonic and utilitarian values have no direct influence on impulsive buying in shopping. The findings of this research were also supported by Lizamary and Edwin (2014) and Fatchur (2009) which found that there was no significant influence between hedonic motivation on impulsive buying behavior. In addition, research conducted by Lee, Namho (2017) showed the findings that the motivation of one’s utilitarian value in shopping through social commerce sites has no significant influence in encouraging impulsive buying.

In addition, some researchers have previously conducted research on the influence of product browsing on impulsive buying behavior. For example, a study conducted by Gultekin and Ozer (2012) found that product browsing had a significant influence on impulse buying and product browsing was a mediating variable between hedonic motivation and impulse buying. The findings of this research were supported by Floh and Mädlerberger (2013) which stated that product browsing activity may have a direct influence on impulsive buying. Other research findings showed the relationship between hedonic and utilitarian motivations toward product browsing. For example, research conducted by Gunes and Jugurnauth (2014) obtained the findings that hedonic motivation had a direct influence on product browsing. Meanwhile, research conducted by Mikalef et al., (2013) obtained the findings that hedonic and utilitarian motivations had a significant impact in affecting product browsing. However, different research findings were found by Lumintang (2012) in which there was no significant influence between product browsing and impulse buying and hedonic motivation through product browsing toward impulsive buying. Furthermore, a research conducted by Gunes and Jugurnauth (2014) found the findings that not all dimensions in utilitarian motivation have a significant influence on product browsing.

III. WRITE DOWN YOUR STUDIES AND FINDINGS

Research Design

The type of this research is quantitative research using the design of causality research which aims to know the influence of online shopping motivation and product browsing on impulsive buying of fashion products on social commerce i.e Instagram. There are four variables in this research namely hedonic motivation (X1) and utilitarian motivation (X2) as independent variables or exogenous variables; product exploration (Y1) as an intervening variable or a mediating variable; and impulsive buying (Y2) as a dependent variable or endogenous variable. The hedonic motivation variable is measured by using five dimensions: trend discovery (TD), socializing (SO), adventure (AD), gratification shopping (GS) and value shopping (VS). Meanwhile, the utilitarian motivation is measured by using four dimensions: convenience (CV), cost saving (CS), information availability (IA) and product selection (PS). There are as many as 33 indicators used in this research. This research uses primary data through questionnaires distribution and the use of likert scale from 1 to 5 (1 = strongly disagree to 5 = strongly agree).

The analysis technique used in this research consists of descriptive analysis by looking at the frequency table of respondent characteristics and quantitative analysis by using Structural Equation Model (SEM) analysis method. The model development of this research applies second-order confirmatory factor (SOCF) technique which is two-level measurement model and estimation method used is Maximum Likelihood Estimation (MLE).
Population and Sample Research

The population of this research is all female consumers who have made the purchase of fashion products online on social commerce i.e Instagram. Research sampling is carried out using non-probability sampling technique namely purposive sampling in which the selection sample is based on certain criteria, namely: female consumers who have made the purchases of fashion products (such as clothing, shoes and bags) on Instagram without pre-planning; they have purchased fashion products for at least the last three months; and they aged between 18-35 years. The number of samples used in this research is as many as 300 respondents.

Results Findings

The findings of this research indicated that the online shopping motivation on the variable of hedonic motivation has significant direct influence on product browsing and impulsive buying, whereas the variable of utilitarian motivation only has a direct influence on product browsing. The variable of product browsing has a direct influence on impulse buying. In addition, online shopping motivation has indirect influence through product browsing on impulse buying meaning that the variable of product browsing is the variable that mediates between online shopping motivation and impulsive buying.

IV. GET PEER REVIEWED

Here comes the most crucial step for your research publication. Ensure the drafted journal is critically reviewed by your peers or any subject matter experts. Always try to get maximum review comments even if you are well confident about your paper.

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V. IMPROVEMENT AS PER REVIEWER COMMENTS

Based on the findings of this research, there are several suggestions that can be given such as: (1) For online retailers, it is advisable to pay more attention to the most dominant factors of online shopping motivation and product browsing that can affect the occurrence of impulsive buying. It is the basis for consideration for online retailers in devising effective marketing strategies to increase product sales volume. These marketing strategies include promotional programs, competitive pricing, fast response in serving online consumers, providing complete information on the fashion products offered in Instagram, offering fashion products that always follow the trend, and creating a good communication relationship with the consumers. (2) By the increasing interest of the community in online shopping and to improve the micro, small and medium enterprise (MSME) industry, the government should actively socialize the methods of selling and marketing of online products to MSMEs in order to increase its competence in the current globalization era. (3) Further research should be conducted to other types of online media instead of Instagram with different types of products such as online food products that currently become one type of product that is in great demand by online consumers in addition to fashion products. (4) For the future researchers, it is advisable to discuss other factors that may affect consumer’s impulsive buying behavior during shopping, such as situational and cultural factors. (5) Further research is expected to be not limited to female consumers but also to male consumers considering that currently many male consumers have made a purchase of fashion products on the social commerce website of Instagram.

VI. CONCLUSION

This research aims to analyze the direct and indirect influence of online shopping motivation and product browsing on impulsive buying; in which the variable of product browsing is the mediating variable between online shopping motivation and impulse buying. The findings of this research indicated that the online shopping motivation on the variable of hedonic motivation has significant direct influence on product browsing and impulsive buying, whereas the variable of utilitarian motivation only has a direct influence on product browsing. The variable of product browsing has a direct influence on impulse buying. In addition, online shopping motivation has indirect influence through product browsing on impulse buying meaning that the variable of product browsing is the variable that mediates between online shopping motivation and impulsive buying.

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The preferred spelling of the word “acknowledgment” in American English is without an “e” after the “g.” Use the singular heading even if you have many acknowledgments.

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Assessment of the Achievement of Information and Communication Technology Policy in Technical Colleges in Adamawa State

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Abstract- The main purpose of the study was to assess the achievement of ICT policy in technical colleges in Adamawa State. Two research questions were used to guide the study. The study adopted descriptive survey design. The population of the study comprised 2465 teachers and students. The sample of the study comprised 32 teachers and 113 students. The instrument used for data collection was a structured questionnaire of Likert-type scale. The instrument was validated by two experts in department of Technology Education, Modibbo Adama University of Technology (MAUTECH) Yola. The reliability of the instrument was determined by using the test-retest techniques, whereby reliability coefficient of 0.73 was obtained using the Pearson Product Moment Correlation Formula. Statistical Package for Social Science (SPSS) was used to analyze mean for each research question. The findings of the study revealed that ICT facilities are not available and human resources for implementing ICT policy are inadequate in technical colleges in Adamawa State. However, base on the findings of the study, the researcher recommended that Adamawa state government should provide more ICT facilities to technical colleges and regularly organize seminars for teachers in ICT application in teaching and learning process.

I. INTRODUCTION

Technical college is an institution that prepares students for careers at various levels ranged from trades to lifelong craft and for educational furtherance in the fields of engineering, technology and business (Oluwatumbi, 2015). Graduates of technical colleges are expected to acquire practical skills in their respective trades, as well as basic Information and Communication Technology (ICT) literacy to enable them to design, maintain and use modern equipment (Robert,2011). Similarly, Shambirna’ah and Abana (2017) observed that the roles of craftsmen and technicians can only be realistic if information and communication technology is implemented in technical colleges, because ICT has ability to enhance skill acquisition and it offers unlimited means of achieving academic goals (Gabriel, Olaniyi and Saliu, 2010).

Information and Communication Technology (ICT) can be describe as electronic technology used for storage, sending, and retrieval of information (Adomi and Kpangban, 2010). ICT encompasses modern technological devices used for storing, sending, retrieving, and researching of information (Andoh, 2012). This study specifically describes ICT as modern technology that is used for communication, recording, storage, retrieval and dissemination of information in forms of text, symbol, graphic, and oral. Having recognized the ICT potential in education system, the revised national policy on education (FRN, 2013), re-emphasized that there is need for ICT integration at all levels of education. In line with the above policy, the Nigerian Educational Research and Development Council (NERDC) initiated curriculum reform for effective implementation of ICT policy in schools and colleges. Consequently, national policy on Information Technology (FRN 2012) identified frameworks for the achievement of ICT in schools and colleges. These includes provision of ICT infrastructures, ICT facilities, ICT skilled human resources and making ICT compulsory subject under general studies in schools and colleges. Although ICT integration in education is faced with challenges, which includes lack of power supply and unstable education polices. These challenges are longing for an immediate attention more especially in technical colleges, because most of the graduates of technical colleges in Nigeria are incompetent, half-baked and lack employable competencies (Gali, 2016). Therefore this study is focused on the assessment of the achievement of Information and Communication Technology (ICT) policy in government technical colleges in Adamawa State.

II. STATEMENT OF PROBLEM

The recent increase of unemployment among the graduates of technical colleges is attributed to lack of employable skill acquired in their respective trades, despite the enormous gain obtained from information and communication technology. Dawha and Medugu(2017) observed that the rate of unemployment existing among technical college graduates has attributed to inability of the students to identify and nurture their entrepreneurial potential required in the labour market. This is contrary to the aims of establishing technical and vocational education in Nigeria. Therefore, this study intends to assess the available resources that can implement Information and Communication Technology (ICT) policy in technical colleges in Adamawa State.
III. PURPOSE OF THE STUDY

The main purpose of the study is to assess the available resources that can implement Information and Communication Technology (ICT) policy in technical colleges in Adamawa State. Specifically, the study sought to assess:

1. The available facilities for implementing ICT policies in technical colleges in Adamawa state.
2. The adequacy of human resources for implementation ICT policies in technical colleges in Adamawa State.

IV. RESEARCH QUESTIONS

This study answered the following research questions which guided the study:

1. What are the available facilities for implementing ICT policies in technical colleges in Adamawa State?
2. How adequate are human resources for implementation ICT policies technical colleges in Adamawa State?

V. SIGNIFICANCE OF THE STUDY

The findings of this study will be significant to students, teachers, parents, school administrators, and Adamawa State government. Students will benefit from the findings of this study by the time Adamawa State government complied with the recommendations of the study, students will be exposed to the uses of ICT facilities and developed ICT skills that will give them gainful employment. It will also help the students to develop self-study ability and it will make lesson more interesting and easy to comprehend. Teachers will benefit from the findings of this study, by the time Adamawa State government complied with the recommendations of the study. This will help teachers to prepare their lesson easily real, interesting and provides good time management during lesson delivery. Parents will benefit from the findings of this study by the time Adamawa State government complied with the recommendations of the study. ICT in education will be fully implemented in technical colleges; this will help to acquire knowledge and marketable skills that will lead them to employment. School administrators’ will benefit from the findings of this study, by knowing the strength, weaknesses and factual information on ICT implementation in technical colleges. This will guide the Adamawa State government to plan for the subsequent ICT programmes in schools and colleges.

VI. METHODOLOGY

Descriptive survey design was adopted for this study. The population of the study comprised 2465 teachers and students. Random sampling technique was employed to select 32 teachers and 113 students for the study. The instrument used for data collection was structured questionnaire of 23 items based on a five points rating scales. Two experts in department of Technology education, Modibbo Adama University of Technology (MAUTECH) Yola, were served with copies of the questionnaires for face validation. Pilot tested was conducted on 15 samples from Federal Science Technical College, Jalingo Taraba State. The reliability coefficient of 0.68 was obtained. The instrument was administered and collected after completion by three research assistants. Statistical Package for Social Science (SPSS) version 17 was used to analyze mean for each research question. Item with 3.50 and above was agreed, while item with less than 3.50 was disagreed.

VII. RESULTS AND DISCUSSION

The results were presented and discussed in harmony with the research questions.

Research Question 1: What are the available facilities for implementing ICT policy in Technical Colleges in Adamawa State?

<table>
<thead>
<tr>
<th>S/N</th>
<th>Item</th>
<th>X₁</th>
<th>X₂</th>
<th>GX</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>closed circuit television system</td>
<td>2.03</td>
<td>4.17</td>
<td>3.10</td>
<td>disagree</td>
</tr>
<tr>
<td>2</td>
<td>video camera in your college</td>
<td>2.57</td>
<td>3.83</td>
<td>3.20</td>
<td>disagree</td>
</tr>
<tr>
<td>3</td>
<td>video camera accessories</td>
<td>1.92</td>
<td>3.90</td>
<td>2.91</td>
<td>Disagree</td>
</tr>
<tr>
<td>4</td>
<td>dubbing machines</td>
<td>2.25</td>
<td>4.13</td>
<td>3.19</td>
<td>Disagree</td>
</tr>
<tr>
<td>5</td>
<td>projectors with accessories</td>
<td>2.25</td>
<td>3.47</td>
<td>2.86</td>
<td>disagree</td>
</tr>
<tr>
<td>6</td>
<td>amplifiers in your college</td>
<td>4.00</td>
<td>3.67</td>
<td>3.84</td>
<td>agreed</td>
</tr>
<tr>
<td>7</td>
<td>microphones in your College</td>
<td>4.19</td>
<td>3.67</td>
<td>3.93</td>
<td>agreed</td>
</tr>
<tr>
<td>8</td>
<td>tripod stands for video camera</td>
<td>4.09</td>
<td>3.53</td>
<td>2.81</td>
<td>disagree</td>
</tr>
<tr>
<td>9</td>
<td>android phones in your College</td>
<td>3.64</td>
<td>4.00</td>
<td>3.81</td>
<td>agreed</td>
</tr>
<tr>
<td>10</td>
<td>internet connectivity</td>
<td>3.76</td>
<td>3.77</td>
<td>3.27</td>
<td>disagreed</td>
</tr>
<tr>
<td>11</td>
<td>educative video cassettes</td>
<td>2.13</td>
<td>4.00</td>
<td>3.07</td>
<td>Disagree</td>
</tr>
<tr>
<td>12</td>
<td>computer systems</td>
<td>4.15</td>
<td>3.90</td>
<td>4.03</td>
<td>agreed</td>
</tr>
<tr>
<td>13</td>
<td>Grand mean</td>
<td>2.83</td>
<td>3.34</td>
<td>3.34</td>
<td>Disagreed</td>
</tr>
</tbody>
</table>
Table 1 revealed that 8 items were rated disagreed, while 4 items were rated agreed out of 12 items listed on the available facilities for the implementing ICT policy in government technical colleges in Adamawa State. The grand mean 3.34 indicates that ICT facilities are not available for implementing ICT policy in Government Technical Colleges in Adamawa State. Specifically, the table revealed that most of the technical colleges in Adamawa State have computers, android phones, microphones and amplifiers.

**Research Question 2:** How adequate are ICT human resources for the implementation of ICT policy in Technical Colleges in Adamawa State?

Table 2 revealed that 8 items were rated disagree, while 3 items were rated agreed out of 11 items listed on the adequacy of human resources for the implementation of ICT policy in technical colleges in Adamawa State. The grand mean 3.14 is an evidence to show that there are inadequate human resources for the implementation of ICT policy in technical colleges in Adamawa State.

### Table 2: Mean Responses of Teachers and Students on the Adequacy of human resources for the implementation of ICT policy in Technical Colleges in Adamawa State

<table>
<thead>
<tr>
<th>S/N</th>
<th>Item</th>
<th>X1</th>
<th>X2</th>
<th>GX</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Adequate computer human resources.</td>
<td>3.08</td>
<td>4.08</td>
<td>3.34</td>
<td>Disagreed</td>
</tr>
<tr>
<td>14</td>
<td>Adequate experts in software maintenance</td>
<td>3.04</td>
<td>4.04</td>
<td>3.42</td>
<td>Disagreed</td>
</tr>
<tr>
<td>15</td>
<td>Adequate experts in hardware maintenance</td>
<td>3.21</td>
<td>4.20</td>
<td>3.32</td>
<td>Disagreed</td>
</tr>
<tr>
<td>16</td>
<td>Adequate educational technologists</td>
<td>2.10</td>
<td>2.10</td>
<td>3.14</td>
<td>Agreed</td>
</tr>
<tr>
<td>17</td>
<td>Adequate ICT store officers</td>
<td>1.93</td>
<td>1.93</td>
<td>2.87</td>
<td>Disagreed</td>
</tr>
<tr>
<td>18</td>
<td>Adequate equipments technicians</td>
<td>4.25</td>
<td>4.25</td>
<td>4.16</td>
<td>Agreed</td>
</tr>
<tr>
<td>19</td>
<td>Adequate camera men</td>
<td>2.24</td>
<td>3.06</td>
<td>2.65</td>
<td>Disagreed</td>
</tr>
<tr>
<td>20</td>
<td>Adequate projectionists</td>
<td>1.98</td>
<td>1.98</td>
<td>2.94</td>
<td>Disagreed</td>
</tr>
<tr>
<td>21</td>
<td>Adequate computer technicians</td>
<td>3.31</td>
<td>2.44</td>
<td>3.38</td>
<td>Disagreed</td>
</tr>
<tr>
<td>22</td>
<td>Adequate video camera men</td>
<td>2.83</td>
<td>2.83</td>
<td>3.43</td>
<td>Disagreed</td>
</tr>
<tr>
<td>23</td>
<td>Adequate graphic artists</td>
<td>3.95</td>
<td>3.95</td>
<td>3.94</td>
<td>Agreed</td>
</tr>
<tr>
<td></td>
<td>Grand mean</td>
<td>3.14</td>
<td>3.56</td>
<td>3.35</td>
<td>Disagreed</td>
</tr>
</tbody>
</table>

The following findings were made from the study:

1. Facilities for implementing ICT policy are not available in technical colleges in Adamawa State.
2. Human resources for implementing ICT policy are inadequate in technical colleges in Adamawa State.

**VIII. SUMMARY OF MAJOR FINDINGS**

The following findings were made from the study:

1. Facilities for implementing ICT policy are not available in technical colleges in Adamawa State.
2. Human resources for implementing ICT policy are inadequate in technical colleges in Adamawa State.

**IX. DISCUSSION**

The findings of this study were discussed based on the research questions of the study.

The finding with regard to research question 1 indicated that there are unavailable ICT facilities in Government Technical Colleges in Adamawa State. This finding concurred with Robert (2011) who conducted a similar study on information and communication technology awareness in technical colleges and found that most Government Technical Colleges in Nigeria are having unavailable ICT facilities. This finding is in consonance with Dukaro and Jude (2012) who revealed that only few government schools are having basic ICT facilities like computers. This implies that ICT facilities are not available for the implementing ICT programs in Government Technical Colleges.

The finding with the respect to research question 2 revealed that there are inadequate human resources for the implementation for ICT policy in Government Technical Colleges in Adamawa State. This finding agreed with Adegmile (2016) who revealed that there are inadequate ICT human resources in Government Technical Colleges that can implement ICT in the educational sector. This finding is in agreement with Adeusum (2010) who revealed that Government Technical Colleges has inadequate human resources that can implement ICT in technical colleges in Lagos State. On the other hand, the findings of Ajayi and Ekudayo (2009) also confirmed that there are inadequate human resources that can apply ICT facilities in teaching and learning process in schools and colleges.

**X. CONCLUSION**

Based on the findings of this study, it was revealed that ICT facilities are not available and human resources are inadequate for the implementation of ICT policy in government technical colleges in Adamawa State. Finally, the researchers recommended that Adamawa State Government should provide more ICT facilities, employ adequate human resources that can support ICT implementation and regularly organize seminars for teachers in ICT application in learning and teaching process in Adamawa State.
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The Philosophical Foundation Of The Corporation As A Legal Subject In Environmental Crime

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Abstract : The number of environmental cases and their consequences in various parts of the world, including Indonesia, proves that corporations can engage directly or indirectly in pollution and environmental destruction. Unlawful acts which result in harm to the interests of the people and the state. Research Objectives To know and understand the philosophical foundations of corporations as legal subjects in environmental crime. this type of research is normative juridical research. Normative juridical research is a method of legal research conducted by examining library materials or secondary materials only. The results showed that setting the philosophical foundation of the corporation as a legal subject and as a subject of criminal law has not been regulated thoroughly in the existing legislation. This raises doubts and ambiguities about the status of the corporation as a subject of law and as a subject of criminal law.

Keywords : corporation, subject of criminal law, environment

1. INTRODUCTION

The role of corporations to promote economic growth of a country, such as increasing tax revenues and living standards of society, create jobs, and contribute positively to the growth of a country. In fact, in some aspects the role of corporation exceeds the role and influence of a State. (Sutan Remi Syahdeini, 2007). Corporations have been known in the business world for centuries. Initially, the corporation was merely an imitating working container of some people who had capital, to gain mutual benefit and not yet as exclusively as today's corporations.

Nowadays corporations that fall into the category of giant corporations or multinational corporations have grown in many countries. They not only built the empire in their home country, but also in other countries, especially developing countries like Indonesia in order to gain greater profit. In 1978 the two largest corporations in the United States, General Motors and Exxon, each had sales exceeding $60 billion, an amount that far exceeds the total income of any US state and most countries in the world. (Sutan Remi Syahdeini, 2007). The data shows how much corporate power is multinational at the moment. Currently, according to Chinard and Yeager, it has been proven that multinational corporations have exercised political influence both on the government at home and abroad where the corporation operates. (Sutan Remi Syahdeini, 2007).

Corporations are no longer the same as they used a simple system. Various systems and methods in running their business continue to be developed in order to gain the maximum profit. Almost all aspects of human life involve corporations in it.

Corporations are commonly used in criminal law experts to refer to what is common in the field of civil law referred to as a legal entity (rechts person), meaning persons (persons) created by law. (Chancellor and Christine Kansil) Legal entities are distinguished in public legal entities and private legal entities. Public legal entities, ie countries, Level I and II Regions, Municipalities and Villages. Private legal entities such as Limited Liability Companies, Foundation, Institution, Cooperative, Mosque and Church. Legal entities have the tools (organs) of people as supervisors who act as a mere tool of the legal entity. Because the tools are people or human beings, it is necessary that the requirements of the laws of law inherent in the human body, such as the subject's fault, the unlawful act may also be fulfilled by the corporate bodies (corporations). An unlawful act committed by a human being, who happens to be a tool of the corporation, may be regarded as a direct act of the corporation. Surely that person should act as a tool of the corporation, meaning that he should not get out of the corporate work environment and act on a corporate charter.

The main problem of any modern society is not to want a large corporation, but what can be expected against such a large corporation to serve the public interest in the effort to realize the ideals of a nation that is a just and prosperous society. The public expects the corporation not only to run its business on the economic principle of seeking great profits but also having the obligation to comply with the laws of the economy and the environment. Some of the expected role of corporations in the
process of modernization or development, among them pay attention and foster the preservation of natural resources and environmental capabilities. Aligning between development and the environment is not an easy thing, for it needs to be implemented environmentally sustainable development.

Sustainable development with an environmental perspective requires solid alignment and coordination between the utilization of human resources and natural resources over time, space, and coordination to be effective, effective and efficient. This principle has been recognized since the Stockholm environmental conference in 1972, in which one of its declarations stated that, in the context of more rational resource management to improve the quality of the environment, an integrated and coordinated approach to environmental sustainability development planning was decided. (Aca Sugandhy and Rustam Hakim, 2007) With this principle, it is hoped that development will be in accordance with the efforts of environmental protection and enhancement, in order to be beneficial to the community, and to the people themselves.

Human beings in principle have the ability to carry out sustainable development, thus ensuring the fulfillment of human needs for today, without diminishing the rights of future generations to meet their needs for natural resources. Sustainable development is a process of development that optimizes the benefits of natural resources and human resources in a sustainable way, by harmonizing human activities in accordance with the ability of natural resources that support it in a space of land, sea and air as a whole. (Aca Sugandhy and Rustam Hakim, 2000).

The use of natural resources must be harmonious, harmonious and balanced with environmental functions. As a consequence, development policies and plans must be imbued with the obligation to manage the environment. Environmental management departs from the basis stated in the 1945 Constitution of the Republic of Indonesia (UUD NRI) as the constitutional basis of the state in Article 33 paragraph (3) which mandates that the earth, water and natural resources contained therein shall be controlled by the state and used for the greatest prosperity of the people.

The Republic of Indonesia is known by the world as the country with the largest natural resources in the world, covering both natural resources on land and natural resources at sea. Under these conditions Indonesia should not deserve the title as a developing country. The country's natural resource potentials such as oil, coal, gold, silver and copper and natural resources in the form of tropical forests contain economic value that enables Indonesia to become a developed country in the world.

The abundant natural resources in Indonesia has been given by God to be utilized by humans for their survival, even though human beings are given unlimited legalities, but are expected to utilize natural resources wisely in order to preserve the function of the environment for present and future generations as the next generation the ideals of the Indonesian nation.

The utilization of natural resources must be implemented based on the carrying capacity and the capacity of the environment by taking into account the continuity of environmental processes and functions, the sustainability of life productivity and the quality of life and welfare of the people.

Law Number 32 Year 2009 on Environmental Protection and Management (hereinafter abbreviated as PPLH Law Year 2009) in general explanation emphasizes Indonesia's environment must be protected and managed properly based on the principle of state responsibility, the principle of sustainability, and the principle of justice. In addition, environmental management should be able to provide economic, social and cultural benefits based on prudent principles, environmental democracy, decentralization, and recognition and respect for local wisdom and environmental wisdom.

In the 1950s, many major cities in the world, such as Los Angeles, experienced smoke-fog environmental problems from vehicle exhaust gases and factories. Smoke and fog that envelops the city can last for days, thus disrupting health, especially the respiratory tract and damaging plants. In Japan at the end of 1953 there was a terrible disease in Minamata bay due to methylmercury and cadmium poisoning, which came to be known as "minamata disease". The disease is caused by consumption of contaminated fish by methylmercury which is sourced from mercury containing (Hg) wastes from some chemical plants that money into Minamata Bay. (Otto Soemarwoto, 1991). A similar disease occurred again in 1964-1965, which afflicts the fishermen and their families living around the island of Nigata located on the North Sea Coast of Japan, Tokyo. Then, the "explosion" of the three similar diseases occurred in 1973 in Goshonoura, Amakusa Island which is faced with Minamata Bay. In addition, in the 1960s in Japan there has also been a cadmium metal poisoning (Cd) disease from a zinc mining company (Zn) owned by Mikioki Corporation in Toyama Prefecture, later known as Itai-itai Disease. (Otto Soemarwoto, 1991).

Then between 1984-1987 there has been a crisis or environmental cases that hit the world. For example, droughts in Africa, India and Latin America, and floods all over Asia, parts of Africa and the Andes region in Latin America, have resulted in millions of people suffering. Leakage of a pesticide factory in Bhopal, India, has killed more than 2,000 people and injured and caused blindness to more than 200,000 others. The explosion of a liquid gas tank in Mexico City has killed 1,000 people and left thousands homeless. Then, the explosion of the nuclear reactor Chernobyl, Russia, has sent nuclear dust throughout Europe, increasing the risk of cancer in humans. Agricultural chemicals, solvents and mercury spilled into the Rhine when there was a fire in a warehouse in Switzerland, killing millions of fish and contaminating drinking water in the Republic of Germany and the Netherlands. (Bambang Sumantri, 1988).

In the Association of Southeast Asian Nation (ASEAN) region, environmental problems occurred in Sarawak, Malaysia, when the area was attacked by malaria epidemic. To combat this malaria disease is used DDT, but some other animals that are not a target of spraying such as lizards and cats are also dead. The extinction of this cat has caused the jumping population of mice, which ultimately transmit typhus disease. (Siahaan, 1987). Other frequent environmental problems in the EAN region include illegal logging and air pollution due to roots or forest burns that disrupt neighboring countries, such as Malaysia and Singapore.

Similarly in Indonesia, environmental problems are also not new. The problems of the national environment in the form of pollution and environmental destruction in its development continue to occur, even tended to get worse, especially after the reform era and regional autonomy. Some cases of environment that reached the green table, among others the Cendrawash Bird, Irian Jaya (1984), the case of Waste Tahu and Pig Waste, Sidoarjo East Java (1989), PT Inti Indorayon Utama case, North
Sumatra (1989), PT Sarana case Surya Sakti, Surabaya (1991). There are several cases occurring in the era of regional autonomy such as Pollution of Way Seputh, Central Lampung (2002), Wildlife Wildlife trade in South Sumatera and Lampung (2003), and Buyat Bay case by PT Newmont Minahasa Raya (2004), PT Freeport (2005-2006), and the case of the Sidoarjo Hot Mud (PT Lapindo Brantas) that occurred since 2006. However, with the weaknesses of existing legal structures and substances, the cases in their resolution have not met expectations. (Siahaan, 1987)

New hope arose when the judges of the district court Meulabo, Aceh Regency sentenced the director of PT Kalista Alam eight months in prison and a fine of . 150.000.000 IDR (One hundred and fifty Million tiah) subsider three months imprisonment, through decision No. 132 / Pid. B / PN MBO. In the verdict of the judges' judgment, the judge assessed PT Kalista Alam as guilty of clearing palm oil plantation on peatland of Tripa Swamp in Darul Makmur Sub-district, Nagan Raya District without permission. PT Kalista Alam decided to violate Article 46 paragraph 2 of Law no. 18 Year 2004 on Plantation. The crime committed by Kalista Alam has resulted in heavy losses to the management of natural resources in Aceh. Losses are not only material, but also environmental losses that impact tremendous to the next life so it needs to do environmental restoration. (Sinar Harapan, Monday August 18, 2014).

On January 8, 2014 the Meulaboh District Court granted the civil lawsuit of the Ministry of the Environment to PT Kalista Alam and sentenced the palm oil corporation to pay material compensation and environmental recovery costs of Rp. 366 billion more because it was proven to open the land by burning illegally in the Peat Swamp, Aceh Province. The judge mentioned PT. Natural Kalista proved to be unlawful for burning 1000 hectares of peatland in Suac Bahong, Darul Makmur District, Nagan Raya District 2009-2012. For the mistake that PT. Natural Kalista must pay material compensation in cash to KLH as plaintiff through State treasury account of Rp. 114,333,419,000. The oil palm plantation company must also pay a fee for environmental restoration measures against the burned land of Rp. 251,765,250,000. PT. Natural Kalista proven to pollute and destroy the environment and it must be overcome by way of recovery on burning land. (Sinar Harapan, Monday August 18, 2014).

The number of environmental cases and their consequences in various parts of the world, including Indonesia, proves that corporations can engage directly or indirectly in pollution and environmental destruction. Unlawful acts which result in harm to the interests of the people and the state. By looking at the phenomenon of pollution and environmental destruction as well as the violations of the law which can be done by the corporation as mentioned above, which has a very wide negative impact on every part of the society's life then the position of corporation began to be considered not only subject to civil law but also subject in criminal law, so as to prosecute and be punished or criminal liability for criminal acts that have occurred. Based on the background as described above, then more concretely the problem in this research can be formulated as follows: What is the philosophical foundation of the corporation as a legal subject in environmental crime?

Research purposes

To know and understand the philosophical foundations of corporations as legal subjects in environmental crime.

2. RESEARCH METHOD

A. Types of Research

Understanding legal research according to Peter Mahmud Marzuki is a process to find the rule of law, legal principles, and legal doctrines to address the legal issues faced. (Peter Mahmud Marzuki, 2006). Moving from the understanding, then this type of research is normative juridical research. Normative juridical research is a method of legal research conducted by examining library materials or secondary materials only. (Soejoeno Soekanto and Sri Mamudi).

B. Problem Approach

This research is a normative or doctrinal legal research completed with empirical data, which will examine and analyze corporate legal responsibility to environmental pollution in Indonesia.

The approach used in the study adapted to the problems to be studied. The first problem is using normative legal research with a philosophical approach to examine and analyze the philosophical foundations of corporations as legal subjects in environmental crime.

C. Source of Legal Material

The source of legal material in this research comes from library research, where library research uses primary legal materials, secondary law materials and tertiary legal materials. The primary legal material is a material that is binding because it is issued by a government or an authoritative institution. And secondary sources of law are materials in the form of books and other printed materials, as well as software, that is by accessing some data through the internet (download) various books, scientific journals and research results, as well as tertiary legal materials are legal materials of a nature supporting primary law materials and secondary legal materials (Devi K. G Sondakh, 2009).

D. Data Collection Technique

In this study, data collection techniques used are primary legal materials and secondary legal materials. The research materials in the form of primary legal materials and secondary legal materials referred to in this study are:

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1. The 1945 Constitution of the State of the Republic of Indonesia
2. Law No. 8/1981 on the Criminal Procedure Code
3. Law no. 32 of 2009 on the protection and management of the environment
4. Law no. 18 of 2013 on forestry
5. Law no. 39 Year 2014 on plantations
6. Law no. 4 of 2009 on MINERBA

Secondary legal materials include materials that support primary legal materials such as textbooks, articles in various scientific magazines or research journals in the field of law, papers presented in various forms of meetings such as discussions, seminars, workshops, and others.

3. RESULT AND DISCUSSION

A. Corporations Are the Subject of Law

Etymologically, corporate sense in other terms is known as corporatie (the Netherlands), corporation (English), corporation (Germany), derived from the Latin word "corporatio". "Corporatio" as a noun (substantivum) is derived from the verb "coporare" which is widely used in medieval or later times. "Corporare" itself comes from the word "corpus" (body), which means giving the body or mixing. (Muladi and Dwidja Priyatno, 1991). Thus, finally "corporatio" means the result of comparative work, in other words the body of the person, the body acquired by human action as opposed to the human body, which occurs according to nature ".

According to Rahardjo, the body he created consisted of the corpus, the physical structure and into which the law incorporates elements of animus that make the body has a personality. Since this legal entity is a legal creation, except for its creation, its death is also determined by law, the corporation can act as human in general, only, concerning corporations such as rights, obligations, and responsibilities are governed by law. With the regulation of corporations as legal subjects, it is expected that corporations that perpetrate such crimes may be held accountable by law.

There are several definitions put forward concerning corporations. According to Sutan Remi Sjahdeini, the corporation can be seen from its narrow meaning, as well as its broad meaning. Then Sutan Remi Sjahdeini revealed that: (Sutan Remi Sjahdeini, 2007)

"According to its narrow meaning, namely as a legal entity, a corporation is a legal figure whose existence and authority to be able or authorized to perform legal acts are recognized by civil law. That is, it is the constitutional law that recognizes the "existence" of the corporation and gives it "life" to be able to exercise legal action as a legal figure. Likewise, the "death" of corporations, a corporation is only "dying" legally if the "death" of the corporation is recognized by law ".

Furthermore, Sjahdeini (Sutan Remi Sjahdeini, 2007), suggests the meaning of corporations in a broad sense can be seen from the definition of corporations in criminal law. According to him, in criminal law, corporations include both legal entities and non-legal entities. Not only are legal entities such as limited liability corporations, foundations, cooperatives or associations authorized as legal entities classified as corporations under penal law, but also firm, partnership or CV, and partnership or maatschap, civil law is not a legal entity. From the description, it can be seen that there is a difference of understanding of corporation in the field of civil law with the definition of corporation in the field of criminal law. In the field of civil law, the meaning of corporation is a legal entity, whereas in the field of criminal law that is meant by corporation is not only legal entity, but also non-legal entity.

The term corporation in Indonesian law or commonly known as Civil Company is known only in the Civil Code. In Article 1654 of the Civil Code, it is stated that the Corporation may be defined as: "A civil company is an agreement between two or more persons, pledging to enter into the company for the purpose of obtaining profit from the enterprise they are. "Based on this explanation, the corporation has been recognized in civil law since its inception and has been placed as the subject of law. There are two kinds of legal subjects in terms of civil law are:

a. Natuurlijke Persoon (natural person) is a personal person (Article 1329 Civil Code).

b. Rechtspersoon (legal entitle) is a legal entity (Article 1654 KUH Perdata).

Therefore the concept of corporation in civil law has equal / equaled with human being as subject of law. Hence against the person and corporation as a legal entity may prosecute and or be prosecuted legally. This confirms that the constitutional law has established corporations as legal subjects.

According to the opinion of the author In fact not only individuals or individuals who are able to have rights and obligations but there are also other parties who have rights and obligations of the corporation, where in conducting corporate business activities aim to gain the maximum profit in various ways including by fighting the law by exploring and exploiting the environment without thinking about the impact of the small / small to the environment and society for it needs to regulate the corporation as a legal subject in order to realize the order of a peaceful society, sejahterah, and provide legal certainty, security, peace, or a harmonious life will can be realized.

In Article 1 Sub-Article 1 of Law Number 31 Year 1999 concerning the Eradication of Corruption Act states that the corporation is an organized group of people and / or wealth, whether it is a legal entity or non-legal entity.

What is meant by a body incorporated association is a company which is due to its nature is liable with limited responsibilities limited to the capital invested. While a non-legal entity is defined as a company which by its nature and form has a broad responsibility personally. (Zainal Asikin, 2014). Non-legal partnership consists of:

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www.ijsrp.org
a. Individual Company

A sole proprietor is established simply by administering SIUP (Trade Trading License) at the trading office, as well as taking care of the Taxpayer Identification Number (NPWP) at the tax office. For those who establish individual companies of more than one person then they must enter into agreements on the company to be established by a written deed or an authentic deed. (Zainal Asikin, 2014).

b. The Civil Guild

A civil fellowship shall be governed by the provisions of Article 1618 of the Civil Code which state that maatschap is a covenant with which two or more persons commit themselves to enter something in fellowship with a view to dividing the profits derived therefrom. So a civil partnership or a civil company is a form of cooperative agreement. Civilian fellowship is the simplest form of partnership, because:

1) In the case of capital, there is no stipulation of "magnitude" of capital;
2) In the event that an income in a partnership or maatschap, other than money or goods, may contribute only to labor;
3) The work field is not restricted, nor in the field of trade;
4) No announcement to third parties as done in the firm. If otherwise stipulated in the agreement or agreement, this cooperation shall enter into force upon the date of approval.

Agreements in civil fellowship generally contain the following:
1) Profit sharing. If the profit sharing is not regulated, then the provisions of the law shall apply;
2) The purpose of cooperation;
3) Time and duration;

   The establishment of a civil partnership (maatschap) can be done through a simple agreement, and there is no formal submission or no governmental approval is required. Its stand can be verbally but may also be based on the deed of establishment, either by written or verbal agreement.

   Dissolution and completion of maatschap by itself dispersed or expired in the event of:
1) The passage of time specified in the maatschap agreement;
2) The loss of goods or the completion of the act which is the subject of the partnership;
3) at the sole and some will or a partner, but the will is based on good faith;
4) If one of the partners is dead or placed under the capability or declared bankrupt.

c. Fellowship Firm (Fa)

Firm is a civil partnership established to run a company with a common name or firm. So the firm has the following elements:

1) The civil union (Article 1618 Civil Code)
2) Running company (Article 16 KUHD)
3) By joint name or firm (Article 16 KUHD)
4) The responsibilities of allies are personal to the whole (Article 18 KUHD).

   Firm is established with an authentic deed made before a notary (Article 22 KUHD). The deed of incorporation contains the articles of association of the firm consisting of:
1) The full name, occupation and residence of the allies;
2) A joint name or firm's resident;
3) Firm is general or limited to running a certain field of business;
4) The names of allies who are not authorized to sign an agreement for the firm;
5) At the start and end of the firm;
6) Third party provisions on third parties against allies.

   The deed of incorporation of the firm shall be registered with the Registrar of the District Court whose jurisdiction covers the domicile of the relevant firm (Article 23 KUHD). Then the deed of establishment must be published in the State Gazette or Supplementary State Gazette (Article 28 KUHD).

Firms are incorporated into non-legal entities because:
1) There is no separation of property between communion
2) with personal allies, every ally
3) be personally responsible for the whole;
4) There is no requirement of ratification of the deed of establishment by the Minister of Justice.

Firm ends if: the time period applied in the household budget, before the expiry of the period (because there are allies who resign or dismiss allies).

   The dissolution of the firm shall be carried out by an authentic deed made before the notary, registered to the local District Court Army and announced in the State Gazette. This omission of registration and announcement resulted in no resignation of the firm, resignation or dismissal of any allegiance or amendment of the articles of association to a third party.
d. Fellowship Commanders (CV)

According to Article 19 of the Civil Code, a CV is a company to run a company formed by one person or several Persero Persons who bear responsibility for all (solidary responsibility) on one side, and one or more persons as a goldschwocher other parties.

The regulation of CV in KUHD is only contained in three articles namely Article 19, 20 and 21 KUHD. The location of the arrangement is in the midst of the rules regarding the firm. This is understandable considering that principally the partnership partnership is also a firm-specific partnership of firma. The specificity lies in the commanding partnership, which in the firm there is no such arrangement. In the firm fellowship there are only "firmant" allies while in a partnership alliance consisting of allied labor and allied partners, ie non-employed allies (allies giving income only do not take care of the company). Thus, the allies in a commanditarian alliance consist of:

1) Allied work (active) companies called complementary allies;
2) The allies are not the (passive) employment of the so-called commander's partners.

Both active allies and passive allies each provide money, physical or mental inputs on the basis of co-financing, that is, the profit is shared between the allied employee and the partner's allies, even though the responsibilities of a limited partner ally are limited to the enabling capital to be included.

Establishment of CV must be made by an authentic deed as a deed of incorporation by a notary authorized in the territory of the Republic of Indonesia. The deed of establishment was then registered at the Registrar of the District Court where the partnership of the association was domiciled. Then the summary of the deed of establishment of the partnership is published in the State Gazette of the Republic of Indonesia.

The matters contained in the deed of establishment are as follows:

1) The name of the association and its legal status;
2) The purpose and purpose of the establishment of the fellowship;
3) The start and end of the fellowship;
4) Equity capital;
5) The appointment of who is an ordinary ally and associate ally;
6) Rights, obligations, responsibilities of the respective allies; and
7) Distribution of profits and losses company partnership.

A legal entity shall consist of:

1. Limited Liability Company (PT)

Limited Liability Company (PT) was previously regulated in Articles 35-36 KUHD and Ordinance Indonesiche Maatschaoij Op Anndelen (IMA) S.1939 No. 569 jo 717. Then through the legal development program the government succeeded in making the Law of Limited Liability Company namely Law no. 1 of 1995 concerning Limited Liability Company which entered into force on 7 March 1996, and refined by Law Number 40 Year 2007.

Limited Liability Company (PT) is a legal entity which is a capital alliance, established under the agreement, engages in business activities with the authorized capital wholly divided into shares and meets the requirements stipulated in this law and its implementing regulations.

The characteristics of a Limited Liability Company are:

1) A legal entity has a separate property with personal property;
2) Capital consists of shares so that the shareholder's liability is limited to a number of shares it enters;
3) The system is more closed so that all technical operations, dissolution and other rules are regulated under the Act.

The establishment of a Limited Liability Company shall be by notarial deed and have a statute and a household budget to be ratified by the Minister of Law and Human Rights, and the obligation to register, announce to be in the board of directors. Subsequently registered to the Ministry of Industry and Trade and announced in the Supplement of the State Gazette.

In practice, certain types of Limited Companies are known: 1) Limited Liability Company Closed PT is a company where not everyone can participate in their capital by giving one or more shares. The criteria in a closed company is that its share certificates are issued entirely on behalf of PT. 2) Open Limited Company Open Limited Liability Company is a company that is open to everyone. A person can participate in his capital by purchasing one / more share certificates typically not written on behalf of. 3) General Limited Liability Company Public Company is an open company, whose capital needs are obtained from the public by selling its shares in the stock (capital market). 4) Individual Limited Liability Company A limited liability company can not be established by just one person, because the company is an agreement, and agreements are only possible by at least two persons. However, once a limited liability company stands, it is possible that all shares fall in one hand so that only one shareholder becomes the director.

Article 1 paragraph 2 of the Limited Liability Company Law stipulates the organ of the Limited Liability Company namely:

1) General Meeting of Shareholders (GMS)

GMS are organs of corporations that have powers that are not granted to the Board of Directors or the Board of Commissioners within the limits specified in this law and / or the articles of association. (Article 1 number 4 UUPT).

2) Board of Directors
The Board of Directors shall be the organ of the company which is fully responsible for the management of the Company for the purposes and purposes of the Company and to represent the Company within and outside the Court in accordance with the Articles of Association.

3) Commissioners.

The duties of the commissioners under the Limited Liability Company Law are to supervise the policies of the Board of Directors in running the Company and to provide advice to the Board of Directors of the Company. Limited Liability Company may be dissolved due to the following reasons:

1) Based on the resolutions of the GMS;
2) Since the establishment period specified in the articles of association has expired;
3) Based on the court's determination;
4) With the revocation of bankruptcy based on the decision of the commercial court that has had permanent legal force, the bankruptcy property of the company is not sufficient to pay
5) the cost of bankruptcy;
6) Since the bankruptcy of the Company which has been declared bankrupt is in an insolvent state as regulated in the Law concerning Bankruptcy and Suspension of Payment Obligations, or
7) Due to revocation of the Company's business license requiring the Company to liquidate in accordance with the provisions of the law.

a. Cooperative

Understanding cooperatives based on Article 1 Act No. 25 of 1992 on Cooperatives is a business entity consisting of a person or legal entity cooperative with the basis of its activities based on the principle of cooperatives as well as a people's economic movement based on the principle of kinship.

Cooperative capital is sourced from members either in the form of principal savings, mandatory savings, and voluntary savings. Whereas the establishment of cooperatives should be done by making the Articles of Association (AD) passed by the local Trade and Cooperative Office and announced in the Supplement of the State Gazette of the Republic of Indonesia.

Cooperative organs consist of meetings of members as holders of supreme authority, administrators as managers of day-to-day cooperatives and supervisors who act to supervise the actions of cooperatives.

b. Foundation

Foundation is a legal entity consisting of wealth separated and destined to achieve certain goals in the social, religious, and humanitarian fields. The Foundation may undertake business activities to support the achievement of its aims and objectives by establishing a business entity and / or participating in a business entity. The regulation on the foundation is regulated in Law Number 28 Year 2004 regarding Amendment to Law Number 16 Year 2001 regarding Foundation.

The foundation of the foundation is done by notarial deed and made in the Indonesian language. Whereas the ratification of the deed of establishment is submitted by the founder or proxy by submitting a written application to the Minister of Justice and Human Rights.

The organs of the foundation consist of the builder who is the organ of the foundation having authority not handed over to the board and supervisor by the Act or AD, the board which is the organ of the foundation that carries out the stewardship of the foundation and the supervisor who is the organ of the foundation in charge of supervising and giving advice to the board in running foundation activities.

c. State Owned Enterprises (SOEs)

Law Number 19 Year 2003 on State-Owned Enterprises is a Law on State-Owned Enterprises which was born after the reformation therefore according to the Act, the type of BUMN has also changed from previously State-Owned Enterprise (Perum), Company Negara Bureau (Perjan) and Perusahaan Negara Persero (Persero), so that with Law Number 19 Year 2003 the type of BUMN consists only of:

1). The Company (Persero)

The Limited Liability Company is a State-Owned Enterprise in the form of a Limited Liability Company (PT) whose capital / share is at least 51% owned by the government, with the aim of pursuing profit. The characteristics of Persero are: a. The establishment of a state shall be proposed by the minister to the President; b. Implementation of the establishment is done by the minister by observing the law; c. Its status is a limited liability company regulated by law; d. Capital in the form of shares; e. A part or all of the odalnya is the state property of separated state property; f. Company organs are GMS, directors and commissioners; g. The designated Minister has the power of holder b) shares owned by the government; a. If all shares are owned by the government, then the Minister shall be a GMS; b. GMS act as the highest authority of the company; c. Persero led by directors; d. Annual reports submitted to GMS for approval; e. Not receiving state facilities; f. The ultimate goal of making a profit; g. Business relationships are regulated in civil law; h. The employees are private employees.

2). Public Company (Perum)
Perum is a state company that aims to serve the public interest, but at the same time seeking profit. The characteristics of Public Companies (Perum) are:

a. Serving the interests of the general public;
b. Led by a director / director;
c. Owning his own wealth and moving in the private sector (Perum is free to make contracts with all parties);
d. Managed with government capital separate from state assets;
e. The employee is a private company employee;
f. Cultivate profits to fill state coffers.

### B. Corporations as the subject of Criminal Law

The subject of the law is anything that can have the right (Right is power, authority granted by law to legal subject) and obligation (Liability is the burden given by law to the subject huk) to act in law. While the Object of law is all things useful to the subject of law and can be the subject of a legal relationship undertaken by the subject of law. Based on this understanding can be studied further about the corporation as the subject of criminal law

Corporations began to enter the scope of Criminal Law as the subject of law since the emergence of corporate crime phenomenon. This phenomenon began to emerge in the developed world in the 19th century. Corporate Crime itself can be defined as: (See excerpt from The Law Reform Commission of New South Wales in Wikipedia, the free encyclopedia, Corporate Crime) "... crimes committed either by a corporation (ie, a business entity having a separate personality from the natural persons that manage its activities), or by individuals that may be identified with a corporation or other business entity."

The crimes committed by Corporations themselves often occur on a large scale and harm the public. As quoted from The Law Reform Commission of New South Wales, Australia: (Wikipedia, the free encyclopedia, Corporate Crime).

"Corporate crime poses a significant threat to the welfare of the community. Given the pervasive presence of corporations in a wide range of activities in our society, and the impact of their actions on a much wider group of people than are affected by individual action, the potential for both economic and physical harm caused by a corporation is great."

Seeing this phenomenon then appears the demand for corporate liability (corporate liability) in the field of Criminal Law. According Mardjono Reksodiputro there are two things that must be considered in determining corporate crime that is 8: (Mardjono Reksodiputro, 2007) 1. On the conduct of the board (or other person) to be constructed as a corporation act and secondly to the errors in the corporation. In his opinion, the first thing to be constructed in an act of management is also the act of the corporation then the "identification principle" is used. With this principle, the capability of the management or employees of a corporation is identified (equalized) with the actions of the corporation itself. 2. It is true that in criminal law the image of the perpetrator of crime is still often associated with the actions physically done by the maker (fysieke dader) but this can be overcome by the teaching of "functional performer" (functionele dader). With we can prove that the actions of the board or the corporate officer in the traffic of the society apply as the actions of the corporation concerned then their mistake (dolus or culpa) should be regarded as a corporate fault.

The current Penal Code does not regulate corporate criminal liability in the sense of not knowing corporations as a subject of crime, but some special laws outside the Criminal Code have recognized corporations as subjects of criminal offenses other than persons. Some legislation outside the Criminal Code that has governed corporations as a subject of criminal offenses, among others, Emergency Law no. 17 of 1951 on Landfill which is the first positive law to use the principle that corporations can become perpetrators of criminal acts.


Based on the above explanation, there is a misappropriation of the legal formulation of a corporation as a legal subject justified by legislation. In the general provisions of the Penal Code clearly does not include corporations as legal subjects. However, in some legislation outside the Criminal Code, corporations listed corporations as legal subjects. Something can be a subject of law because 1) has rights and obligations, 2) possesses legal competence, and 3) is legally recognized by law. The problems that are found will be different when talking about the corporation because at the moment, there is no regulation on corporations in the Criminal Code which is the basis of violation and criminal sanctions. So it is unreasonable to equate the corporation with "who", "whoever" or "anyone" is contained in the Criminal Code to impose corporal punishment on behalf of the corporation.

In the Indonesian criminal system, an act constitutes a criminal offense or violation of criminal behavior only when a criminal provision has determined that the act is a crime. This is in conformity with the validity of the legality principle as defined in Article 1 paragraph (1) of the Criminal Code, which reads: "No act shall be liable to be criminal except on the basis of criminal law in the legislation which before the act has been committed."

This provision assures that a person can not be prosecuted under the prevailing law provisions. This provision is also supported by his spirit in Law no. The principle of legality can also be found in Article 6 paragraph (1) of the Law, which reads: "No one can be brought before the courts, except the law of deciding otherwise."
So based on the above explanation the meaning of a criminal offense is a behavior that violates the criminal provisions that apply when the behavior is done, whether the behavior in the form of performing certain acts that are prohibited by criminal provisions or not perform certain acts required by criminal provisions. Whereas such conduct shall be done by human being as a legal subject known in the Criminal Code, but in this case under Article 59 of the Criminal Code, the corporation as the subject of the law is not known, the complete runtime of Article 59 of the Criminal Code is: "In cases where the offense is determined the penalty is threatened to management, members of the management board or commissioner of the commissioner, shall not be convicted of a board member, commissioner or commissioner who does not interfere with the offense."

In the Indonesian Criminal Code, there is not a single article that determines the perpetrators of non-human criminal acts. The establishment of the Criminal Code that only human beings who can be burdened with criminal responsibility is due to the existence of adagium actus non facit reum, nisi mens sit rea meaning "no crime without error", this adage is universally embraced in criminal law. This adage argues that one must have a state of mind or a mens rea that is directly related to the act. It is this view which then holds that corporations without heart can not be burdened with criminal responsibility. But as you know, corporations exist not only for granted, but certainly there are those who founded the corporation, and who founded the corporation that later had the heart. This thought then gave rise to the opinion that corporations can also serve as perpetrators of criminal acts. And along with human and social development of society also, the law must also seek new ways to cover the gaps that may occur that can cause economic instability, social and cultural society considering the law is as an umbrella for the justice seekers.

The development of this law is also in line with the development of criminal law in other countries. In special crime laws such as Law no. 5 Thn 1997 on Psychotropic, Law No. 15 tihn 2002 jo Law no. 25 tihn 2003 on Money Laundry, Law No.31 year 1999 jo Law no. 20 tihn 2001 on the Eradication of Corruption. And in the Draft Law of the Indonesian Criminal Code 2004 (RUU KUHP at the Directorate General of Legislation, Department of Law and Human Rights, 2004) it also appears to have given its understanding to the corporation listed in Article 166 as follows: "The corporation is an organized collection of persons and / or wealth, whether legal entities or non-legal entities ". All of the above laws have provided an understanding of the corporation derived from the notion of corporation in the Criminal Code Bill.

Bara Nawawi Arief, quoting from Nico Keijzer, wrote about the conditions that would place corporations as perpetrators of criminal acts, according to some legal rules in some countries as in: (Bara Nawawi Arief, 2002)

**a. American Model Penal Code (MPC) - section 2.07. (1): 1**

1) Where the intent of the legislator to impose liability to the corporation is clearly visible and the act is committed by a corporation agent acting on behalf of the corporation within the scope of position / task or occupation; or.
2) If the offense is a waiver / violation of a special obligation imposed on the corporation by law; or
3) In the event of a crime it is justified / authorized, requested, ordered, executed, or tolerated recklessly by the board of directors or by top management agents acting on behalf of the corporation within the scope of the task / job.

**b. Dutch Case Law (Dutch Jurisprudence):**

1) In the event of a violation of the provisions of the law specifically aimed at the corporation, for example the corporation does not meet the conditions of a permit granted to it. Therefore, the corporation is not considered to have committed a criminal offense in terms of the provisions of the Act specifically addressed to individuals.
2) Where the corporation is obliged to prevent the occurrence of a crime, but fails to do so (eg discrimination).
3) If the offense is related to the business field of the corporation concerned. For example a few days pollution caused by the sewage drain of a chemical company.

The opinions above explain that along with the progress of legislation, law enforcers are also looking for new rules in order to enforce these laws in all aspects. Where in the present, corporations mentioned can also be held accountable and can be used as perpetrators of crime. Thus, in the development of Indonesian criminal law, there are three systems of corporate status as the maker and accountability of corporations in criminal law, namely: (1) Corporate management as responsible maker and management, (2) Corporations as responsible makers and managers, (3) Corporations as the maker and the responsible. (Reksodiputro B Mardjono, 1989) Here's an explanation:

To further clarify the 3 systems of corporate standing as the maker and accountability of corporations in criminal law, the authors will explain further among others;

**a. Corporate Management As Responsible Builder and Board**

This system of accountability is a system adopted by the Criminal Code. The Criminal Code has the view that corporations can not be held liable for criminal liability because corporations have no heart and no guilty mind, corporations who have hearts as naturlijk person who can commit crimes, then corporate administrators can be given criminal liability. The establishment of this Penal Code is set forth in Article 59 of the Criminal Code. The provision that the criminal act is only committed by human is Article 53 jo Article 55 of the Criminal Code and Article 372 jo Article 374 of the Criminal Code, where Article 53 reads:

1) The trial of committing a crime shall be liable to a criminal, if the intention of committing the crime is evident, with the commencegment of the offense and the act not being solved only by reason which is independent of his own will.
2) The maximum penalty that is threatened for the crime is reduced by a third in the case of the trial.
3) If the crime is punishable by a dead pidan or life imprisonment, then a fifteen year jail sentence shall be imposed.
4) For the crime that has been resolved and the trial of committing the crime, the same additional criminal.

Article 55 of the Criminal Code reads:
1) Sentenced as the maker of any offense:
   a) the person committing, ordering or committing the act;
   b) persons with wages, covenants, misuse of power or dignity, resort to coercion, threats or deceit by giving opportunity, endeavor or information, deliberately inciting the act to be committed.
2) As for the person referred to in sub 2 that, which may be accountable to him is only a deliberate act persuaded by him and the consequences of that action.

Article 372 of the Criminal Code reads:
Whoever intentionally and unlawfully owns the goods, wholly or partly belonging to another person, and which is not to him of crime, is convicted of embezzlement, with a maximum imprisonment of four years or a fine, up to a maximum of nine hundred rupiah

Article 374 of the Criminal Code reads:
The embezzlement done by the person who holds the goods because of his own position or because of his job or for receiving money, is punished with imprisonment for five years.

5. CONCLUSION

The setting of the philosophical foundation of the corporation as the subject of law and as the subject of criminal law has not been regulated thoroughly in the existing legislation. This raises doubts and ambiguities about the status of the corporation as a subject of law and as a subject of criminal law.

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Fingerprint Based Attendance System Using Arduino

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Abstract - Attendance system is required in many different places such as offices, companies, schools, organizations and institutions, etc. There are many attendance systems to take attendance. But, every place need to have a good system. This paper describes one of the attendance systems. The main objective of this paper is to study and construct the attendance system using fingerprint module. In this system, Arduino UNO controller and PLX DAQ tool are the main components to display the record on Excel.

Index Terms - Arduino, PLX-DAQ, attendance, fingerprint module

I. INTRODUCTION

In an educational system, the teachers call out the name of each and every student and mark the attendance. This causes time wastage during lecture time. This becomes more and more important where number of students in a class is very large. Managing the attendance data is also very difficult such a large group. The other way is that the teacher must pass the attendance sheet around the class for the students to sign. These methods have a major drawback because the students tend to answer or sign for their friends. In educational institutions, attendance and academic success are directly related. Therefore, to have a proper attendance management system is important. In developing countries, most of the educational institutions and government organizations still use paper-based attendance method to keep and save the attendance. Most employers value work attendance for their ethics.

Biometrics is the emerging technology used for automatic identification of a person based on biological characters such as fingerprint, iris, facial recognition, etc. The fingerprint verification system is commonly used biometric technique. Fingerprint based technique use computer to store and verify fingerprints.

II. PRESENT ATTENDANCE SYSTEM

In this system, the reference roll number and name for every student is provided by the institute with sheets. The teachers call out the roll number and mark ‘present’ or ‘absent’ on the sheet. For a particular class or each lecture, the call out process is also replaced by passing the sheet and signing. Many institute or university still use this type of paper-based attendance system. The disadvantages of this system are that roll calling and singing process is waste time and cannot take actual attendance.

III. OPERATION

This paper represents a fingerprint based biometric attendance system. Fingerprint module and arduino UNO are used to take and keep the attendance. Overall block diagram is shown in Figure (1).

![Figure (1). Overall Block Diagram](http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7967)

In this system, there are three main parts: enrolling, searching and displaying the attendance. This simple device starts with the connection of Arduino and fingerprint sensor to the computer for enrolling. In searching phase, as soon as the user presses the fingerprint sensor, it reads the user’s fingerprint and related user’s information are display on the computer depending on the instruction written in. For this system, scanning time, date, user name and ID number are displayed on the computer. Microsoft Excel is used in this system to show the information. PLX-DAQ is a useful tool to connect the Arduino with Excel. Circuit diagram is shown in Figure (2).

![Figure (2). Connection Diagram](http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7967)

IV. SYSTEM REQUIREMENTS

(i) Arduino UNO microcontroller
(ii) Fingerprint Module
(iii) PLX-DAQ tool
(iv) Microsoft Excel

4.1. Arduino UNO Microcontroller
The main purpose of the microcontroller is to enroll and search the fingerprint. In enrolling, this controller reads the template from the fingerprint sensor and enroll the ID number. This display the ID number on serial monitor. And then, this controller check the fingerprint with the stored template in the searching process. If the fingerprint is correct, the display values are shown in excel. Otherwise, the controller don’t give any output. [1][6]

4.2. Fingerprint Module
There are many kinds of fingerprint module. They are optical, capacitive, piezoresistive, ultrasonic, piezoelectric, RF, thermal, etc. An optical fingerprint sensor is used in this system. This sensor read the fingerprint pattern. The scan image is converted as template and saved in memory.

4.3. PLX-DAQ Tool
In this system, PLX-DAQ application software called parallax microcontroller data acquisition add-on tool is used to display the output of controller in Excel sheet. When PLX-DAQ software is opened, Excel sheet is automatically opened. After that, it is needed to connect PLX-DAQ with Arduino with the suitable baud rate of 9600bps and com port. Any of microcontrollers connected to any sensor can now send data directly into Excel using the serial port of a PC with PLX-DAQ. [3]

V. EXPERIMENT SETUP
5.1 Enrolling
Firstly, fingerprint module is connected with controller. ID number is enrolled using the serial monitor. If this step is ok, the fingerprint is scanned with sensor. And then, the fingerprint is converted as templates and stored in EEPROM. Figure (7) and (8) shows this process. After that, another fingerprint is taken and saved as another ID number. Figure (5) shows the flow chart of enrolling.
5.2. Searching and Displaying Fingerprint

Firstly, the controller checks whether the fingerprint is present or not. When the fingerprint is detected and compared this template with the stored value in EEPROM. If this is matched, ID number and name is displayed into Excel including the scanning time and date.

![Flow Chart of Scanning and Displaying Attendance](image)

The flow chart of searching and displaying attendance is shown in Figure (9). In testing, the result will be seen by pressing the finger on the sensor.

![Test and Result of Fingerprint Attendance System](image)
VI. CONCLUSION

Now a days, Information systems and Communication Technologies (ICT) are becoming more and more improved. Biometric technology is also an effective tool to identify and detect fraudulent issues. A fingerprint-based attendance system is presented in this paper. This system will enhance the ability to detect the presence of the students in class or employees in an organization. In terms of efficiency and performance, fingerprint-based attendance system is used in many places. This system is user-friendly and reliable because this system displays name, the ID numbers, date and time on excel sheet. This excel sheet can also be saved and attendance can be calculated with Microsoft Excel technique. Otherwise, this attendance system can be implemented to check which person reached the work in time or on time or late time. So, this developed system is very also useful in saving valuable time of students and lectures, paper, generating report at required time.

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Figure (16). Photo of Fingerprint Attendance System
Design and Implementation of Supervisory Control and Data Acquisition Based Manufacturing System Using PID Control

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Abstract- In this research, the main theme is the system integration of Supervisory Control and Data Acquisition (SCADA) Based Mini Factory Design Using PID Control. The integrated system is composed of the master terminal unit (MTU) and the remote terminal units (RTUs). The main function of master terminal unit is acquired data from RTUs within the region, log and display this data on a local operator station, pass data back to the master station, and pass on control requests from the master station to the RTUs in its region. The remote terminal unit means PLC, DCS or IED is located at a remote location in industrial automation, which is composed of the actuator systems and the sensory systems. The communication system uses industrial ethernet communication system, which combines the master terminal unit with the remote terminal units. To integrate both systems, the signal classification, baud rate of communication system and system characteristics considered PID control is designed with signal and measurement theory. This research analyzes the stability state from remote terminal units (RTUs) to field elements of manufacturing process. Moreover, the simulation results of PID controller are shown with MATLAB simulink.

Index Terms- PID control, SCADA, Master terminal units (MTUs), Remote terminal units (RTUs), Mini-factory Design.

I. INTRODUCTION

This computer-based supervisory control and data acquisition (SCADA) systems have evolved, from standalone, compartmentalized operations into networked architectures that communicate across large distances. In addition, their implementations have migrated from custom hardware and software to standard hardware and software platforms. Some of the characteristics, performance requirements, and protocols of SCADA system components require adapting information-system security methods in industrial settings. Supervisory control and data acquisition (SCADA) systems are vital components of most nations’ critical infrastructures. They control pipelines, water and transportation systems, utilities, refineries, chemical plants, and a wide variety of manufacturing operations. SCADA provides management with real-time data on production operations; implements more efficient control paradigms, improve plant and personnel safety, and reduce costs of operation. These benefits are made possible by the use of standard hardware and software in SCADA systems combined with improved communication protocols and increased connectivity to outside networks, including the Internet. However, these benefits are acquired at the price of increased vulnerability to attacks or erroneous actions from a variety of external and internal sources.

In this research, the system presents how to control the unstable spare parts batch process industry by PID controller. The stability analysis of Remote Terminal Units (RTUs) could be designed by applying the ideas of that PID control techniques. This research used the MATLAB PID commands for simulation results. According to the simulation results, the steady state error will be zero at infinite time. By changing the simulation parameters from this research, it could analyze difference applications for other control system to be stable. After applying the PID controller, the condition of that factory will be reached to the stability state.

II. SCADA BASED MINI-FACTORY DESIGN

A. Design Block Diagram

Fig.1. SCADA System Architecture
The SCADA system architecture is shown in Fig. 1. This system consists of three levels to control the field elements from the operator. The first level is operator level, the second level is communication level and the third level is field level. The stability techniques are based on the PID control for master terminal units (MTUs).

### B. Second-Order Process and a PID Controller

In the processing industry, PID controllers play a crucial role in keeping our plants running – virtually everything from simply filling up a storage tank to complex Mini-Factory. PID control is the most commonly used strategy for programmable controllers in the industry. PID Controllers have been in use for many years, due to their ease of use and ability to effectively control a wide range of plants. In recent years there has been substantial interest in auto-tuners for PID controllers. PID control is a widely used in the most of the industrial automation process because of its remarkable efficiency, simplicity of implementation and broad applicability. The PID control algorithm is a three-term linear control strategy that uses proportional control as its major control term, integral action to largely remove steady state error, and derivative control to add stability to a loop and thus facilitating the use of higher proportional action.

![Fig.2. Block Diagram of Two Loop Controller](image)

**C. Integrating Process**

For controller design purpose, we used the following simple integrating process:

\[
G_p(s) = \frac{K}{(\tau s - 1)} e^{-Ls} 
\]

(1)

With proportional controller in the inner feedback loop, the internal closed-loop transfer function \( G_f(s) \) can be obtained as

\[
G_f(s) = \frac{G_p(s)}{1 + KG_p(s)} = \frac{Ke^{-Ls}}{\tau s - 1 + Ke^{-Ls}} 
\]

(2)

By using a Taylor series expansion, the time delay term in the denominator of equation (2) can be approximated by

\[
e^{-Ls} \approx 1 - Ls + 0.5L^2s^2
\]

(3)

By substituting

\[
G_i(s) \approx G'_f(s) = \frac{Ke^{-Ls}}{0.5KLs^2 + (\tau - KL)Ls + KL - 1}
\]

Here, \( G'_f(s) \) denotes the second-order plus time-delay model obtained from the Taylor series expansion method. Since the characteristic equation of \( G'_f(s) \)' should have negative poles to be stable, the following condition must be satisfied from the Routh-Hurwitz stability criterion

\[
K_{min} = \frac{1}{K} < K_i < \frac{\tau}{LK} = K_{max}
\]

(5)

For optimum disturbance rejection, it was proposed as:

\[
K_i = \sqrt{K_{min} K_{max}} = \frac{1}{K} \sqrt{\frac{\tau}{L}}
\]

Then

\[
G_p(s) = \frac{Ke^{-Ls}}{(\sqrt{\tau} \sqrt{L})} e^{-Ls} 
\]

(7)

The design method proposed can be directly used to design controller

\[
b_0 = \frac{K \sqrt{L}}{(\sqrt{\tau} \sqrt{L})}
\]

\[
a_2 = \frac{0.5L^2 \sqrt{\tau}}{(\sqrt{\tau} \sqrt{L})}
\]

\[
a_1 = \frac{(\tau \sqrt{L} - L \sqrt{\tau})}{(\sqrt{\tau} \sqrt{L})}
\]

(8)

\[
\begin{bmatrix}
K_p \\
K_i \\
K_d
\end{bmatrix} = \frac{\pi \left[ \frac{1}{2\pi m KL \sqrt{\tau}} \left( \frac{(\sqrt{\tau} \sqrt{L} - \sqrt{\tau})}{(\sqrt{\tau} \sqrt{L})} \right) \right]}{0.5L^2 \sqrt{\tau}}
\]

(9)

From Fig. 2, \( e(s) = r(s) - y(s) \), the process input \( u(s) \) can be written as

\[
u(s) = \left( K_p + K_i + K_d \right) [r(s) - y(s)] - K_i y(s)
\]

\[= \left( K_p + K_i \right) \left[ \frac{K_p}{K_p + K_i} r(s) - y(s) \right] + \left( K_i + K_d s \right) e(s)
\]

(10)

Let \( b = \frac{K_p}{K_p + K_i} \) and \( K_p' = K_p + K_i \) we can be obtained \( u(s) \) in the following form:

\[
u(s) = K_p' \left( b \times r(s) - y(s) \right) + \left( \frac{K_i}{s} + K_d s \right) e(s)
\]

(11)

The net result of inner feedback loop is the equation (11) which is the two-degree of freedom PID controller, where \( K_p, K_i, K_d \) and set-point weighting are PID settings as shown in Fig.3.

The effect of \( K_i \) is reflected in the PID controller design, we can ignore the inner feedback loop and directly design PID controllers for integrating or unstable time delay processes by equation (9).

![Fig.3. Implementation of PID Control for Integrating and Unstable Processes](image)

### D. Research Example

The integrating process transfer function is as follows:

\[
G_p(s) = \frac{e^{0.2s}}{s(s+1)}
\]

(12)
The control performance of the proposed method is compared with PID tuning methods for integrating processes. PID controller settings for each method are listed in Table 1.

**Table 1. PID Controller Setting for Research Example**

<table>
<thead>
<tr>
<th>Gain and Phase Margin Method</th>
<th>( K_p )</th>
<th>( K_i )</th>
<th>( K_d )</th>
<th>( b )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( K_p )</td>
<td>3.0994</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( K_i )</td>
<td>2.618</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( K_d )</td>
<td>2.6704</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( b )</td>
<td>0.6768</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**III. FLOW CHART OF PID CONTROLLER FOR MANUFACTURING SYSTEM**

![Flow Chart of PID Controller for Manufacturing System](image)

This flow chart explains the simulation of PID controller for manufacturing system. It includes start and stop, simulation parameters and time, initial error value, two error derivative values, calculate time response ODE and display a response curve for the PID controller. And then simulation parameters for PID controller are shown in Table 2.

**Table 2. Simulation Parameters for PID Controller**

<table>
<thead>
<tr>
<th>Proportional Gain, ( K_p )</th>
<th>Integral Gain, ( K_i )</th>
<th>Derivative Gain, ( K_d )</th>
<th>Input Reference</th>
<th>Transfer Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.05</td>
<td>3</td>
<td>10</td>
<td>1000</td>
</tr>
<tr>
<td>1.0</td>
<td>0.5</td>
<td>3</td>
<td>10</td>
<td>1000</td>
</tr>
<tr>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>10</td>
<td>1000</td>
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<td>2.0</td>
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<td>2.5</td>
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<tr>
<td>3.0994</td>
<td>2.618</td>
<td>2.6704</td>
<td>10</td>
<td>1000</td>
</tr>
</tbody>
</table>

**IV. SIMULATION RESULTS OF PID CONTROL SYSTEM**

In this research, “PID” is an acronym for “proportional, integral, and derivative.” A PID controller is a controller that includes elements with those three functions. In the literature on PID controllers, acronyms are also used at the element level: the proportional element is referred to as the “P element,” the integral element as the “I element,” and the derivative element as the “D element.” An investigation performed in 1989 in Japan indicated that more than 90% of the controllers used in process industries are PID controllers and advanced versions of the PID controller.

The normal manufacturing system could not be stable for running condition. But the PID controller for stable system is added to the unstable system for manufacturing system. The present manufacturing system is process industry. The following results are shown in bellow with various conditions. In this page, it includes ten time steps and eight magnitude steps. The simulation results are depended on three gains that are Proportional gain (\( K_p \)), Integral gain (\( K_i \)) and Derivative gain (\( K_d \)). The simulation parameters are given in Table 4.2. In this research, the experimental results could be displayed with three kinds of gain for the PID controller. These gain results will be appreciated for manufacturing processes used PID control.

![Simulation Result for Parameter One from Table 2](image)
The simulation result for parameter one shown in Figure 5. In this result, the system parameters used to $K_p=0.5$, $K_i=0.05$, $K_d=3$ and $T_f=1000$. The result has high overshoot and undershoots between time 100 and 200. Then, this result approaches to stable stability state about 900 seconds.

The simulation result for parameter two shown in Figure 6. In this result, the system parameters is $K_p=1$, $K_i=0.5$, $K_d=3$ and $T_f=1000$. This result had high overshoot and undershoots between 100 and 150 time steps. Then the system approaches to the stability state about $t=500$ seconds. Therefore, the stability condition depends on three gains of PID controller.

The simulation result for parameter three shown in Figure 7. In this result, the system parameters is $K_p=1.5$, $K_i=1.5$, $K_d=1.5$ and $T_f=1000$. The result had high overshoot between 80 and 120 time steps. Then the system approaches to the stability state about $t=400$ seconds. Therefore, the stability condition depends on three gains of PID controller.

The simulation result for parameter six shown in Figure 8. In this result, the system parameters used to $K_p=3$, $K_i=2.5$, $K_d=2.5$ and $T_f=1000$. The result had zero values about between 0 and 80 time steps. Because the angle use at this is 80 degree. Then, it had high overshoot and high undershoots about between time 80 and 140. Then, system had stable about $T=220$ seconds. But, the transfer function used 1000 at this result.

The above simulation parameter used $K_p=3.0994$, $K_i=2.618$, $K_d=2.6704$ and transfer function $T_f=1000$ seconds. The result is approached to stability state about $T=210$ seconds. So the latest result has the most stability condition than any other parameters from this research. Therefore, the research reaches the stability state during the less transfer function time of the system.

V. CONCLUSION

In this paper the system has presented how to control the unstable spare parts batch process industry by the PID controller. The stability analysis of remote terminal units (RTUs) could be designed by applying the ideas of that PID control techniques. The author used the MATLAB PID commands for simulation results. According to the simulation results, the steady state error will be zero at infinite time. By changing the simulation parameters from this research, different applications for other control system could be analyzed to be stable. This system is developed to control the stable state of the system such as manufacturing system, waste water system and etc. Using this PID control system, it is intended to become stability condition from the process. The advantage of this system is low cost, less worker, precise the manufacturing process and save the time. This research explains how to control unstable spare parts batch process industry by PID controller. The stability analysis of Remote Terminal Units (RTUs) could be designed by applying the ideas of that PID control techniques. Implementation of supervisory control and data acquisition based manufacturing system used MATLAB programming for this system. According to the simulation results, the steady state error will be zero at infinite time. After applying the PID controller, the condition of that factory will be reached to the stability state. This system will be applied for various industrial processes.

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Design and Implementation of Juice Mixer Machine

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Abstract- A juice mixer machine is generally agreed to be a machine that mixes the various kind of juice selected by the user. There are many juice mixer machine in commercial market, but most were complex and expensive. So, this paper focuses on the design and implementation of five channel juice mixer machine that is more accessible and on the hobbyist maker. This proposed system design has 5 different juice tanks, 5 channels, which are connected to water gear pump motors which are controlled by relays. The user can select the desired juice channel and juice content from keypad. The microcontroller calculates the corresponding juice content from user’s desired percentage by using the weight sensor module. Moreover, the user has a favor to choose two options. First option is percentage based automated juice mixing and the second is the manual import.

Index Terms- Microcontroller, Weight sensor module, Relay module, LCD, Automation.

I. INTRODUCTION

Nowadays, automated machines are in demand for they make numerous activities not only easier but also efficiently. These machines require minimal human intervention to do its job. In most cold drink bars, the busiest person is usually bartender since he is the one who mixes and prepares drinks for customers who are eager to have a drink. Due to time pressure and demand from the customers, bartender is to making mistakes during the actual juice mixing process. The juice mixer machine minimizes the need for bartenders to cater to the needs of the customers. The machine is user friendly and is very simple to operate. The customers will only have to deal with marked label that indicate the kind of juice to be produced. With this, labor cost will be minimized and it will also give bar owners the opportunity to attract more customer with this innovation. Furthermore, with the use of juice mixer machine, accuracy is obtained. The machine prevents product loss by eliminating over pouring and spillage of liquor inventory as well as breakages due to bottle is handling. This will, in effect, lead to maximizing of the establishment’s liquor inventory and increased profit. By means of automated machines, manual handling of the ingredients will be eliminated, there are existing automated juice mixer machine in the market but most of them are based on computer, such as Raspberry Pi. This paper shows how implementation of juice mixer machine is done through the use of Arduino.

II. OPERATION PRINCIPLE

The operation of juice mixer machine involves six main components. They are Arduino Mega2560, HX711 weight sensor module with load cell, five 12volt dc water gear pump motor,4 channel and single channel relay modules,20x4 LCD and 4x5 matrix keypad as shown in Figure(1).

Figure (1) Block diagram of Juice Mixer Machine

Arduino Mega 2560 that functions as the brain of the system to which all the operating functions of each module, is chronologically programmed in it. It has predefined programs and instructions that are responsible for juice mixing process that the machine will perform as directed by the user via keypad. LCD display is used to interface with the user for monitoring the operating status. The weight sensor module that is used to get measurable data out from load cell sends the information to the microcontroller, the microcontroller knows and controls the pump motor through the relay if the juice reaches the desired percentage. If the user wants to mix juice automatically as his desired ingredients, he has to select the option 1 by pressing 1 from keypad. And then, the user must enter the juice content percentage of each channel. Otherwise, if the user selected option 2, he able to control the juice content and channel number. That is, if the user desires to drink juice from channel 2, he must enter number 2 from keypad. In this time, the pump motor connected to the channel 2 is processing and pouring the juice for tank2 to the glass until the user presses * key from keypad. The user guide operational flow diagram is shown in Figure (2).

Figure (2) Operational flow diagram
III. HARDWARE AND SOFTWARE IMPLEMENTATION

In this section, hardware implementations of proposed system are described in actual connection diagrams. The main unit of the system is Microcontroller Arduino Mega2560 that is to control the water pump motor for juice mixing process. The microcontroller also calculates the corresponding juice content value for the user’s desired value via keypad. The microcontroller plays a main role in this system as shown in Figure (3).

![Figure (3) Overall hardware implementation](image)

Figure (3) Overall hardware implementation

Figure (4) is construction diagram of load cell and HX711 weight sensor module that are used in this system. A0 and A1 pins of microcontroller are used as inputs for the digital output (DOUT) and serial clock (SCK) of HX711. In this system, 20x4 LCD module is used to display the juice mixing processing status. In this LCD implementation, pin 8 of microcontroller is used as analog output to eliminate the potentiometer that is used for the desired contrast by optimizing the contrast value in serial monitor.

![Figure (4) Weight sensor module with load cell](image)

Figure (4) Weight sensor module with load cell

As the final implementation, 4 channel and single channel relay modules that are used as switches to control the water pump motor shown in Figure (5). In this portion, the pump motor is supplied from the dc power supply. The 12 volt dc water pump motor connected with pipe is only used to deliver the juice in tanks to glass. As the software implementation, weight calibration is mainly role in this system. For this implementation, HX711 weight sensor module library is added to the Arduino IDE. Figure (6) shows flow chart of the proposed system.
Figure (5) Relay module and water pump motor

Figure (6) System flow chart

Start

Option ==1?

Empty_cup val=read_sensor val
Tank1=user input1
Tank2=user input2
Tank3=user input 3
Tank4=user input4
Tank5=user input5
Current val= read_sensor val- Empty_cup val

Tank1 !=0?

Target val=Tank1*val of 1%
Start motor 1

Current val >Target
Stop motor 1

Tank2 !=0?

Target val+=Tank2*val of 1%
Start motor 2

Current val >Target
Stop motor 2

val=user input

val ==1?

val ==2?

Start motor 1

val ==6?

val ==-6?

Stop motor 1

val ==-13?

Exit from option 2

val ==2?

End

val ==1?
IV. TEST AND RESULT

In this section, the testing results of juice mixer machin are shown step by step. In this proposed system, the user has a favor to drink 5 channel ingredients such as lemon, coca cola, lychee, sparkling and orange juices. If the user selected the option 1 and desires to drink only 75% of lychee juice, he has to enter juice content number (75) of channel (tank) 3 from keypad. And then the machine will fill the desired amount of lychee juice in glass automatically. The step by step processing statements are shown in Figure (7).

If the user wants to mix the 15% of coca cola and 15% of lychee juice, he has to enter the desired channels and values from the keypad. The machine will stop the water pump motor at the 30% of ingredient in glass automatically as shown in Figure (8).

Figure (7) One channel juice filling process

Figure (8) Two channel juice mixing process
Otherwise, if the user selected the option 2, he must control the juice content manually by pressing the * key from keypad. Figure (9) show channel 5 orange juice filling process manually. In this option, the user can also get mixed drink as the option 1 by entering desired channel number sequentially.

![Figure (9) Manual import operation](image)

V. CONCLUSION

The juice mixer machine provided a very satisfactory performance with a minimal percentage error. The utilization of a microcontroller has been accomplished in the form of Arduino Mega 2560. The decision to use the Arduino was based on the elimination of external programmer problem and optimization of the juice mixer machine. In addition to this, the utilization of the various proposed components such as weight sensor module, relay modules, dc pump motor, LCD and keypad. For future studies, I would like to recommend considering additional features that will maximize the use of microcontroller, such as increasing the channel, adding the ingredient menu, replacing the pump for juice with gas, eliminating the weight calibration based on a cup.

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Microwave Link Design, Survey and Installation In Pyay Technological University

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Abstract Nowadays, microwave link has become an indispensable form of communication networks around the world. This research project describes design and installation of remote desktop connection from one computer to another computer by using 5GHz Cambium ePMP Force 180 TDD license exempt microwave link. The required components are two computers, two antennas, two POE (Power Over Ethernet) splitters, RJ 45 Ethernet cables and power supply cords. In this research, the two locations are 400 meters far away each other. The latitude and longitude of these points are used to design with the link planner software. As the system is point to point microwave system, line of sight must be between two locations. The softwares that we used in this research are Google earth and Cambium Link Planner. This research involves an iterative technique to explain the sequential communication of signal transmission for short distance radio communication through microwave link with best efficiency.

Index Terms- Microwave Radio, Cambium, Link Planner, Link Budget

I. INTRODUCTION

Microwave technology is used to transmit or receive the signals in the form of radio wave from one place to another. From the frequency perspective, there are two types of microwave called Licensed and License exempt bands. Licensing is a way of ensuring that wireless operators do not interfere with each other’s radio frequencies. Licensed band is individual companies pay a licensing fee for the exclusive right to transmit on assigned channels within that band in a given geographic area or nationwide assignment. The license microwave frequencies are normally 6-42 GHz and products are produced with frequency division duplex system (FDD).

To radiate RF frequencies from the antenna, the necessary things are power supply, radio unit (outdoor unit), IF cable (in our case is Cat5-e cable). Radio frequency (RF) is a measurement representing the oscillation rate of electromagnetic radiation spectrum, or electromagnetic radio waves, from frequencies ranging from 300GHz to as low as 30kHz. It can be categorized microwave systems to two based on their product architectures. They are split mount microwave system and full outdoor system. Split mount system consists of indoor unit (IDU) + outdoor unit (ODU) + Antenna while full outdoor system combines IDU and ODU as one. So full outdoor system consists of ODU +Antenna only. (In this research project, ePMP Force 180 5GHz is full outdoor system, so there is no IDU.) The function of IDU is to accept baseband signals, digitized and convert to intermediate frequency (IF signal) via the IF cables (Cat5-e cables or Coax cables).The function of ODU is to modulate IF signal to radio frequency (RF signal) and amplify the power of the signal. ODU is power supplied by IF cables together with IF signal mostly or power supplied
with separate cables rarely. The function of the antenna is to do the directivity of RF signal to the desired direction.

![Figure 2. Typical Full Outdoor Microwave System](image)

**II. PROPOSED SYSTEM**

This research project consists of two computers, one microwave hop, two POE splitters, RJ 45 Ethernet cables and power supply cord. In these installation, the microwave hop product is ePMP Force 180 5GHz. The ePMP Force 180 5GHz subscriber module is the next generation of the ePMP 5GHz integrated radio offering a higher-gain, integrated 16 dBi patch antenna. Installation and alignment are easy with the adjustable mounting bracket and the Force 180 is small, sleek and equipped with Gigabit Ethernet port to deliver the maximum throughput. POE (splitter) which is supplied together with ePMP has two ports which are Gigabit data and Gigabit data + Power. Data + Power slot is connected to the antenna slot by using RJ 45 and another port is connected to the computer to configure the parameters. And then, POE is supplied to the DC input power.

3.1 Hardware (Equipment)

This involves two antennas (ePMP Force 180 5GHz), two computers, two POE (power over Ethernet), four RJ 45 and power supply. At first, two antennas must be placed into line of sight. POE (splitter) has two slots which are Gigabit data and Gigabit data + Power. Data + Power slot is connected to the antenna slot by using RJ 45 and another slot is connected to the computer to configure the parameters. And then, POE is supplied to the DC input power.

3.1.1 ePMP Force 180 5GHz

The ePMP Force 180 5GHz subscriber module is 5GHz Integrated Radio offering a higher-gain, integrated 16 dBi patch antenna. Installation and alignment are easy with the adjustable mounting bracket and the Force 180 is small, sleek and equipped with Gigabit Ethernet port to deliver the maximum throughput. It has the exceptional reliability and quality that users have come to expect from the ePMP product line and adds some significant performance enhancements. This radio comes in a small, sleek form factor but delivers high performance. The antenna gain is increased by 3 dB to 16 dBi which will provide a 40% increase in range. It comes equipped with a Gigabit Ethernet port so that nothing will limit this product in delivering the maximum throughput. The radio module is powered by POE and the Ethernet port has the unique capability of being powered from a POE injector that conforms to standard pin outs or from a POE injector that conforms to Cambium pin outs. This makes it possible to upgrade...
existing radio locations to the Force 180 without changing the POE injector. It also includes an adjustable mounting bracket that eases the task of installing and properly aligning the radio.

Figure 4. ePMP Force 180 5GHz

3.2 Software

In this research, the software that used are Google earth and Link planner. The desired points are measured with GPS and compare on the map by using Google earth software. The latitude and longitude of these points are used to design with the link planner software. When design the position of antennas, need to change the value of band, product, ePMP PTP mode, bandwidth and modulation to get best result of availability and capacity.

3.2.1 Link Planner

Calculating the achievable availability of a microwave link is carried out on the basis of statistical methods. Currently there are now available software solutions from a number of companies which enable the microwave link planner to calculate and configure rapidly and effectively the microwave link. All of this software is based on uniform guidelines of the International Telecommunication Union (ITU). Cambium link planner is free software provided by Cambium and it is easy to use. In this research, Link Budget is calculated by the followings equations:

The received power of antenna 2 can be calculated by using link planner equation.

\[\text{Rx power } 2 = \text{EIRP}_1 - \text{Free space loss} + \text{Antenna gain}_2\]  
\[\text{EIRP}_1 = \text{Tx power}_1 + \text{Antenna gain}_1 \]  

where,

\[\text{Rx power } 2 = \text{received power of antenna } 2\]

\[\text{Tx power } 1 = \text{transmitted power of antenna } 1\]

\[\text{EIRP} = \text{Effective Isotropic Radiated Power}\]

For one microwave link, availability and the capacity of the link are the most important factors. So these two factors need to meet the target since the design stage. Availability is a function of fade margin and fade margin is the difference of sensitivity and received power. Capacity of the microwave link is directly proportional to the channel spacing and modulation schemes. To provide faster capacity, channel spacing need to be wide as well as need to use higher modulation schemes. In our project, availability target is 99.99% and capacity target is 50 Mbps.

\[\text{Fade Margin} = \text{Received signal} - \text{Sensitivity of the radio}\]

The received power depends upon free space loss and effective isotropic radiated power (EIRP). EIRP is the addition of transmitted power and antenna gain. The transmitted power depends on the product type and brand while antenna gain can be controlled by changing antenna size. Free space loss depends on frequency and the distance between two antennas.

\[\text{Freespace Loss} = \left(\frac{4\pi df}{c}\right)^2\]

where, \(d\) is the distance between two antennas in miles.

IV. SURVEY, DESIGN AND CONFIGURATION

4.1 Site Survey

In our project, we located latitude and longitude of point 1 and point 2 using Google Earth and installed hardware equipment step by step. Latitude and Longitude of point 1 and Latitude and Longitude of point 2 are shown in Figure 5. and Figure 6.

18850921.60N 95820907.10E
4.2 Design Criteria

After site survey, we design the microwave link by using cambium network link planner step by step.

Check that the profile is accurate and identify any obstructions that may affect signal quality. The profile can be verified using Google Earth(TM), maps, GPS data and site visits. It is particularly important to verify the antenna heights, to measure interference and to identify obstructions near both ends of the Fresnel zone. The following Table shows the design parameter of the research project.

Table 1. Result of Design Parameter

V. TESTS AND RESULTS

In this research project, we want to send the data between two computers and control the remote desktop connection from other computer. So, we want to access remote desktop connection. Figure11 shows remote desktop connection between two computers. In Figure 12, wireless in monitor will be up so that the project would be operated. In Figure 13, the eAlign in tools change if the interference have between point 1 and point 2 antennas. If the value of
RSSI is fewer, the result of the project is better. Figure 14 shows that the two computers have connected by using microwave link. In this condition, we can sent (data, video, photo, audio, etc.) of one computer to other computer by using microwave link.

VI. CONCLUSION

This research project is tested in Pyay Technological University. We located two points, the first point is placed in front of Civil Department and the second point is placed in front of Academy Hall. The distance between two points is 400 meters long and two antennas must be line of sight. We designed the location of latitude and longitude in the link planner software. By using this software, we know the result of availability and capacity of our project. In this project, we can send the data between two computers and control the remote desktop connection with microwave link from other computer effectively.

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AUTHORS

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Abstract: The study was conducted to assess the impacts brought by fertilizer towards the growth and yield performance of sweet corn under no tillage operation in Bukidnon, Philippines. Soil samples were taken from the site for initial characterization. Six treatments were employed; T1- No fertilizer, T2- Recommended rate of inorganic fertilizer (RRIF) based on soil analysis of the experimental area, T3- 2 tons ha⁻¹ Vermicompost, T4- ½ RRIF + 1 ton ha⁻¹ Vermicompost, T5- ½ RRIF + 2 tons ha⁻¹ Vermicompost and T6- RRIF + 1 ton Vermicompost. Fertilizer treatments were incorporated in the soil to facilitate appropriate chemical reactions. Dibble planting method was employed all throughout the area. Harvesting was done at 70 days after sowing (DAS). The application of fertilizer materials in Bukidnon soil under no tillage operation has no significant effects towards the growth performance of sweet corn. The full recommended rate of inorganic fertilizer plus 1 ton Vermicompost ha⁻¹ consistently gave significantly higher yield parameter values (ear diameter and ear length) than those with no fertilizer applied. Yield data was observed significantly highest in plots with full recommended rate of inorganic fertilizer and 1 ton Vermicompost ha⁻¹ with a value of 49369 ears per hectare. On the other hand, soil pH was significantly affected by the application of inorganic fertilizer alone. Moreover, the application of ½ RRIF + 2 tons of Vermicompost ha⁻¹ caused significant effects towards the organic matter content (%) of the soil at harvest. The use of inorganic fertilizer in combination with organic fertilizer in sweet corn production under Bukidnon soil with no tillage operation are productive means and ways to be executed. Yield response was significantly highest in those plots, thus, possible means to be implemented in Bukidnon setting following no tillage operation.

Key words: Growth, yield, sweet corn, fertilizer, no tillage, Bukidnon

1. INTRODUCTION

Most soil used to grow plants, including ornamentals, grass and vegetables, and needs the basic nutrients be replenished over time. Fertilizers boost the soil's reserves of elements essential to the healthy growth and development of plants. Although conventional and organic fertilizers both add needed nutrients to the soil, organic fertilizer differs because it is derived from natural sources as opposed to being synthetically manufactured [1].

Plants get many of the elements they need through the air. Oxygen, carbon and hydrogen are readily available. In addition, plants can create glucose and other substances through sunlight. However, basic elements cannot be created through photosynthesis, and plants must extract these elements through the soil. Even though air contains a significant amount of nitrogen, plants cannot absorb it. As a result, they must get it from the soil. Nitrogen becomes depleted in soil quickly, and the primary benefit of fertilizer is the nitrogen it provides. Plant cells also depend on potassium and phosphorous, which are rare [2]. Fertilizer contains a large amount of these elements, which ensures that plants stay healthy. Plants can generally grow without fertilizer, but they may take more time to get the elements they need to thrive. Fertilizer is essential in modern farming, and almost all farmers depend on it to keep their fields healthy and productive. Gardeners often use small amounts of fertilizer as well to ensure that their flowers and other plants look their best [3].

No tillage farming is a way of growing crops or pasture from year to year without disturbing the soil through tillage. No-till is an agricultural technique which increases the amount of water that infiltrates into the soil, the soil's retention of organic matter and its cycling of nutrients. In many agricultural regions, it can reduce or eliminate soil erosion. It increases the amount and variety of life in and on the soil, including disease-causing organisms and disease organisms, but are kept in check by a diverse and healthy soil food web. The most powerful benefit of no-tillage is improvement in soil biological fertility, making soils more resilient. Farm operations are made much more efficient, particularly improved time of sowing and better trafficability of farm operations [4,5].

The province of Bukidnon is considered to be the food basket of Mindanao, being the major producer of rice and corn in the region. Two types of climate prevail between the northern and southern sections of Bukidnon, The northern part is classified as
Sweet corn scientifically known as *Zea mays* L. var. *Saccharata* is a variety of maize with a high sugar content. Sweet corn is the result of a naturally occurring recessive mutation in the genes which control conversion of sugar to starch inside the endosperm of the corn kernel. Unlike field corn varieties, which are harvested when the kernels are dry and mature (dent stage), sweet corn must be picked when immature (milk stage) and prepared and eaten as a vegetable, rather than a grain [7].

2. MATERIALS AND METHODS

2.1 Location

The field experiment was conducted at the Research Station of IPB-UPLB (7° 51' 31.788'' N and 125° 3' 40.4568'' E), Central Mindanao University, Musuan, Bukidnon, Philippines.

2.2 Collection, preparation and characterization of soil samples

Surface soil samples at 0-20 cm depth were collected randomly from the experimental area following a zigzag direction prior to the land preparation. The collected soil samples were placed in cellophane bags and then brought to the Soil and Plant Analysis Laboratory (SPAL), Department of Soil Science, College of Agriculture, Central Mindanao University, Musuan, Bukidnon, Philippines wherein laboratory analyses were conducted. Prior to analysis, the collected soil samples were air-dried at room temperature for about a week, and passed through a 2-mm sieve and were stored in a clean plastic containers. Soil samples were also collected from each experimental plot after harvest of sweet corn. The chemical and physical properties of the soil were determined and analyzed at the Soil and Plant Analysis Laboratory (SPAL). The properties tested include; soil pH in 1:5 soil : water ratio [9]; organic matter content by the Walkley and Black method [8]; extractable P using the Bray 2 method [8] and exchangeable K using 1N NH₄OAc buffered at pH 7.0 using a Flame photometer [8].

2.3 Characteristics of soil in the experimental area

Table 1 shows that the soil samples collected from the experimental area has a pH value of 5.52 and is classified as strongly acidic [9]. The soil has organic matter content of 3.90% which is considered marginal [8]. For the extractable phosphorus, it has a value of 17.37 mg kg⁻¹ and is classified as medium in amount [10]. On the other hand, exchangeable potassium was found high in amount because of its value 1.11 cmol kg⁻¹ [10]. Hence, the fertilizer recommendation for the experimental site was 70-50-0 kg ha⁻¹ of N, P₂O₅ and K₂O.

2.4 Experimental design and treatments

The field experiment was laid out in a Randomized Complete Block Design (RCBD) with six (6) treatments and replicated three (3) times. Treatments include: T⁻¹- no fertilizer, T⁻²- Recommended rate of inorganic fertilizer (RRIF) based on soil analysis of the experimental area (70 – 50 – 0 N, P₂O₅, K₂O kg ha⁻¹), T⁻³- 2 tons ha⁻¹ Vermicompost, T⁻⁴- half RRIF (35 – 25 – 0 N, P₂O₅, K₂O kg ha⁻¹) + 1 ton ha⁻¹ Vermicompost, T⁻⁵- half RRIF (35 – 25 – 0 N, P₂O₅, K₂O kg ha⁻¹) + 2 tons ha⁻¹ Vermicompost and T⁻⁶- RRIF (70 – 50 – 0 N, P₂O₅, K₂O kg ha⁻¹) + 1 ton Vermicompost.

2.5 Land preparation and lay-outing

The field was left unplowed to facilitate no tillage condition. A pre-emergence herbicide was used to control emerging weeds, this was observed in all the experimental plots. The total land area used in the experiment was 463.75 m² (35 m x 13.25 m). It was divided into three (3) blocks and each block had a dimension of 131.25 m². A one meter space was provided between blocks and experimental plots as alleyways.

2.6 Fertilizer application and seeding operation

The Vermicompost was sourced out from one of the Vermi farms in Valencia City, Bukidnon, Philippines. The Vermicompost was applied in those plots assigned with organic fertilizer as treatment following the rate of two (2) tons ha⁻¹. It was carefully broadcasted within each plot before the seeding operation. While basal application of inorganic fertilizer was done in treatments assigned to inorganic fertilizer. Inorganic fertilizers were placed in a hole covered with a thin layer of soil then followed by the sowing
of seeds and then covered again with soil to have a close contact between the seed and the soil, thus, would facilitate uniform germination. The chemical assay of Vermicompost used in the experiment include: pH of 6.52 and an organic matter content of 32.45 %. For the nutrient content, total nitrogen of 2.82 %, total phosphorus of 1.14 % and total potassium of 0.45 %.

<table>
<thead>
<tr>
<th>Properties</th>
<th>Value</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>5.52</td>
<td>Potentiometric (1:5 soil : water)</td>
</tr>
<tr>
<td>Organic Matter Content, %</td>
<td>3.90</td>
<td>Walkley-Black</td>
</tr>
<tr>
<td>Extractable Phosphorus, mg kg⁻¹</td>
<td>17.37</td>
<td>Bray P₂</td>
</tr>
<tr>
<td>Exchangeable Potassium, cmol kg⁻¹</td>
<td>1.11</td>
<td>1N NH₄OAc / Flame photometer</td>
</tr>
</tbody>
</table>

Since no furrows were made to serve as a guide for planting, a line was drawn using a stick served as demarcation in sowing the seeds. Dibble planting method was done on these plots. The seeds were sown at a distance of 0.25 m between hills. There were six (6) rows in every experimental plot with 5 m in length. The planting distance of 0.25 m between hills and 0.75 m between rows was then observed. One row in both sides of the plot served as the guard rows while the inner 4 rows served as the data rows from which agronomic and yield data were derived.

2.7 Care and management

Care and management immediately started right after seeding up to the harvesting period. Weed population was closely monitored to avoid possible competition of nutrients. Moreover, disease monitoring was also done. Application of pesticides was also employed due to the evident infestation of insect pests. Due to adverse climatic condition during the conduct of the experiment, irrigation was done once a week to sustain the water need of the crop. Irrigation ceased when the experimental plants were about to be harvested at 70 DAS.

2.8 Tagging of data plants and harvesting

Ten (10) sample plants were randomly selected from data rows in each experimental plot. A sheet of white paper was stapled to each data plants to serve as marker and guide during data collection. During the harvesting, the data plants were harvested first followed by the guard rows. Ears were carefully separated from its stover to avoid damage of produce. Yield data collection was then employed and other parameters.

2.9 Statistical analysis

Statistical analysis was done after tabulating the gathered data through the Statistical Tool for Agricultural Research (STAR) software. Moreover, some parameters were found significant as manifested in the F computed value, comparison of means then proceeded using Honestly Significance Difference (HSD) test as the Post hoc test undertaken [11].

3. RESULTS AND DISCUSSION

3.1 Growth of sweet corn as affected by fertilizer applications under no tillage operation

The mean values of plant height at 20, 40, 60 DAS and ear height in plots treated with different fertilizers are presented and discussed in this section.

3.1.1 Plant height at 20, 40 and 60 DAS

Table 2 shows the mean plant heights of sweet corn measured at 20, 40 and 60 DAS. Based on statistical analysis, it was found out that heights of sweet corn at 20 DAS was not significantly affected by the fertilizers applied under no tillage condition. It was observed that sweet corn plants planted in those plots treated with ½ RRIF + 1 ton Vermicompost ha⁻¹ (T₄) had the tallest heights with an average value of 42.78 cm. It was then followed by sweet corn plants planted in those plots with full RRIF + 1 ton Vermicompost ha⁻¹ (T₆) having an average height of 41.25 cm. Shortest plants were noted in plots with no fertilizer application (T₁). However, the report of [12] was that there is a significant increase in growth parameters including plant height and number of leaves of corn plants when applied with NPK fertilizers.
At 40 DAS, no significant effects were also noted among sweet corn plants treated with different fertilizers under no tillage condition. Tallest plants were observed in experimental plots with T2 were full recommended rate of inorganic fertilizer was applied having an average height of 129.85 cm. Plants with no fertilizer application remains to be the shortest at 40 DAS. This result was opposite to the findings of [13] that corn plants when treated with fertilizers would cause significant increase in its height, stem diameter and other growth parameters.

Table 2. Plant height at 20, 40, 60 DAS and ear height of sweet corn as affected by fertilizer application under no tillage operation

<table>
<thead>
<tr>
<th>TREATMENTS</th>
<th>Plant Height, cm</th>
<th>Ear Height, cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>CODE</td>
<td>DESCRIPTION</td>
<td>20 DAS</td>
</tr>
<tr>
<td>T1</td>
<td>No fertilizer</td>
<td>38.43</td>
</tr>
<tr>
<td>T2</td>
<td>Full RRIF</td>
<td>41.20</td>
</tr>
<tr>
<td>T3</td>
<td>2 tons Vermicompost ha⁻¹</td>
<td>36.93</td>
</tr>
<tr>
<td>T4</td>
<td>½ RRIF + 1 ton Vermicompost ha⁻¹</td>
<td>42.78</td>
</tr>
<tr>
<td>T5</td>
<td>½ RRIF + 2 tons Vermicompost ha⁻¹</td>
<td>39.15</td>
</tr>
<tr>
<td>T6</td>
<td>Full RRIF + 1 ton Vermicompost ha⁻¹</td>
<td>41.25</td>
</tr>
</tbody>
</table>

At 60 DAS, no significant difference was noted among plants treated with different fertilizer materials under no tillage condition, however, this result is contradictory to the report of [14] that application of fertilizer particularly nitrogen could cause increase in height of corn as it will promote more cell division leading to an enhanced vegetative stage.

3.1.2 Ear height of sweet corn

As reflected in Table 2, the ear height of sweet corn plants were not significantly affected by the imposed treatments. Tallest ear height was manifested by sweet corn plants planted in plots with full RRIF + 1 ton Vermicompost ha⁻¹ (T6) with an average height of 90.50. Statistical analysis declares no significant effect was done by the treatments. This result was in agreement with the result of [15] who reported no significant difference in ear height of sweet corn plants treated with different fertilizer materials. This insignificant difference is attributed to the natural fertility of the experimental area, initial analysis revealed that the area has marginal amount of organic matter which serves as the source of native nutrients in the soil by the growing plants [16].

3.2 Yield components and yield of sweet corn as affected by fertilizer application under no tillage operation

The mean values of ear diameter, ear length and yield (number of ears per hectare) in plots treated with different fertilizer materials under no tillage condition are presented and discussed in this section.

3.2.1 Ear diameter and ear length of sweet corn

The ear diameter of sweet corn is presented in Table 3. Fertilizer treatments gave significant effects towards the ear diameter of sweet corn. Largest ear diameter was observed in those plots applied with full RRIF + 1 ton Vermicompost ha⁻¹ (T6) with an average diameter value of 4.97 cm while smallest ear diameter was observed in plots with no fertilizer application with an average value of 4.13 cm. Comparison of means revealed that the application of full RRIF + 1 ton Vermicompost ha⁻¹ has no significant difference with that of T2, T4 and T5 but significantly different with treatment 1 and treatment 3. These results confirmed the findings of [17] who reported that application of amendments like fertilizer with NPK can lead into an increase in plant height, stem girth, number of leaves, leaf area, number of cobs, ear diameter and length, weight of cob, 100-grain weight, and grain yield of maize.

Moreover, the ear length of sweet corn gave also a significant response on the influence of fertilizers applied under no tillage condition (Table 3). Ear length of sweet corn plants planted in plots treated with full RRIF + 1 ton Vermicompost ha⁻¹ (T6) gave a significant long ear length with a value of 21.57 cm. However, post hoc test reveals that the no significant difference in ear length was observed between T6 and T2 (full RRIF). Furthermore, T6 was significantly longer in ear length than those with T1, T3, T4 and T5. Results agree to the reports of [12,13,14,17] who reported that application of fertilizers particularly with inorganic fertilizers could cause proliferation and increase in corn growth and yield performance as it will supply the nutrients needed by the planted crop in its...
available form, thus further process like mineralization is no longer needed, hence, there is an ease of nutrient absorption by the growing crops.

3.2.2 Yield (number of ears) of sweet corn per hectare

The yield of sweet corn as affected by fertilizer application planted under no tillage operation is presented in Table 3. Results have revealed that sweet corn plants planted in plots treated with full RRIF + 1 ton Vermicompost ha\(^{-1}\) (T\(_6\)) gave the highest number of ear yield of 49369 per hectare. Lowest yield was observed in those plots with no fertilizer application with a value of 44373 ears per hectare. Analysis of variance among the yield data gathered revealed that the fertilizer materials significantly influence the yield parameter of sweet corn. Post hoc test further revealed that sweet corn plants planted in plots with full RRIF + 1 ton Vermicompost ha\(^{-1}\) was significantly the highest in terms of yield, which confirms the results reported by [12,18] that fertilizer materials are capable of increasing the yield of corn as these materials can supply the needed nutrients by the plants that it may proceed with further metabolism and in producing ears. The combined effects of inorganic and organic fertilizer had caused the great increase in yield as application of full RRIF alone gave only a yield of 47634 per hectare which was significantly lower than T\(_6\) [13,14,17]. Plots with no fertilizer application (T\(_1\)) gave a yield that was not significantly different with T\(_3\), T\(_4\) and T\(_5\). The experimental area has a marginal amount of organic matter [20] making sweet corn plants still very productive amidst no application of fertilizer in T\(_1\). On the other hand, as reported by [18,19], in order to maximize yield, the application of fertilizer particularly N fertilizer may cause an increase in yield.

### Table 3. Ear diameter, ear length and yield of sweet corn as affected by fertilizer application under no tillage operation

<table>
<thead>
<tr>
<th>TREATMENTS</th>
<th>CODE</th>
<th>DESCRIPTION</th>
<th>Ear (\dagger) diameter, cm</th>
<th>Ear length(\dagger), cm</th>
<th>Yield (\dagger) (number of ears) ha(^{-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>T(_1)</td>
<td>No fertilizer</td>
<td>4.13 c</td>
<td>17.57 d</td>
<td>44373 c</td>
<td></td>
</tr>
<tr>
<td>T(_2)</td>
<td>Full RRIF</td>
<td>4.87 ab</td>
<td>20.13 ab</td>
<td>47634 b</td>
<td></td>
</tr>
<tr>
<td>T(_3)</td>
<td>2 tons Vermicompost ha(^{-1})</td>
<td>4.57 b</td>
<td>19.37 bc</td>
<td>44917 c</td>
<td></td>
</tr>
<tr>
<td>T(_4)</td>
<td>½ RRIF + 1 ton Vermicompost ha(^{-1})</td>
<td>4.60 ab</td>
<td>19.10 bcd</td>
<td>44600 c</td>
<td></td>
</tr>
<tr>
<td>T(_5)</td>
<td>½ RRIF + 2 tons Vermicompost ha(^{-1})</td>
<td>4.63 ab</td>
<td>18.20 cd</td>
<td>45280 c</td>
<td></td>
</tr>
<tr>
<td>T(_6)</td>
<td>Full RRIF + 1 ton Vermicompost ha(^{-1})</td>
<td>4.97 a</td>
<td>21.57 a</td>
<td>49369 a</td>
<td></td>
</tr>
</tbody>
</table>

\(\dagger\) Means followed by the same letter(s) are not significantly different at 5% level of significance based on HSD

3.3 Soil chemical properties at harvest as affected by fertilizer application under no tillage operation

The mean values of soil pH, organic matter content (%), extractable P (mg ka\(^{-1}\)) and exchangeable K (cmol kg\(^{-1}\)) in plots treated with different fertilizers are presented and discussed in this section.

3.3.1 Soil chemical properties at harvest

The pH was significantly affected by the imposed fertilizer treatment based on soil analysis conducted [21] after harvest as presented in Table 4. Plots with no fertilizer application (T\(_1\)) had the highest pH value of 5.85 which was significantly higher with those plots treated with Full RRIF + 1 ton Vermicompost ha\(^{-1}\) (T\(_6\)). However, post hoc analysis using HSD at 5% level of significance revealed that T\(_1\) pH value has no significant difference with of T\(_2\), T\(_3\), T\(_4\) and T\(_5\). Results presented by [22] is opposite to the findings of the study. The reason is due to the short period of time that sweet corn plants stay in the field. Sweet corn plants are harvested in less than 3 months which would cause incomplete reactions with the soil. Leading to a minute change in pH.

Organic matter content of the soil was found significantly affected by the imposed treatments based on statistical analysis. Highest organic matter content was observed in plots applied with ½ RRIF + 2 tons Vermicompost ha\(^{-1}\) (T\(_3\)) followed by those plots treated with 2 tons Vermicompost ha\(^{-1}\) (T\(_2\)), ½ RRIF + 1 ton Vermicompost ha\(^{-1}\) (T\(_4\)), Full RRIF + 1 ton Vermicompost ha\(^{-1}\) (T\(_6\)) and lastly T\(_1\) (no fertilizer) and T\(_2\) (Full RRIF). Post hoc test reveals that T\(_5\) value was not significantly different with that of T\(_3\), T\(_4\) and T\(_6\).
But significantly higher with that of $T_1$ and $T_2$. Application of organic fertilizer like Vermicompost can readily increase and improve the amount of organic matter in the soil as reported by [15,16]. The extractable P measured in mg kg$^{-1}$ was not significantly affected by fertilizer treatments. However, highest value was obtained by those plots applied with $\frac{1}{2}$ RRIF + 2 tons Vermicompost ha$^{-1}$ ($T_5$). Exchangeable K was also not significantly affected by the imposed treatments of fertilizer. Highest value was also obtained by those plots treated with $\frac{1}{2}$ RRIF + 2 tons Vermicompost ha$^{-1}$ ($T_3$). Treatment 5 got the highest values for extractable P and exchangeable K at harvest.

### Table 4. pH, organic matter content, extractable P and exchangeable K of soil at harvest as affected by fertilizer application

<table>
<thead>
<tr>
<th>TREATMENTS</th>
<th>pH</th>
<th>Organic Matter Content, %</th>
<th>Extractable P, mg kg$^{-1}$</th>
<th>Exchangeable K, cmol kg$^{-1}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_1$ No fertilizer</td>
<td>5.85 a</td>
<td>3.93 b</td>
<td>11.00</td>
<td>1.24</td>
</tr>
<tr>
<td>$T_2$ Full RRIF</td>
<td>5.59 ab</td>
<td>3.93 b</td>
<td>14.33</td>
<td>1.20</td>
</tr>
<tr>
<td>$T_3$ 2 tons Vermicompost ha$^{-1}$</td>
<td>5.84 a</td>
<td>4.11 ab</td>
<td>14.17</td>
<td>1.21</td>
</tr>
<tr>
<td>$T_4$ $\frac{1}{2}$ RRIF + 1 ton Vermicompost ha$^{-1}$</td>
<td>5.72 ab</td>
<td>4.05 ab</td>
<td>10.17</td>
<td>1.13</td>
</tr>
<tr>
<td>$T_5$ $\frac{1}{2}$ RRIF + 2 tons Vermicompost ha$^{-1}$</td>
<td>5.65 ab</td>
<td>4.15 a</td>
<td>16.33</td>
<td>1.26</td>
</tr>
<tr>
<td>$T_6$ Full RRIF + 1 ton Vermicompost ha$^{-1}$</td>
<td>5.54 b</td>
<td>4.00 ab</td>
<td>13.33</td>
<td>1.23</td>
</tr>
</tbody>
</table>

*Means followed by the same letter(s) are not significantly different at 5% level of significance based on HSD*

### 4. CONCLUSION

Favorable response of sweet corn applied with different fertilizer materials were observed in the study. No significant influence was noted among the growth parameters (plant height at 20, 40, 60 and ear height) of sweet corn treated with different fertilizer materials, however, significant differences among treatments were realized on the ear diameter, ear length and number of ears per hectare. The application of full recommended rate of inorganic fertilizer plus 1 ton vermicompost ha$^{-1}$ gave the highest yield of sweet corn under no tillage operation of Bukidnon soil. These findings also conforms to the reports of other researchers. Hence, Bukidnon condition under no tillage operation would provide significant sweet corn yield with the application of inorganic fertilizer combined with organic fertilizer. Moreover, post soil analysis revealed that there will be an increase in organic matter content of the soil whenever organic fertilizers are used, as this was known to have direct effect and benefit towards the soil’s chemical property particularly on the organic matter content. Thus, the increase in organic matter would signify preservation and improvements of some soil properties like porosity, structure, bulk density, water holding capacity and others. The combination of inorganic and organic fertilizer caused significant effects towards the yield of sweet corn and soil properties, thus, highly recommended in a no tillage operation under Bukidnon condition.

### ACKNOWLEDGMENT

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Design of Single Suction Centrifugal Pump and Performance Analysis by Varying the Speed of Impeller

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Abstract- This paper presents the design of impeller and casing of single-suction centrifugal pump for clean and cold water. Type of pump is single stage centrifugal pump with closed impeller and it can develop a head of 20 m and deliver 0.015 m³/s of water. The designed impeller has 99 mm inlet diameter, 250 mm outlet diameter, 20° inlet vane angle and 23° outlet vane angle. The number of vanes is 6 and input shaft power is 6 hp. The inlet width and outlet width are 20 mm and 12 mm respectively. The discharge diameter is 80 mm to operate the designed head and capacity. The performance analysis of the designed pump is also presented on various speed. The predicted maximum efficiency is nearly 65% and the expressed actual efficiency of designed pump is 61%. Therefore, the designed efficiency has a satisfactory value. The designed single-suction centrifugal pump can fulfill the requirements of water pumping system for irrigation, and domestic usage in multistory building.

Index Terms- head, flow rate, speed, performance characteristics.

I. INTRODUCTION

A pump is a device which lifts water from a lower level to a higher level at the expense of mechanical energy. It consists an impeller rotating within a volute casing. In rotodynamics pump, the energy is transferred by rotary motion and by dynamic action. The input power of the pump is mechanical energy of the drive shaft and the output power is hydraulic energy. The rotating blade system imparts a force on the fluid, thereby making the fluid to move. Pumps are widely used for irrigation and are most common where pumping from surface water supplies such as river, lakes and streams and rising water to a higher level. Moreover, they are widely used in many other industries such as chemical plants, steam power plants, food processing factories, hydraulic system, and so on.

Fig 1.Single Suction Centrifugal Pump

II. DESIGN OF CENTRIFUGAL PUMP

The two main components of centrifugal pump are impeller and casing. The impeller is enclosed in a water tight casing that the kinetic energy of water is converted into pressure energy before the water leaves the casing. The other components are suction pipe, discharge pipe, shaft, bearing, wear rings, stuffing box, mechanical seal and various types of valves and gauges.
When the overall design of pump is considered, the shape of an impeller is the most important for optimum efficiency. Impeller design should be in such a way that, losses must be as low as possible. The design of a pump’s impeller can be divided into two parts. The first is the selection of proper velocities and vane angles needed to obtain the desired performance with the best possible efficiency. The second is the layout of the impeller for the selected angles and areas.

The specifications of pump that will be designed are:
- Pump head, \( H = 20 \text{ m} \)
- Discharge, \( Q = 0.9 \text{ m}^3/\text{min} \)
  \( Q_s = (Q/60) \text{ m}^3/\text{s} = 0.015 \text{ m}^3/\text{s} \)
- Rotational Speed, \( n = 1800 \text{ rpm} \)
- Density of water, \( \rho = 1000 \text{ kg/m}^3 \)

### A. Design of impeller

Specific speed is an essential criterion to determine the impeller shapes. It is mathematically expressed as

\[
n_s = \frac{n \times \sqrt[3]{Q}}{H^{\frac{1}{2}}} \tag{1}
\]

In this design, calculated value of specific speed based on required head and capacity is 180 rpm and it is within the range of low specific speed pump that is greater than 80 and less than 600. So, end-suction type single stage centrifugal pump with closed impeller is chosen.

Pump efficiency, \( \eta \) is assumed by using Fig. A1. and also the diameter of suction pipe \( D_s \) can be estimated from this chart. The discharge pipe diameter \( D_d \) is usually selected equal to or one size smaller than that of the suction pipe. Thus, velocities in these pipes are given by

\[
V_s = \frac{Q_s}{\pi D_s^2/4}, \quad V_d = \frac{Q_s}{\pi D_d^2/4} \tag{2}
\]

Input power of centrifugal pump can be determined by following equation.

\[
L = \frac{\rho Q_s g H}{\eta} \tag{3}
\]

For charge condition of the pump work, maximum shaft power or rated output of an electric motor \( L_r \) (kW) is decided by using Equation (4).

\[
L_r = \frac{(1 + F_o) \times L}{\eta_{tr} \times 1000} \tag{4}
\]

Where, \( F_o \) is the allowance factor, and 0.1~ 0.4 for an electric motor and larger than 0.2 for engines And then, \( \eta_{tr} \) is the transmission efficiency, and 1.0 for direct coupling and 0.9 ~ 0.95 for belt drive.

The shaft diameter at hub section of impeller is

\[
d_s = \sqrt[3]{\frac{16 T}{\pi \tau}} \tag{5}
\]

Where, \( T \) is the torsional moment and it can be estimated by

\[
T = \frac{60 L_r}{2 \pi n} \tag{6}
\]

Allowable shear stress of material of shaft, \( \tau \) is 24.5 MPa because the main shaft is made of S30C. The estimated shaft diameter will be increased because it is difficult to predict the bending moment at this time.

The hub diameter, \( D_h \) is usually taken from 1.5 to 2.0 times of the shaft diameter and the hub length, \( L_h \) is from 1.0 times to 2.0 times of the shaft diameter.

The diameter of impeller eye, \( D_o \) is calculated by

\[
D_o = \sqrt{\frac{4Q_s}{\pi V_{mo}} + D_h^2} \tag{7}
\]

Where, the flow rate through the impeller, \( Q_s \), is \( Q/\eta \), and volumetric efficiency \( \eta \), is estimated by

For Equation (7), the velocity at the eye section is given by
\[ V_{mo} = K_{mo} \sqrt{2gH} = (1.5-3.0) \leq V_{m1} \] (9)

For a fluid flowing through the rotating impeller, \( u \) is the tangential velocity, \( V \) is the absolute velocity and \( v \) is the relative velocity of a fluid particle to impeller rotation. The angle between \( V \) and \( u \) is \( \alpha \) and the angle between \( v \) and \( u \) is \( \beta \) and it is the angle made by tangent to the impeller vane and a line in the direction of motion of the vane. The tangential component and radial component of absolute velocity \( V \) are \( V_u \) and \( V_r \) respectively. The outlet velocities triangle with solid lines represents the actual diagram.

The parameters \( K_u \) (speed constant), \( K_{m1}, K_{m2}, \) and \( D_1/D_2 \) are obtained on the value of specific speed in Fig A2. The outlet diameter \( D_2 \),
\[ D_2 = \frac{u_2 \times 60}{\pi \times n} \] (11)

Where, the peripheral velocity at impeller outlet is
\[ u_2 = K_u \sqrt{2gH} \] (12)

The peripheral velocity at the inlet is also expressed by
\[ u_1 = \frac{\pi D_1 n}{60} \] (13)

O And then, flow velocities at the inlet and outlet are
\[ V_{r1} = K_{m1} \sqrt{2gH} \quad \text{and} \quad V_{r2} = K_{m2} \sqrt{2gH} \] (14)

If the incoming flow has no pre-rotation, the blade angle \( \beta_1 \) (deg) is given by
\[ \beta_1 = \tan^{-1} \left[ \frac{K_{m1} V_{r1}}{u_1} \right] \approx \tan^{-1} \left[ \frac{V_{r1}}{u_1} \right] + (0-6) \] (15)

Where, \( K_{m1} = 1.1-1.25 \)

The amount of outlet angle \( \beta_2 \) usually has between 15˚ and 35˚. So, the vane outlet angle is assumed that \( \beta_2 = 23˚ \) in this design. From the velocity triangles, inlet and outlet relative velocities are
\[ v_1 = \frac{u_1}{\cos \beta_1} \quad \text{and} \quad v_2 = \frac{V_{r2}}{\sin \beta_2} \] (16)

The virtual tangential component \( V_{u2} \) of \( V_2 \) is
\[ V_{u2} = u_2 - \frac{V_{r2}}{\tan \beta_2} \] (17)

For radial-type impellers, the slip factor, \( \eta_o \) varies between 0.65 and 0.75 and it is assumed that \( \eta_o = 0.7 \) average. Thus, the actual tangential component \( V_{u2} \) of \( V_2 \) is
Thus, the actual outlet is found by
\[ \tan \alpha' = \frac{V_{r2}}{V'_{u2}} \]  
(19)

The absolute outlet velocity from outlet velocity diagram is
\[ V_2 = \sqrt{V'_{r2}^2 + V'_{u2}^2} \]  
(20)

The number of blades, \( Z \) is decided by using the Pfieiderer formula.
\[ Z \approx 6.5 \frac{D_2 + D_1}{D_2 - D_1} \sin \left( \frac{\beta_1 + \beta_2}{2} \right) \]  
(21)

In this design, blade thickness and shroud thickness are taken as 2.5 mm and 3.0 mm respectively for \( D_2 \) is greater than 200 mm.

The inlet passage width \( b_1 \) and outlet passage width \( b_2 \) are calculated by
\[ b_1 = \left[ -\frac{Q_s}{\pi D_1 V'_{r1}} \right] \left[ \frac{\pi D_1}{\pi D_1 - S_1 Z} \right] \]  
and  \[ b_2 = \left[ -\frac{Q_s}{\pi D_2 V'_{r2}} \right] \left[ \frac{\pi D_2}{\pi D_2 - S_2 Z} \right] \]  
(22)

Where, \( S_1 \) is \( (\delta_1 / \sin \beta_1) \), \( S_2 \) is \( (\delta_2 / \sin \beta_2) \), and \( \delta_1 \) and \( \delta_2 \) are blade thicknesses near the leading edge and trailing edge respectively. Moreover, \( S_2 \) can also be determined by the following relationship equation.
\[ \frac{\pi D_1}{(\pi D_1 - S_1 Z)} = \frac{\pi D_2}{(\pi D_2 - S_2 Z)} \]  
(23)

The impeller blade is drawn by three circular arcs method with solid work software.

![Fig. 3 Curvature of Impeller Blade](image)

\[ \rho_A = \frac{\left( R_A^2 - R_B^2 \right)}{2 \left( R_A \cos \beta_A - R_B \cos \beta_B \right)} \]  
\[ \rho_B = \frac{\left( R_B^2 - R_C^2 \right)}{2 \left( R_B \cos \beta_B - R_C \cos \beta_C \right)} \]  
and  \[ \rho_C = \frac{\left( R_C^2 - R_D^2 \right)}{2 \left( R_C \cos \beta_C - R_D \cos \beta_1 \right)} \]  
(24)

Where, \( R_A \), \( R_B \), \( R_C \) and \( R_D \) are base circle radii, \( R_e = D_2/2 \) and \( R_D = D_1/2 \).
The angles between $\beta_1$ and $\beta_2$ are divided into three angles.

**B. Design of volute casing**

Design of volute casing is calculated depending on the $D_2$ and the basis of constant average flow velocity in volute casing. The volute casing increases proportionally in size from cut water to the discharge nozzle. In rear velocities distribution, across volute section is not uniform. Volute angle is read from volute constant chart shown in Fig. A3 and in this design, the volute angle, $\alpha_v$, is 8° based on $n_s$ value.

![Fig. 4 Section through Volute Casing [4]](image)

The width of the volute at any point may be calculated from

$$b = b_3 + 2x\times\tan(\theta/2)$$  \hspace{1cm} (26)

Where, $x$ is the distance between any radius $R$ and impeller outside radius $R_2$. The volute is designed by determining the angle $\Phi^\circ$ measured from and assumed radial line by tabular integration of Equation (27).

$$\Phi^\circ = \frac{360}{Q} \int_{R_2}^{R_3} b dR = \frac{360}{Q} R_2 V'_{a2} \sum_{R_2}^{R_3} b \Delta R / R$$  \hspace{1cm} (27)

The tongue angle of volute casing is determined by

$$\Phi_t^\circ = \frac{132}{\tan \alpha_2^\circ} \log_{10} \frac{R_1}{R_2}$$  \hspace{1cm} (28)

Volute wall thickness is chosen according to suction pipe diameter and it is taken as 6 mm since the suction pipe diameter is within 100 and 150 mm in this design.

**III. DESIGNED RESULTS OF CENTRIFUGAL PUMP**

**A. Calculated Results**

The calculated results for both impeller and casing design of centrifugal pump are clearly expressed in Table I.

<table>
<thead>
<tr>
<th>No.</th>
<th>Descriptions</th>
<th>Symbols</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Input Power</td>
<td>$L$</td>
<td>6 hp</td>
</tr>
<tr>
<td>2</td>
<td>Shaft diameter</td>
<td>$d_s$</td>
<td>34 mm</td>
</tr>
<tr>
<td>3</td>
<td>Hub diameter</td>
<td>$D_h$</td>
<td>51 mm</td>
</tr>
<tr>
<td>4</td>
<td>Hub length</td>
<td>$L_h$</td>
<td>68 mm</td>
</tr>
<tr>
<td>5</td>
<td>Impeller eye diameter</td>
<td>$D_o$</td>
<td>97 mm</td>
</tr>
<tr>
<td>6</td>
<td>Impeller inlet diameter</td>
<td>$D_1$</td>
<td>99 mm</td>
</tr>
<tr>
<td>7</td>
<td>Impeller outlet diameter</td>
<td>$D_2$</td>
<td>250 mm</td>
</tr>
<tr>
<td>8</td>
<td>Inlet angle of impeller blade</td>
<td>$\beta_1$</td>
<td>20°</td>
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<td>9</td>
<td>Outlet angle of impeller blade</td>
<td>$\beta_2$</td>
<td>23°</td>
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<td>10</td>
<td>Impeller passage width at inlet</td>
<td>$b_1$</td>
<td>20 mm</td>
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<td>11</td>
<td>Impeller passage width at outlet</td>
<td>$b_2$</td>
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<td>12</td>
<td>Number of impeller blades</td>
<td>$Z$</td>
<td>6 blades</td>
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<td>13</td>
<td>Base width of volute casing at $D_2$</td>
<td>$b_3$</td>
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<tr>
<td>14</td>
<td>Volute tongue angle</td>
<td>$\Phi_t$</td>
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<td>15</td>
<td>Discharge nozzle diameter</td>
<td>$D_d$</td>
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**B. Modelling of Centrifugal Pump**

The three dimensional centrifugal pump is created by using Solidworks Software.

**IV. PERFORMANCE ANALYSIS BY VARYING SPEED OF IMPELLER**

Performance Characteristic curves of actual head and efficiency on capacity are presented by varying the speed of impeller in Fig 6. The actual head is achieved by subtracting of shock losses, diffusion losses, friction losses, circulatory flow effect, leakage losses and mechanical losses from the theoretical head.

**V. CONCLUSION**

The designed pump is aimed to use in agricultural application especially for river pumping project. The clearance between impeller and tongue of volute is 3 mm. This value is a reasonably safe value for the tongue. The diameter of discharge flange is 80 mm. The thickness of volute casing to withstand the discharge pressure, 6 mm is selected depending upon the suction pipe diameter. When the
performance of the designed pump is predicted, the maximum efficiency has nearly 65%. According to Fig 6, the designed centrifugal pump satisfies for head of 20 m and capacities of 15 L/sec at speed of 1800 rpm. At the maximum efficiency condition, we observed that the head is 25 m although the capacity is 13.5 L/s. The materials to be used should be selected depending upon the type of water. The impeller is made of bronze to protect corrosion. To reduce the leakage from discharge to suction between the casing and impeller, the clearance must be made very small. It is used only to pump water at 70˚ F and if very hot water is used this pump will be damaged. The designed single-suction centrifugal pump can fulfill the requirements of domestic application and industrial application, and then can improve pump efficiency.

APPENDIX

A. FIGURES

Fig. A1 Overall Efficiency Curve [2]  Fig. A2 Stepanoff Chart

Fig. A3 Design Parameters for Volute Casing [3]

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THE ARRANGEMENT OF RELIGIOUS TOURISM CORRIDOR IN SEKUMPUL MARTAPURA BASED ON LIVABLE STREET

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Abstract – The public interest to the religious tourism of K.H. Zaini Abdul Ghani Al Banjary’s grave in Sekumpul, Martapura increasing in each year. The phenomena show the potential apparently to develop the tourism area. Because religious tourism offers "double satisfactions" these are the tourists not only get satisfaction in their journey but also the spiritual satisfaction that strengthen their faith. However, The social, economy and spiritual potential are not supported by the physical conditions that is uncomfortable, unsafety, inaccessible corridor that accommodate the activities. The purpose of this study is to formulate the concept of the corridor that comfortable and accommodate for all the corridor users and support the corridor for religious tourism purpose. This research based on livable street approach because considering the aspects of comfort and safety corridor. The strategy used in this research was qualitative method. The method can be accomplished by the data collections applied by observation and interviews, observation, and interviews, analysing data existing based on livable street aspects. Finally, the concept formulation of the religious tourism corridor design in sekumpul martapura based on livable street approach. The result of this study is proposed the concept in arranging religious tourism corridors in sekumpul martapura based on livable street approach that design the street pattern which can be applied by the normal use and the spiritual activities, and completing the corridor facilities such as the availability of safe and convenient pedestrian lanes, bicycle lanes and public transportation. And strengthen its identity as a corridor of religious tourism area that can be achieved by improving the quality of praying places such as the arrangement of outer space, the addition of supporting facilities of religious activities, and designing the complementary elements of the corridor that can strengthen the identity of the religious tourism area.

Index Terms - Livable Street, Religious Tourism, Sekumpul

I. INTRODUCTION

Over the last few decades, the phenomena of religious tourism is in great demand by the Muslim community in Indonesia. Proven by the increasing activities of pilgrimage to the tomb of the ulamas and kyai who are considered to have a major role in spiritualism. As it happens in the Guru Sekumpul's tomb or Makam K.H. Zaini Abdul Ghani Al-Banjari located in Sekumpul village of South Kalimantan. For many K.H. Zaini Abdul Ghani Al Banjari’s fanatic, the pilgrimage or religious tourism has become a weekly, monthly and even annual routine.

The phenomena of religious tourism prove the syiar islam growth in South Kalimantan. That what makes Martapura town filled by Islamic values. Particularly in Ramadan and Guru Sekumpul funeral anniversary, intensity of pilgrims increased sharply. Pilgrims increased over the usual days. Recorded from the last three years of tourists from local and outside the country that visited the area of religious tourism Sekumpul in 2015 amounted to 483,727, in 2016 visitors amounted to 3,226,496 people and in 2017 that counted to June amounted to 2,785,031 people [1]. From that phenomena it is obviously increase more than 500 percent from 2015 to 2016 of tourists and constantly increase until 2017. It makes Sekumpul region established by the government as a center of regional and national religious activities and areas of cultural tourism and cultural heritage destined [2].

Religious tourism is a temporary travel activity to gain a spiritual experience by visiting places of religious value such as tombs or sanctified places [3]. The religious tourism of Sekumpul gives a positive impact to improve the local community's economy. Because tourism and the economy are two things that affect each other and mutually beneficial if the tourism field are managed properly [4]. The concept of tourism activity can be defined by three factors [5], that is something to see, something to do, and something to buy. Something to see is related to the interesting things in the tourist destination, something to do is related to the activities of tourists in the tourist attractions, while something to buy is associated with local souvenirs of tourists bought in the tourist area he visited.

The impacts of economic development from religious tourism to bring a vibrant economy of the surrounding community, which can be seen from the many different business community, ranging from craft traders, Muslim equipment dealers, stalls, cafes, hawkers, motorcycle taxis, parking and
lodging along the road. The Sekumpul Corridors potentials should be balanced with comfort, safety, accessible for road users, and accommodate funeral anniversary that be held in every years.

The importance of safe and comfortable roads especially for pedestrians, disability, and the elderly in town that can live the road. the more comfortable and safer road is considered to attract more people to cross the street, potentially reducing dependence on private motor vehicle use and thus less conflict that causes road congestion.

Livable street concept is the concept of complete road that live, secure, comfort, environmental health, uniqueness identity, green, fun, can be a social space for all road user, disability, motors or non-motorized vehicles and transport common [6] [7] [8]. This approach is also known as a perfect approach that can be applied to Skumpul corridor that require tranquility for religious practice.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

The paradigm used in this research is a naturalistic paradigm with a qualitative methods [9]. These methods can be accomplished by identifying the physical condition of the corridor and interview. Aspects that used in this study are physical and non-physical aspects of the corridor that cause the discomfort of Corridor users. The related aspects of identifying that cause the discomfort corridor users are analyzed based on the livable street criteria [6],[7],[8]. that safety and comfort, Healthy street, social space, Neighborly territory, Fun green street, unique, transparency, Maintenance and good quality of construction and design. The main tool used in this research is walkthrough analysis [10], which is summarized by mapping technique [10] and semi structured interview to identify the main problem of the corridor, what is liked and disliked by the Sekumpul community, and the respondent idea for the better Sekumpul based on their perception about livability. For this study, interviews were conducted on several respondents directly related to the study including residents who were among the elderly, as well as Sekumpul corridor users and tourists, religious and commercial areas. Respondents were questioned using random sampling.

III. FINDINGS AND RESULT

Based on livable street aspect [6],[7],[8]. Found 2 main components in this research to accomplish the concept of arrangement that suitable with religion tourism corridors of sekumpul martapura that observed by the corridor livability based on the condition of the existing corridor and public perception about corridors livability and things that people like and do not like to the condition of the corridor and what the respondent idea for the better Sekumpul. Which then formulates the concept of arrangement of the religious tourism corridor in sekumpul martapura.

A. Walkthrough analysis based on the The livability of the Sekumpul corridors

First, Safety and Comport from the result that shown in building border line figure 2. It is known that the arrangement criteria of Sekumpul corridor is to arrange the corridor in accordance with the Banjar Regency Regulation concerning the Road Border that is 15 meters.

Fig. 2. Building border line

From the result that shown in road structure figure 3. Is known that the arrangement criteria of sekumpul corridor are need for widening road in accordance with the general provisions of zoning regulations for primary local roads ie at least 7.5 meters [12], roads should have clarity signage, the
Roads must have a median road to avoid the chaos of motor vehicle. Roads should be able to accommodate all road users include the pedestrians, disabilities, or public transportation, and need a drainage channel reconstruction. Drainage channels should be closed to avoid accidental road users and to avoid the behavior of people throwing waste in drainage channels.

**Fig. 3. Road Structure**

From the result that shown in Pedestrian ways figure 4. Is known that the arrangement criteria of Sekumpul corridor are: along Sekumpul corridor must provide pedestrian track, disability path, and bicycle path, the pedestrian road surface should be flat and not hollow. Requires a barrier between highways, bicycle lanes, pedestrian lanes and buildings. The pedestrian track should be comfortable and secure, and pedestrian ways should be barrier-free and polluted.

**Fig. 4. Pedestrian Ways**

**Second, Healthy Street** from the result that shown in Traffic volume figure 5. Known that the arrangement criteria of Sekumpul corridor need more facilities (like pedestrian lanes, bicycle lanes, and public transportation modes) that are comfortable, safety, attractive and have a good quality to accommodate alternative non-motor modes and public transportation modes. So the use of personal transportation mode can be decreases.

**Fig. 5. Traffic volume**

**Third, Social Space** from the result that shown in social space figure 6. Is known that the arrangement criteria of Sekumpul corridor that the bench should be available evenly along Sekumpul road, the bench should be comfortable and secure, and need have a specifically open space that is safe and comfortable to accommodate the social interacting community.

**Fig. 6. Social space**

**Fourth, Neighborly territory** from the result that shown in neighborly territory figure 7. Known that the arrangement criteria of Sekumpul community attach to the environment have to be improved by strengthening the identity of the corridor as a religious tourism area Sekumpul Martapura so that the people in the segment parameters can have the sense of belonging to the place.

**Fig. 7. Neighborly territory**

**Fifth, Fun and Green Street** from the result that shown in vegetation figure 8. Known that the arrangement criteria of Sekumpul corridor need for vegetation titled width along Sekumpul corridor to create a comfortable corridor that protect from the sun, and variety vegetation to create a pleasant green environment. This strategy can soften the environment, Pedestrian paths need to use materials that can reduce the heat of the local temperature, and the pedestrian way design should be attractive to attract pedestrians to pass.

**Fig. 8. Vegetation**
Sixth, from the result that shown in religious activity figure 9. Known that the arrangement criteria of Sekumpul corridor need for a specific treatment in temporary religious activities as follows, and sekumpul corridor needs to focus in increasing the pilgrims services by adding support facilities for religious activities such as wudlu place, health post and accessible congregational consumption post, and then improve the quality of homestay that close to the dome of the guru Sekumpul, good traffic coordination during the held of temporary religious activities, and a comfortable parking area that safe and accessible by the pilgrims.

Every Friday the road is closed for Friday prayers

In addition to prayer 5 times, places of worship is also filled with temporary activities such as maulid habsy, breaking fast together and tarawih in ramadan. And especially haulan K.H. Zaini Abdul Ghani held every year that always meet along the corridor.

Fig. 9. Religious activity

Seventh, from the result that shown in Transparency figure 10. known that the arrangement criteria of Sekumpul corridor it is necessary to improve the quality of the facade more attractive and transparent retail buildings as to create an interconnected atmosphere between inside and outside building.

Retail buildings that most of the facade tend to be of good quality and have transparency between inside and outside space so that feels the intertwined atmosphere.

Retail buildings that are mostly facade tend to be of poor quality, have no intertwined atmosphere and outer space, and their existence tends to lead to pedestrian conflict

Retail buildings that are mostly fasadenya tend to be good quality but do not have connectedness atmosphere inside and outside the building

Fig. 10. Transparency

Eighth, from the result that shown in maintenance of good quality and design figure 11. known that the arrangement criteria of Sekumpul road the trash should be applied along the Sekumpul road, and need for waste sorting system, Container garbage for pedestrians placed in every 50 meters, Placing garbage containers do not interfere with road users or other means.

There are no permanent waste containers along Sekumpul Road

Fig. 11. Maintenance of good quality and design buildings

B. Analysis of public perceptions on livability of sekumpul corridor

In this analysis there are several things that need to involve community participation that is related to the identification of physical condition of the corridor, the problems which according to the society is very important to be immediately give the solution, the things that people like, the do not like and some sekumpul community idea related to the development of the corridor. The technique used in this analysis is semi structural interviewing technique. This technique is used to collect opinions, ideas, and enter from related communities about the corridor of religious tourism area Sekumpul Martapura.

To explore ideas and opinions from the public used index cards that have been designed associated with the general criteria of livable street.

Based on the interviewed result most of the respondents answered very often visited sekumpul within the range of 1 to 6 times a week with the purpose of pilgrimage or just shopping around Sekumpul. Because of his residence located around martapura. Others answered rarely or within a period of 1 to 3 in a month with the purpose of pilgrimage.

Accessibility the majority of respondents said it was easy to access the sekumpul road, but they also said on the way around, especially around the Tomb of Guru Sekumpul during the crowded congregation, difficult to access. some others said it is difficult on certain days, such as the day of jum'at which is the access closed for praying activities. And the road is crowded and narrow.

Public transportation problems respondent most said it was hard to find, because public transport only reaches the main road, and doesn’t enter Sekumpul territory, others said it was easy for public transportation such as motorcycle taxi, becak and bendor. And there are some respondents who never access public transportation at all.

Motor vehicles respondents who being used motor vehicles said most respondents that used two-wheeled vehicles said the road is easy to access, but they feel insecure and quite difficult to parking the vehicle because of the narrowness road, and the unavailability of parking lots along the road.

To cross the Sekumpul corridor by walking based on interview result most respondents said it was uncomfortable and unsafe to cross the road by walking, due to the lack of a pedestrian way, so the pedestrians often used the highway to cross the Sekumpul road. In the street sekumpul also there is no shady vegetation so that when accessing the road by walking very uncomfortable. Store building along the road are often display their wares along the side road causing loss of space for
pedestrians. Another small part felt it was safe to walk because the speed of vehicles passing on the road collected quite slow.

**Signage** Most respondents said it is unclear, and still not complete. The road marker around the religious tourism area is only inscribed with the “Sekumpul dome” and that its existence is not very helpful because of its location directly opposite the entrance gate dome Gathered.

**Environmental comforts.** Some respondents said that the environment a little bit uncomfortable, they said the discomfort is caused by narrow roads, crowded, traffic jams, less vegetation, and when in rainy days street are often flooded. Especially in the market area ridho, very dense and chaotic so often lead to circulatory insufficiency.

**Healthy street** aspect most of the respondents stated that the corridor environment is not healthy, due to the lack of vegetation in the Sekumpul corridor, at certain times such as haulan, mawlid habsy weekly and ramadhan, the density of passing vehicles causes air and noise pollution and during the rainy season many road segmen are overflow by flood, and uncomfortable pedestrian way to cross.

**Comfort in praying activity** most respondents said quite comfortable while worshiping in the area sekumpul, due to a place of worship far enough from the highway, so the effects or pollution from passing vehicles is not too disturbing. Except in certain moments like when pilgrims are piled up.

According to the respondents the main problem of the Sekumpul corridor is the narrow street, to crowded street, less vegetation, Unrestrained and limited parking spaces, lack quality of pedestrian ways, there is no public transportation access for pilgrims, and many buildings that build on an illegal land.

Most of the respondents liked the religious sense and the friendliness of the visitors, others liked the trade area along the way of the collections that they value more complete and varied. And they don’t like the narrow street, the Lack of traffic management, Parking haphazardly, lack quality of pedestrian way, and not found the zebra cross along the street, the overheating weather, and air pollutions. And then they suggest the need for widening the street, improve the pedestrian ways quality, using material that cooling the local heat, adding vegetation and sun shading in the special area like musholla arraudhah, set the parking lot, especially in ridho market area, and improve the quality and structuring of traditional markets ridho, repair the drainage channel, traffic signage settings, special area of religious tourism plus a better place design ablution and permanent, and an interesting religious tourism area design.

**C. The concept of arrangement of religious tourism corridor based on livable street**

First, The Sekumpul Corridor should have a safe, comfortable and accessible pubic space for all road users, accommodate the guru Sekumpul funeral anniversary and Ramadhan events, especially for pedestrians, disabilities, elderly, cyclists and public transport.

Second, more facilities (pedestrian paths, bicycle paths, and public transportation modes) are convenient, safe, attractive and of good quality and can be used for the big event of Haul Guru Sekumpul.

Third, There is a need for open space that is safe, comfortable and accessible for the community so as to increase the social interaction of people and Sekumpul tourism.

The sense of community attachment as well as religious tourism visitors Sekumpul to the environment must be improved by strengthening the identity of the corridor as a religious tourism of Sekumpul Martapura by providing elements of Islamic nuances along the corridor. By adding street furniture that is nuanced as Islamic calligraphy Al-qur'an and asmaul husna.

![Fig. 12. Street pattern](image1.png)

![Fig. 13. Street facilities](image2.png)

![Fig. 14. Bollard to boundaries the motor vehicle](image3.png)

![Fig. 15. Green open space](image4.png)
Fig. 16. Entrance

Fig. 17. Calligraphy to strengthen the identity of the corridor as a religious tourism

And then Sekumpul corridor need for additional street facilities that facilitate the maintenance of the Sekumpul environment.

IV. CONCLUSION

To improve the secure and comfort of Sekumpul corridor need to be done by completing the corridor facilities such as the availability of safe and convenient pedestrian lanes, bicycle lanes and public transportation. While to strengthen its identity as a corridor of religious tourism area that can be achieved by improving the quality of praying places such as the arrangement of outer space, the addition of supporting facilities of religious activities, and designing the complementary elements of the corridor that can strengthen the identity of the religious tourism area.

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Working Tools, Acceptance and the Performance of Security Outfits in Niger Delta Region of Nigeria

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Abstract
This study examines the effect of working tools, acceptance on the performance of security outfits in the Niger Delta region of Nigeria. Survey method which allows for the use of questionnaires was adapted to facilitate information from 1120 participants sampled from the region. Respondents were selected from private and public security organizations. Data gathered were subjected to statistical analysis. To ease interpretation, results were presented in percentage, charts and tables. Findings show that, the availability and the acceptance of working tools by security officials enhances their performance and the overall output of their organizations. Specifically, the study reveals that surveillance equipment and crime detective equipment enhance the operational effectiveness of public and private security organizations’ in areas of criminal investigations and crime detection. The study recommended among others policy option that importantly encouraged the urgent equipping of security outfits in the Niger Delta region of Nigeria public-private partnership.

Keywords: Working tools, acceptance, organizational performance, security outfits, Niger Delta.

Introduction
In the past one and half decade, security remains a high profile challenge to government at all levels in Nigeria. Lawlessness, social disorder, armed robbery, kidnapping, terrorism, organized crimes, senseless vindictive assassination, criminal threat, ranked among the most pressing concerns of security issues in the country. This situation is creating many concerns in and outside the country. In response to the security challenges, government has at various times encouraged through enhanced salaries and trainings, the activities of the Nigeria police force, immigration service, civil defence, military, and customs. Government also encouraged the establishment of private security outfits as means of addressing the many security challenges in the country.

An effort of government in the past has little impact on the current security demands of the Nation. The inability of the police and other security organisations to check the rising spate of crime has been blamed on inadequate working tools, which largely characterized most government establishment and some private outfits in the country. Records also revealed that the fundamental problem with security agencies in Nigeria is not the existence but adequate utilisation of security equipment. These developments have negatively impacted on the operational performance and morale of officers in public and private security outfits. The lack of government aggressive attitude towards equipping security agencies in the country is not unconnected to inadequate empirical facts/data from seasoned research. The divide in opinion on the security situation in the country suggests that more facts and intelligent information are needed to curtail these upheavals and this can only be achieved through well-structured empirical research. It is therefore obvious that the available scanty and obsolete information is failing government in strategic security planning and policy formation. This study is designed to bridge the empirical gaps and generate concrete information on the state of security equipment, usage and the effectiveness of security outfits in the Niger Delta region of Nigeria.

Aims and objectives of the project/study
The general objective of the study is to investigate the relationship between working tools and the performance of security organisations in the Niger Delta region of Nigeria. Specifically, the study examined the effect of surveillance equipment on crime investigation. It assessed the relationship between crime detection equipment and performance of security organisations in detecting crime. The study critically reviewed the performance of security outfits with respect to the quality of service delivery in terms of high visibility geographic policing, emergency response, rapid response, and proactive problem-solving policing. It assessed the current
capacity and capability of communication gadgets within the context of gathering and sharing of intelligence with reference to operational performance and public satisfaction. It evaluated the effectiveness of security equipment in terms of quantity, quality, efficiency, and relevance to the prevailing security challenge in the country.

**Literature review**

**Institutional performance**

In the past, around 1950s, institutional performance was defined as the extent to which entities or establishments fulfilled their social or economic objectives (Georgopoulos & Tannenbaum, 1957). In the 1960s and 1970s institutional performance is the ability or an organisation to exploit it environment effectively using accessible and limited resources (Yuchtman & Seashore, 1967). In the 1980s, and 1990s, institutional performance is viewed as a complex whole which includes the ability of an organisation to accomplish its goals effectively and efficiently, that is with minimum resources (Lusthaus & Adrien, 1998). At the turn of the new millennium, institutional performance was seen as a set of financial and non-financial indicators which explicitly offers explanation about the degree of organisation’s achievement of it predetermined objectives and results (Lebans & Euske, 2006). This suggests that continuous institutional performance is the only way organisations grow and progress (Gavrea, Ilies & Stegerean, 2011).

Performance is a complex series of tasks that blends skills, knowledge, equipment (working tools) to produce an acceptable and valuable result, while to perform is to “produce valued results” (Elger, n.d). Performance can be collective or individually. Collective performance requires collaborative effort. This suggests that industrial performance goes beyond individual, it entails group of individuals within an entity engaging in a collective task to produce valued end or result. It is a series of well collaborative efforts geared at achieving set goals in an organisation (Campbell, 1990, 1999; Cascio, 2006). According to Vanscottter, Motowidlo and Cross (2000), organisational goals attainment is dependent on: highly performing workers or individuals. Kanfer (1990) posit that institutional performance is behavioural or actions of individuals that leads to acceptable outcome m the organisation. This suggests that what individual security officer does in work situation given the right working tools is highly significant in achieving optimal performance in the organisation. Thus, Campbell, et al., (1993) define institutional performance as what the organisation hires an employee/security official to do, and “do well”. It implies that institutional performance is measurable, can be sealed, evaluated and subject to judgemental processes.

**Working tools, acceptance of working tools and institutional performance**

The correlates between working tools, employees, and institutional performance are high (Agba & Ushie, 2014). The levels of technology utilisation in any organisation significantly influence the quality and quantity of production of goods and services (Dauda & Akingbade, 2011). Organisational performance is determined by the systematic application of working tools or technology. Working tools here could be in form of equipment, machine, information and communication technology (ICT), software, surveillance camera, computers, vehicles etc. which enables task accomplishment in work or security organisations (Khalil, 2000).

For instance, Dauda and Akingbade (2011) observe that employees of various categories have benefited from internet and multimedia working tools, which provide technical solution to their individual and organisational problems as well as increase their effectiveness and efficiency.

Working tools or office facilities are vital in maintaining comfortable, safe and supportive work encouragement, which in-turn stimulate and enhance workers’ motivation and productivity (Parveen, Sohail, Naeem, Azhar & Khan, 2014). Similarly, Carnevale (1992) posit that better office equipment or working tools boost employees’ and final productivity of the organisation. Keeling and Kallaus (1996) posit that selecting and using proper working tools importantly enhance employees’ and institutional performance. The function and effectiveness of business organisations or outfit depends not only on the availability of working tools but on the skills and competencies of employees’ (Akpori & Ordu, 2009). This suggests that employee or organisational performance is not just a function of working tools or technology but a combination of it with workers’ skills and competencies. According to Edwin (2008), Exposure to modern equipment or technology makes work much easier for the employees and knowledge much more accessible and avoidable. Osuala (2004) posit that offices equipment makes a hardworking staff more productive as well as the business organisation.

Repaid technological advancement continues to accelerate the frontier performance in formal organisations (Hampel & Martinsons, 2009; Imran, Maqbool & Shafique, 2004), competition and advanced technology enhances efficiency and rapid growth among employees. Advances in working tools increases human performance when ethically applied and used for the benefit of the organisation. According to Imran, Maqbool and Shafique (2014), most organisations today purchase advanced working tools to improve employees’ performance, increase efficiencies, and high level of effectiveness.

Availability and acceptance of improved working tools is pivotal to institutional performance. Availability of advanced working tools or technology alone is not a prediction for enhance job performance. That is, workers must accept available tools as a precaution for their performance (Hasan & Hadzar, 2010). This is because not all workers can adjust to modern working tools that require training (Gallivan, 2004). Change in working tools is an inevitable and inalienable part of organisational life. These changes are important

contributing fact to organisational dynamics. It also informed workflow amongst workers in public and private organisations across the world (Morgan, 2001; Bameth, 2005; Ramlah, Nor-Shahriza & Mohd Hasan 2007).

Accessibility and acceptability is vital in selecting working tools for employees. Acceptability here is a function of two major variables: “ease of use,” and “perceived usefulness” (Davis, 1989). A workers who views a given working tool as difficult technology to use workplace, will not support such no matter how efficient it seems to be. This may also affect the worker’s productivity if compelled to use unaccepted technology or working tool. Perceived usefulness is also a significant determinant of working tool utilisation at workplace. A worker who perceived that a given technology or working tool is vital to his/her productivity will more likely require and desire to utilize it. This suggests that security officers must accept a given working tool in terms of its usefulness and “easy to use” before such technology can boost their efficiency.

Theoretical survey

This study utilized the six-component theory of performance: Six components theory of performance. The six components theory of performance has its origin from the works of Donald Elger a professor in the Department of engineering, university of Idaho, Moscow. Specifically, his work on theory of performance” provides an inside on what inform performance in formal organisations across the world. The theory was based on the assumption that humans or workers are “capable of extraordinary accomplishment” through inspiration and integrated collaborations. Elger observes that “performance” is a journey while “level of performance” is the location in the journey He posit that level of performance depends fundamentally on size components including - levels of skills, context, personal factors, fixed factors, level of knowledge and level of identity. The theory proposed three axioms for effective performance improvement in work organisations; these include: “immersion in enriching environment”, “performer’s mind-set”, and engagement in reflective practice.

Elger identified seven categories of performance. These include - quality increase, cost decrease, capacity increase, knowledge increase, skill increase, identity and motivation. He also argues that performance of individual, group, or organisation advances through levels; from level 1, 2, 3, etc. This suggests that organisational performances hardly skip levels, it is chronological, sequential, and orderly patterned. This suggests that the performance of security outifes in the Niger Delta region will increase gradually from one level to another without skipping a step. It shows that performance of security organisations is a journey and the level of performance is the location in the journey. The theory suggests further that, security officials working in the Niger Delta region are capable of extraordinary accomplishments if given the necessary supports. It highlights the importance of skills, knowledge and work experience in increasing the performance of security officials and indeed security organisations in the Niger Delta region.

Study area

The Niger Delta region is located in Southern part of Nigeria (see Fig. 1). It occupies an area of 112, 110 km², representing 12 per cent of the Nigeria’s total surface land mass (see Table 1) (FRN, n.d). It is bordered to the South by the Atlantic Ocean and to the South by Republic of Cameroon. It sits on the Bight of Biafra side of the Gulf of Guinea (Hogan, 2013). The region lies between latitude 4 and 6 north of the Equator and 4 and 8 East of the Greenwich (Eyinla & Ukpo, 2006; Afinotan & Ojakorotu, 2009).
The Niger Delta region consists of nine states including Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers. The states of Cross River, Edo, Delta and Ondo have the large land areas respectively. The region has a population of 39,157,000 with the states of Rivers, Delta, Akwa Ibom, Imo and Abia having the highest population respectively (See Table 1 for details). Each state is further divided into senatorial, federal and state constituencies, local government areas and council wards for ease of administration. The administration of each state is vested on the governor, the deputy governor and appointed executives. The Senator represents each senatorial district at the national assembly, while the House of Representative member represents each federal constituency in the House of Representatives. The state constituencies are represented by house of assembly members. While local government council wards are represented by elected legislators (counsellors). The administration of the local government area is vested on the local government chairman and his executive cabinet.

<table>
<thead>
<tr>
<th>State</th>
<th>Land area</th>
<th>2015 Projected population</th>
<th>Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abia</td>
<td>4,877</td>
<td>4,383,000</td>
<td>Umuahia</td>
</tr>
<tr>
<td>Akwa Ibom</td>
<td>6,806</td>
<td>4,537,000</td>
<td>Uyo</td>
</tr>
<tr>
<td>Bayelsa</td>
<td>11,007</td>
<td>2,320,000</td>
<td>Yenagoa</td>
</tr>
<tr>
<td>Cross River</td>
<td>21,930</td>
<td>3,712,000</td>
<td>Calabar</td>
</tr>
<tr>
<td>Delta</td>
<td>17,163</td>
<td>4,877,000</td>
<td>Asaba</td>
</tr>
</tbody>
</table>

**Source:** FRN (n.d). *Niger Delta Regional Development Master Plan.*
The Niger Delta region is the economic nerves of Nigeria. It accounts for over 90 per cent of the total foreign exchange income of Nigeria. Apart from crude oil, the region has the largest deposit of gas. It is a home to huge oil and gas multinational companies. These companies are the major employers of labour in the energy sector of Nigeria. Oil multinationals in the Niger Delta region include Agip, Exxon Mobil, Chevron-Texaco, Total, FinalElf, Shell Petroleum Development Company (SPDC), among others. While gas companies include Liquefied Natural Gas (LNG), Shell Gas, CLEAG a subsidiary of Elf, and Agip Gas.

The huge economic activities in the Niger Delta region are not without negative consequence. Oil exploitation is responsible for the environmental degradation of the region and its immediate environs. It is also responsible for unemployment especially among farmers whose lands have been polluted because of oil spillage. It accounts for air and water pollution in the region. The waves of militancy and high rate of insecurity in the region is also tied to oil exploitation activities. The emergence of notable militant groups such as Niger Delta People's Volunteer Force (NDPVF), Niger Delta Vigilante (NDV), and now the Niger Delta Avengers, is also tied to oil exploitation creks of the Niger Delta Region (Okonata & Douglas, 2003; Obi & Rustad, 2011).

The in-flock of migrants from different countries into the region because of its huge economic activities comes with crimes such as robbery, kidnapping, and cyber-crimes. The continue militarisation of the region informed a number of reforms, including the establishment of the Niger Delta Development Commission (NDDC), Ministry of Niger Delta (MND), and the Local Content Policy (LCP). U occasioned the formation of different security task force, private security organisations among others. Despite government and private efforts to address the upheavals in the Niger Delta, the region is still witnessing a great number of crises Efforts of security organisations in the region remained fruitless. The concern of this study therefore is to unearth what is rendering security organisations in the region ineffective; with specific reference to the effect of working tools on the operational effectiveness of both private and public security outfits in the Niger Delta region.

**Methodology**

Survey design was used in this study. It was adopted because it allows systematic empirical investigation and easy inferences. Preliminary survey of existing operational base and stakeholders meeting was organized to determine appropriate sample for the study. Open and closed ended questionnaires were afterward designed and served to purposively selected security organisations in the Niger Delta region. Two states were selected out of the region for the study; these are Akwa Ibom and Cross River State. The questionnaire contained major variables of the study including items that collects demographic information from respondents.

A total of 1120 respondents were selected for this study; 560 participants were selected from each of the states. Questionnaires were administered purposively to the sample to elicitate data and opinion across gender and age brackets. Information gathered was coded and analysed using SPSS and results were presented in tables and charts.

**Findings**

**Demographic report of respondents**

Majority of the respondents (65%) worked with public security outfits, while (35%) of the participants are employed in private security organisations (see Fig. 2). Over (90%) of the respondents were male (Fig 3). Significant proportion of the respondents (70%) are between ages 30 and 45 years (Fig. 4). The study showed that, majority of the respondents (50%) were O’level/senior secondary certificate holders. B.Sc or its equivalent were (27%), while OND or NCE holders only (3%) of the security agents were either M.Sc or Ph.D holders (see Fig. 5). Forty percent (48%) of the participants has spent 6-10 years in their security organisations. Thirty-nine percent (39%) spent 11 years and above in their organisations. The rest, that is 13%, worked between 1-5 years with their establishments (see Fig 6).
Fig 3: Gender

Fig 4: Age of respondents

Fig 5: Highest educational qualification of respondents

Fig. 6: Years of working experience
Surveillance equipment and criminal investigation

Result showed that over (85%) of the respondents had knowledge of CCTV surveillance equipment. Fifty percent (50%) of participants has CCTV surveillance at workplace and 59% used CCTV equipment especially video for their daily operations. Eighty percent (80%) of the respondents agreed that CCTV ease crime detection and over seventy percent (70%+) agreed that CCTV enables effective surveillance (see Fig. 7).

**Fig. 7: Surveillance equipment and criminal investigation**

<table>
<thead>
<tr>
<th></th>
<th>1-5 years</th>
<th>6-10 years</th>
<th>11-years and above</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surveillance equipment</strong></td>
<td>13</td>
<td>48</td>
<td>39</td>
</tr>
<tr>
<td><strong>CCTV surveillance</strong></td>
<td>94</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td><strong>Use of video surveillance</strong></td>
<td>61</td>
<td>45</td>
<td>39</td>
</tr>
<tr>
<td><strong>Crime easily detected</strong></td>
<td>84</td>
<td>16</td>
<td>26</td>
</tr>
<tr>
<td><strong>Cameras and surveillance</strong></td>
<td>74</td>
<td>26</td>
<td>26</td>
</tr>
</tbody>
</table>

Crime detection equipment and security outfit performance

Findings on crime detection equipment showed that 60% of the respondents agreed that in their organisations there is availability of the device for verifying crime and this ease crime detection. Over seventy percent (70%) and above agree that there is availability of security equipment for acquiring evidence of crime and this enhance their detective operations. A significant proportion of respondents (over 90%) have patrol vehicles that enhances their response to emergencies and distress calls. However, only 80% agreed that their patrol vehicles are regularly fuelled during their detective operations (see Fig. 8).
Discussion of findings

Surveillance equipment and criminal investigation

The outcome of this study is quite revealing; it showed that knowledge of, and the use of CCTV surveillance equipment significantly enhance criminal investigations in public and private security outfits in the Niger Delta region of Nigeria. It enables security personnel to detect crime and carry out effective surveillance operations. This finding corroborate with the ideas of Agba and Ushie (2014), who posit that working tools and workers are vital ingredient to institutional performance.

Similarly, Dauda and Akingbade (2011) observe that the level of technology or working tools utilised in an organisation importantly determine the quality and quantity of its output. This is not surprising, security outfits in the Niger Delta region that are equipped with a good number of working tools, performs better than those with inadequate equipment. Khalil (2000) posit tat organisational outfits is determined by the systematic application of equipment or resources. Working tools enables task accomplishment in organisations including security establishments.

However, availability of working tools, example; CCTV, without acceptability by workers may not lead to effective performance at individual and organisational levels. According to Hassan and Hadzar (2010), availability and acceptance of improved working equipment is quintessential to improved institutional performance. This is because not all workers, in this instance, security personnel can adjust to modern security equipment or tools.

Consequently, Gallivance (2004) argue that, training is essential to create acceptability and efficient use of equipment among staff. Apart from training as a contributory factor to institution performance, Brewer and Selden (2000) observe that leadership and supervision, human capital, and organisational culture are predictive factors to effective performance. It suggests that, equipment/working tools without good leadership, supervision, human capital and organisational culture will not stimulate institutional performance.

Crime detection equipment and security outfit performance

The study showed that there is a significant correlate between crime detection equipment and the performance of security outfits in the Niger Delta region. It revealed that the availability and usage of crime detection equipment enhances the operational effectiveness of security organisation. This finding is in line with the views of Parveen, Sohail, Naeem, Azhar and Khan (2014) who posits that office equipment creates comfort and supports productivity of workers and that of the organisation. Similarly, Carnevale argue that working tool boost employees’ and final output of security organisations.

In the same vein, Keeling and Kallous observe that selecting and using proper equipment stimulate and enhance institutional performance whether private or public. Akpomi and Ordu (2009) observe that, although effectiveness of organisations depends on equipment, the competencies and skills of employees are tonic to effective institutional performance. It showed that, workers’ and organisational output is not just a function of working tools but a combination of skills and competence as well. Osuala (2004) and Edwin (2008) argue that technological advancement in area of office equipment makes work much easier at the work-floor and the organisation at large. It makes hardworking staff more productive as well as boost the performances of many organisations.

Conclusion and recommendations

The correlates between working tools, acceptance, and the performance of private and public security organizations in the Niger Delta region of Nigeria was established in this study. This outcome was revealing as it shows that the availability and acceptance of
working tools by security officials enhances their performance and the overall output of their organizations. Specifically, it reveals that surveillance equipment and crime detective equipment enhances the operational effectiveness of public and private security organizations in areas of criminal investigations and crime detection. This suggests that the security challenges in the Niger Delta region and indeed Nigeria is not unconnected to want of security equipment in the country. It further suggests that organizations that are not lacking working tools are more likely to suffer from low productivity. The study recommended policy option that importantly encouraged the equipping of security outfits in the Niger Delta region and the country at large through public-private partnership. Employers of labour should train and create awareness for workers before new equipment are introduced in their organizations as this will enhance more acceptability among employees.

Acknowledgements

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References


Implementation of Mechanical Coupling of Synchronous Generator with Exciter System for Voltage Generation

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Abstract- This paper presents the voltage generating process of synchronous generator. The aim of this paper is to understand the excitation system of synchronous generator. A direct current (DC) is applied to the rotor winding of a synchronous generator to produce the rotor magnetic field. A prime mover rotates the generator rotor to rotate the magnetic field in the machine. A three-phase set of voltages is induced in the stator winding by the rotating magnetic field. Excitation is the important part of synchronous generator. Synchronous generator excitation system consists of exciter, automatic voltage regulator, rectifier, step down transformer. The basic function of an excitation system is to provide direct current to the synchronous generator field winding. Voltage generating process simulate the MATLAB software.

Keywords: voltage, synchronous generator, excitation, control

I. INTRODUCTION

Synchronous generators or alternators are synchronous machines that convert mechanical energy to alternating current (AC) electric energy. A direct current (DC) is applied to the rotor winding of a synchronous generator to produce the rotor magnetic field. A prime mover rotates the generator rotor to rotate the magnetic field in the machine. A three-phase set of voltages is induced in the stator winding by the rotating magnetic field. The exciter generator output (three-phase alternating current) is converted to direct current by a three-phase rectifier circuit also mounted on the rotor. The DC current is fed to the main field circuit. The field current for the main generator can be controlled by the small DC field current of the exciter generator, which is located on the stator.

Synchronous generators are used almost exclusively in power systems as a source of electrical energy. The generator is supplied with real power from a prime mover, usually a turbine, whilst the excitation current is provided by the excitation system shown schematically in Fig. 1. The excitation voltage $E_1$ is supplied from the exciter and is controlled by the automatic voltage regulator (AVR). Its aim is to keep the terminal voltage $V$ equal to the reference value $V_{ref}$. Although the AVR is very effective during normal steady-state operation, following a disturbance, the generator is in the transient state and the AVR may have negative influence on the damping of power swings. As power swings cause the terminal voltage to oscillate, the reaction of the AVR is to force field current changes in the generator which, under certain conditions, may oppose the rotor damping currents induced by the rotor speed deviation $\Delta \omega$. This so-called negative damping may be eliminated by introducing a supplementary control loop, known as the power system stabilizer (PSS), also shown in Fig. 1. The task of the PSS is to add an additional signal $V_{PSS}$ into the control loop, which compensates for the voltage oscillations and provides a damping component that is in phase with $\Delta \omega$[6].

![Figure 1. Functional diagram of excitation control](http://dx.doi.org/10.29322/IJSRP.8.7.2018.p7975)
mechanical energy into electrical energy. As the generation cost is considerable due to high price of diesel, therefore, such power stations are only used to produce small power [7].

II. METHODOLOGY

The proposed excitation system consists of synchronous generator, transformer, rectifier, exciter and AVR.

A. Exciter

Exciter is the source of electrical power for the field winding of generator and is realized as a separate DC or AC generator. Exciter has its field winding in the stator, and armature winding in the rotor. In case of AC generator, as the rotor rotates, stator DC current induces a three-phase alternating current into the rotor winding. This AC current is rectified using diode, thyristor or transistor bridge installed in the rotor. Exciter is controlled by the AVR, which is very effective during steady-state operation, but, in case of sudden disturbances it may have negative influence on the damping of power swings, because then it forces field current changes in the generator.

AVR acts upon the DC voltage $V_f$ that supplies the excitation winding of SGs. The variation of field current in the SG increases or decreases the emf (no load voltage); thus, finally, for a given load, the generator voltage is controlled as required. The excitation system of an SG contains the exciter and the AVR. The exciter is, in fact, the power supply that delivers controlled power to SG excitation (field) winding. As such, the exciters may be classified into the following:

• DC exciters
• AC exciters
• Static exciters (power electronics)

The DC and AC exciters contain an electric generator placed on the main (turbine-generator) shaft and have low power electronics control of their excitation current. The static exciters take energy from a separate AC source or from a step-down transformer and convert it into DC-controlled power transmitted to the field winding of the SG through slip-rings and brushes. The AVR collects information on generator current and voltage ($V_g$, $I_g$) and on field current, and, based on the voltage error, controls the $V_f$ (the voltage of the field winding) through the control voltage $V_{con}$, which acts on the controlled variable in the exciter.

AC exciters basically make use of inside-out synchronous generators with diode rectifiers on their rotors. As both the AC exciter and the SG use the same shaft, the full excitation power diode rectifier is connected directly to the field winding of SG. The stator-based field winding of the AC exciter is controlled from the AVR. The static power converter now has a rating about $1/20(30)$ of the SG excitation winding power rating, as only one step of power amplification is performed through the AC exciter.

The AC exciter in Fig. 3 is characterized by the following:

• Absence of electric brushes in the exciter and in the SG
• Addition of a single machine on the main SG-turbine shaft
• Moderate time response in $V_f$ (SG field-winding voltage), as only one (transient) time constant ($T_d0'$) delays the response; the static power converter delay is small in comparison
• Addition of one torsional shaft frequency due to the flexibility of the AC exciter machine shaft and mechanical coupling
• Small controlled power in the static power converter: $(1/20[30]$ of the field-winding power rating)

The brushless AC exciter is used frequently in industry, even for new SGs, because it does not need an additional sizable power source to supply the exciter’s field winding.
In large alternators, the excitation system is provided by a small synchronous machine connected on the same shaft as the main synchronous generator. Current rectification is performed by a rotating diode bridge mounted on the synchronous machine shaft, thus avoiding slip rings for providing DC power to the synchronous generator field. Mechanical coupling of the synchronous generator and the exciter is done by using speed as mechanical input for the exciter machine [8]. The exciter is a small synchronous machine rated 8.1 kVA, 400V, 50Hz, 1500 rpm.

**B. Automatic Voltage Regulator**

Considering Figure 4, any change in the output voltage of the generator will change the terminal voltage. The voltage value measured by a voltage sensor is transmitted to AVR. Then AVR alters the terminal voltage of excitation system to keep the terminal voltage of generator at the desired value. The field current of generator changes by this way. This condition also changes the generated EMF. The power generation of the generator is adjusted to a new equilibrium point and the terminal voltage is maintained at the desired value. Block diagram of AVR system whose schematic diagram is presented in Fig. 4 is given in Fig. 5 [9].
C. Transformer
A transformer is a device that uses the action of a magnetic field to change alternating current (AC) electric energy at one voltage level to AC electric energy at another voltage level. It consists of a ferromagnetic core with two or more coils wrapped around it. The common magnetic flux within the core is the only connection between the coils. The source of AC electric power is connected to one of the transformer windings. The second winding supplies power to loads. The winding connected to the power source is called primary winding, or input winding. The winding connected to the loads is called the secondary winding, or output winding [2]. In this paper, the step-down transformer rating is 10 kVA, 400V/12V.

D. Rectifier
Rectification is the process of converting alternating current or voltage into direct current or voltage. The DC output voltage is fixed in magnitude by the amplitude of the AC supply voltage. However, the DC output is not pure - it contains significant AC components called ripple. To eliminate this ripple, a filter is inserted after the rectifier. The main components of a semiconductor rectifier are semiconductor devices like the diode, thyristor, etc. the switching properties of these devices are used in rectifiers. Based on switching elements, these rectifiers are divided into two types [3]:
- Uncontrolled Rectifiers
- Controlled Rectifiers

In this paper, rectifier output is about 12V.

III. SIMULATION AND RESULTS
Simulation of the paper represents the implementation of synchronous generator voltage generating with mechanical coupling of an excitation system. The simulation diagram is demonstrated by MATLAB/SIMULINK. Simulink model of voltage generating system is shown in Fig .6.

Figure .6 Simulation model of voltage generation system with mechanical coupling of an excitation system
In this Fig. 6, the synchronous generator is 2MVA, 400V, 50Hz, 1500 rpm and machine driven by diesel engine. The step-down transformer rating is 8.1 kVA, 400V/12V. The generator output results are shown in Fig. 7.

![Figure 7. Simulation results of generator voltage and current](image)

The simulation results of the generator voltage and current are shown in Fig 7. In this result, generating voltage is about 1 pu and current is initially 1000 A and after 3s the current is about 3000A.

![Figure 8. Simulation results of exciter voltage and current](image)

The simulation results of the exciter output voltage and current are shown in Fig 8. In this result, exciter voltage is about 1 pu and current is initially 4 A and after 3s the current is about 6A.
The simulation results of the diode output voltage and current are shown in Fig 9. In this result, diode voltage is initially about -12V, after 3s the voltage is -20V and current is initially 120 A and after 3s the current is about 190A. The simulation results of the field output voltage and current are shown in Fig 10. In this result, field voltage is initially about 10V, after 3s after the voltage is about 15 and current is initially 110 A and after 3s the current is about 190A.

IV. CONCLUSION
In this paper, the model of voltage generating system is about 400V. Voltage regulation of the generator is performed by controlling the field voltage of the exciter. To increase the efficiency and the performance of generating system, needs the control of turbine and excitation. The terminal voltage of the synchronous generator is kept as a constant to a predefined magnitude. Excitation control in synchronous generator is an important part to enhance the stability of power system.

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Effect of Employee Acquisition Plan on the Performance of Kenya Agricultural and Livestock Research Organization

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Abstract- This study established the effect of employee acquisition plan on the performance of Kenya Agricultural and Livestock Research Organization. This study adopted a descriptive research design. The unit of analysis which is the study population consisted of the employees of Kenya Agricultural and Livestock Research Organization. The unit of observation which is the target population consisted of the 145 employees of Kenya Agricultural and Livestock Research Organization from CRI, TRI, SRI and VRI and the sample size was 145 respondents. The study adopted the census method to select respondents from the human resources/administrative department, research scientists and technical staff in the selected agricultural research institutes. Structured questionnaire containing close-ended questions were used to collect primary data for this study. The questionnaires were distributed using drop-and-pick later method to the respondents. Secondary data was obtained through published materials such as journals and annual reports. Data collected was analyzed using descriptive and inferential analysis methods using SPSS Version 24 and the analyzed data was presented in form of tables, graphs and charts. The correlations of the study variables were determined which established that there was a positive and significant relationship between the independent variables and the dependent variable. All the independent variables were positively related to the performance of the organization as attested by the respective correlation coefficients: Employee acquisition plan (r=0.769), HR utilization (r=0.592), HR demand forecasting (r=0.678) and employee retention (r=0.702). All the relationships are rendered significant since their p-values are less than 0.05. A multiple linear regression analysis was used to analyze the effects of employee acquisition plan on the performance of Kenya Agricultural and Livestock Research Organization. The findings of this research hold that there is a strong positive and significant correlation between the employee acquisition plan and performance of Kenya Agricultural and Livestock Research Organization.

Index Terms- Employee Acquisition Plan, Performance, Kenya Agricultural and Livestock Research Organization

I. INTRODUCTION

Performance measurement is the process whereby an organization establishes the parameters within which programs, investments, and acquisitions are reaching the desired results (Graham & Bennet, 1998). The linkage between human resource planning and organizational performance has dominated much of the debate within the human resource management literature since the mid-1990s.

Human resource planning is the process of identifying current and future needs and it is a crucial process in every organization. It is essential to conduct human resource planning since hiring the wrong employees or failure to anticipate fluctuations in hiring needs could be costly in the long run. The process of human resource planning ensures that, an organization’s employees have the requisite skills and competencies an enterprise needs for it to succeed (Ghazala & Habib, 2012). Gupta (2008) adds that, human resource planning prepares appropriately employees for potential rationalization. It further enables a firm to make adequate preparations for recruitment and strategic hiring.

According to Mursi (2003), there is significant and positive relationship between human resource planning and organizational performance. Organizations that undertake human resource planning stand to benefit in more ways than one; through optimum utilization of their human resources; they are able to match and align personnel activities to organizational strategic objectives; making fairly accurate predictions on the labour and how these would affect the organization and coordinate different personnel management programs such as affirmative action, talent development and management and retention (Werther & Davis, 2003). Chand & Katou (2007), in their study in the Indian hotel industry, found out that manpower planning have strong relationship to productivity, and productivity impact on organizational performance.

No doubt therefore, human resource planning is important for organizational success. “it is the system of matching the supply of people, internally (existing employees) and externally (those to be hired and searched for) with over a given time frame”. Human resource planning has two objectives; the optimum utilization of currently employed human resources and providing future human resource needs in the areas of skills and...
numbers (Public Service Commission, Kenya, 2017). Human resource planning will enhance the process of decision making, encourage open discussion, bringing the right people together around the right questions, resolving conflicts among strong technical professionals, and managing emotional ups and downs of employees of the organization.

Matching human resources with the present and the future is one of the main problems faced by organizations (Dubois, 2004). Human resources have a certain degree of inflexibility, both in terms of their movement, development and their utilization. There is the lead time to recruit and to train the average employee. In the case of upper management personnel in the organizations, the process may take up to years to nurture the candidate and making sure of the succession plans are put in place. Making decisions on recruitment and development are strategic and will produce long-lasting results given the right people are being chosen. Therefore, the management must forecast the demand and supply of human resource as part of the organization’s business and functional planning processes. Demand refers to the number and characteristics (e.g. skills, abilities, pay levels, or experience) of people needed for particular jobs at a given point in time and at a particular place. Supply refers to both the number and characteristics of people available for those jobs.

Human resource planning has become an increasingly significant concern for every organization and research institutes have not been left behind. According to an International Labour Organization (ILO) report, a gap exists between manpower planning and strategic decision making, indicating that use of human resource planning is given very low emphasis by managers in most public organizations. Since the government of Kenya froze employment in 2012, most government organizations realize that there is a gap which has been created due to the aforementioned (Omollo, 2013).

Kenyan government ministries continue to experience high staff turnover rates which in turn lead to staff shortages hence making it difficult to undertake strategic human resource planning. According to Kenya Agricultural and Livestock Research Organization strategic plan for 2017-2021, which was launched recently, human resource planning was stated as one of the major challenges and weaknesses facing the organization being a major problem due to inadequate capacity to catalyze agricultural technology dissemination, delayed implementation of human resources management policies, plans/terme of services leading to high turnover of skilled staff. This study therefore, aimed to establish the effect of employee acquisition plan on the performance of the organization. This study aimed at establishing the effect of employee acquisition plan on the performance of Kenya Agricultural and Livestock Research Organization.

Human resource planning is surrounded by three basic level practices which can increase the organizational performance being, to increase the knowledge, skills and abilities among employees, enhance their empowerment like giving them employment security and organize some participation programs for employees and finally give them motivation through both incentive means like giving them compensation and benefits, and also through internal promotion them with their job status (Yongmei et al., 2007).

According to Schermerhorn (2002), the most basic kind of motivation for employees to perform is reinforcement. Reinforcement comes in two different ways, positive and negative. If a manager likes what he or she is seeing in an employee, it is important to let this be known to the employee. There should be ‘administration of positive consequences that tend to increase the likelihood of repeating the desirable behaviour in similar settings’. However, there is needed to be a distinction between reinforcement and rewards. This method does not always encourage better performance, so rewards should only be used in the right situation. Otherwise, a reward may lose its desired effect as a motivator used so often. Negative reinforcement is given if a manager does not approve of what he/she is seeing. This is if the employee is not performing to the expected standards. While these methods are not the most effective ways, they are easy and can be used on a daily basis to help increase the performance of workers.

In a study done by Aswathapa (2008), he stated that Evaluation and control of human resource planning is necessary as it helps in gauging the effectiveness of the interventions that have been put in place as considerable costs are incurred by organizations in HRP processes like recruitment and selection.

A study conducted by Mensah (2012) on An analysis of human resource planning and its effect on organizational effectiveness at information services department Accra, he states that, for an organization to get the right number of people to do a particular task, human resource must be forecast. Forecasting require that an organization determines the number of future workers, with the specialized skills and ability needed over a period of time. Availability forecasting is to determine the number of needed employees the organization able to hire.

Human resource planning is crucial in organizations in the sense that, it makes the organization aware of what course of action to take, and also to be proactive in recruiting and retaining employees. Through human resource planning organizations can determine, if there will be right supply of talent in order to increase their recruiting efforts and act quickly to secure skilled and talented employees. To better compete in the global market, organization will need to create and implement corporate strategies to promote itself as a “preferred employer” – investing in progressive HR policies and programs with the goal of building a high-performing organization of engaged people, and fostering and creating a work environment where people want to work, not where they have to work (Michael, 2006).

Human resource planning contribute to organization success in the sense that, it ensures that an organization always have a concept of the job market and how it related to its failure (Michael, 2006). A company that refuses to engage in human resource in order to be proactive may find itself with a number of unfilled positions. He concluded that, human resource planning

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needs a continual process to help organizations to achieve its goals, though some jobs are still in demand during downturn, securing people with highly desirable skills will always be a challenge.

According to Homer (2001), as is true for any type of program evaluation, this phase involves assessing how well objectives were achieved. Because short-term planning objectives are generally stated in terms that are relatively easy to quantify (e.g., numbers of applicants, numbers of hires, and performance levels of employees), systematic evaluation of human resource planning programs to meet short term organizational needs is quite feasible, and some types of program evaluations are actually common in large organizations. For example, in part because numerous federal and state laws prohibit some forms of discrimination, selection programs in particular have been closely scrutinized to ensure that employers base their selection decisions on characteristics of applicants that are job related.

Legal regulations have prompted many organizations, especially large ones, to assess empirically that relationship between an applicant’s characteristics (e.g., abilities) and job performance. Such evaluation studies (validity studies) benefit employers because they serve to monitor the objective of getting right people in the right job. Validity studies also serve a scientific function by providing valuable data to researchers interested in improving our understanding of the factors that influence human performance (Horton, 2000).

III. RESEARCH METHODOLOGY

The study adopted a descriptive research design in order to determine the relationship between human resource planning and performance of agricultural research institutes in Kenya without any biasness. It aimed at investigating the research objectives and answering the research questions formulated from the literature review. According to (Creswell, 2008), descriptive research designs are used in preliminary studies to allow the researcher to gather information, summarize, present and interpret it for the sake of clarification.

For this study, the researcher used descriptive survey. Descriptive survey design enables the researcher to summarize and organize data in an effective way (Kiruru, 2013). It provides tools for describing collections of statistical observations and reducing information to an understandable manner.

The unit of analysis which is the study population consisted of 4 research institutes within KALRO. The unit of observation which is the target population consisted of 145 respondents at different management levels of the organization. The study adopted the census method to select respondents from the human resources/administrative department, research scientists and technical staff in the selected agricultural research institutes. The study targeted a total of 145 staff working in the selected 4 institutes in three levels of management within the organization and this constituted the target respondents.

In this study, a semi structured self-designed questionnaire and interviews were used as the survey tool for this study based on the anticipated small sample population. Items in the questionnaire were developed to investigate the research objectives and answer the research questions of the study. Secondary data was gathered using past published scholarly articles explaining the theoretical and empirical information on human resource planning in organizational performance.

The researcher collected a letter of introduction from the university requesting respondents to feel free in answering the questions as it will be used only for academic purposes. The researcher then introduced herself and gave the questionnaires to the respondents which were used to collect the primary data. Secondary was collected using journals, magazines and books.

A pilot study was undertaken to present the data instrument for validity and reliability. 15 questionnaires were pretested to a selected sample of respondents from KALRO to estimate the time it will take to complete the study and to check whether the questions were relevant to the study intended. Further, the comments and suggestions given by the pre-test sample were used to improve on the instrument in order to enhance its level of clarity.

The study generated both quantitative and qualitative data. The quantitative data collected was analyzed using descriptive statistical techniques and will be summarized into descriptive statistics of percentages and frequencies so as to organize them into meaningful information. The data analysis tools of Statistical Package for Social Scientists software (SPSS, V24) and regression analysis were used to analyze the quantitative data to give a deeper insight into the responses from the respondents into the subject of the research. Content analysis approach was used for qualitative data so as to determine the respondents’ opinions on human resource planning in the organization. Data was presented in the form of frequency distribution tables and pie chart that facilitated the description and explanation of the study findings.

IV. RESEARCH FINDINGS AND DISCUSSION

A total of 145 questionnaires were administered for the study. However, 113 questionnaires were completely filled and returned. This translates to 77.93% as shown in Table 1. This response rate was considered adequate as recommended by (Babbie, 2010).

<table>
<thead>
<tr>
<th>Rate Category</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response</td>
<td>113</td>
<td>77.93%</td>
</tr>
<tr>
<td>Non response</td>
<td>32</td>
<td>22.07%</td>
</tr>
<tr>
<td>Total</td>
<td>145</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Majority of the respondents 64% were male while the rest 36% were female as shown in Figure 2, an indication that Kenya Agricultural and Livestock Research Organization has slightly more male staff than females. However, this is a good distribution which depicts a fair balance of gender. Since majority of the responses for this study relies on the perceptual measures of the respondents, this gender distribution is expected to accommodate the opinions and views from both sides of the gender divide. Nevertheless the balance in gender in the
organization may also be an evidence of successful efforts of various gender mainstreaming campaigns.

![Gender Distribution](image1)

**Figure 2: Gender of respondents.**

The respondents were asked to indicate their age categories. The age of the respondents to some extent may explain the level of experience an employee has acquired. According to the results in Figure 3, 16.2% of the respondents belonged to the bracket of 21-30 years. This category of respondents has the least level of experience. Some are new to the organization and are still undergoing inductions or on the job training in the form of internship. 23.4% were of age between 31-40 years most of which belonged to the middle level of the management, they are responsible for the day to day operations of the organization. Majority of the respondents belonged to the bracket of 41-50 years which was 36%, most of this group belongs to the top management and most of the strategic decisions of the organization are made by them. 24.3% of the employees belonged to the 51 years and above. These groups as well, belong to the higher levels of the management and have vast knowledge and experience on the management of the organization.

![Age Distribution](image2)

**Figure 3: Age of the respondents**

Majority of the management staff are holders of bachelor’s degree and diploma both represented by 30.9%. 21.8% of the respondents were holders of master degree as 14.5% owning certificates, 1.8% of the respondents were PhD holders (Figure 4). This is interpreted to mean that recruitment at Kenya Agricultural and Livestock Research Organization is based on academic merits and therefore those employees are perhaps great contributors to human resource planning.
The perception of employee acquisition plan on the performance of Kenya Agricultural and Livestock Research Organization was sought from the respondents. The results are presented in Table 2.

Table 2: percentages distribution of respondents’ perception on employee acquisition plan

<table>
<thead>
<tr>
<th>Employee acquisition plan</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our institute advertises vacancies openly.</td>
<td>24.1%</td>
<td>42.6%</td>
<td>19.4%</td>
<td>13.9%</td>
</tr>
<tr>
<td>Candidates who meet the minimum qualifications are the only ones who are shortlisted and interviewed.</td>
<td>16.8%</td>
<td>51.4%</td>
<td>17.8%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Selection adheres to the requirements of the constitution on gender, ethnic and disability</td>
<td>20.6%</td>
<td>43.9%</td>
<td>24.3%</td>
<td>11.2%</td>
</tr>
<tr>
<td>My job interview was relevant to my field of specialization and experience</td>
<td>39.8%</td>
<td>51.5%</td>
<td>3.9%</td>
<td>3.9%</td>
</tr>
</tbody>
</table>

From the results, employee acquisition plan largely contributes to an organization’s performance. The results showed that majority of the respondents agreed to the fact that vacancy advertisement has an effect on an organization’s performance. This is evident from the table where 13.9% strongly disagreed while 19.4% disagreed to the fact while 42.6% agreed and 24.1% strongly agreed that competitive vacancy advertisement has an effect on an organization’s performance. The findings are in agreement with (Berente, et al., 2009) who argues that human resource management regards employee recruitment is a function concerned with organizational activity aimed at bettering the job performance of individuals and groups in organizational settings.

When asked whether employee qualifications/skills level has an effect on an organization’s performance, 14% disagreed, 17.8% agreed while the majority 51.4% agreed while 16.8% strongly agreed that employee skills level has an effect on an organization’s performance. When asked whether recruitment selection procedure has an effect on an organization’s performance, 11.2% strongly disagreed, 24.3% disagreed, 43.9% agreed while 20.6% strongly agreed with the statement. When the employees were asked whether relevance of job interviews had an effect on the performance of an organization, 3.9% strongly disagreed while another 3.9% disagreeing, 51.5% agreed while 39.8% strongly agreed. The findings concur with the
observation by Armstrong, 2012 that relevant skills and competencies are needed in planning future staffing activities.

V. CONCLUSION AND RECOMMENDATIONS

The findings of the study revealed that Kenya Agricultural and Livestock Research Organization advertises for vacancies openly whenever it needs to recruit new employees, only candidates who meet the minimum qualifications are the ones who are shortlisted and interviewed, selection procedures adhere to the requirements of the constitution on gender, ethnic and disability and that job interviews are always relevant to the field of specialization and experience. The study further established that all the new successful employees are properly inducted on the organization’s culture, structure and expectations. This implies that Kenya Agricultural and Livestock Research Organization has well-developed human resource systems with all the necessary standard operating procedures which have a set of fixed instructions and steps for carrying out routine operations and to provide detailed guidance for initiating and completing any human resource action. Among the SOPs is the employee acquisition plan which has enable the organization to perform its mandate through engaging the right people into the organization.

Employee acquisition plan is crucial for organizational development and success. It is fruitful to both employers and employees of an organization. Employees become more efficient and productive if they are not overwhelmed and if they are engaged on what they understand. According to the study, Kenya Agricultural and Livestock Research Organization was found to be using a management system which supports the integration of human resources planning allowing the organization to assess the current human resource capacity based on their competencies against the capacity needed to achieve the vision, mission and goals of the organization. The results showed that employee acquisition plan positively and significantly affected the performance of Kenya Agricultural and Livestock Research Organization.

This study strongly recommends adoption of employee acquisition plan by organizations. Many organizations have begun to view their employees as important resources to their operations. Human resource acquisition plan is a guideline or a roadmap that outline how the following series of activities will be done to ensure that the right people are in the organization viz.: forecasting future manpower requirement either in term of mathematical projection of trends in the economic environment and development in industry or in terms of judgmental estimates based upon the specific future plans of an organization. For organizations to align themselves competitively, they should ensure that the right number of employees, right skills and a considerable reward scale are well taken care of. As a result of implementing the employee acquisition plan, the organizations will be able to run their operations at the most optimum cost, attain profitability while performing as per their set standards and having all their employees happy thus a win-win situation.

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Recent developments in use of analytic and quantitative tools for the modelling, analysis, design, and management of telecommunication system

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Abstract- This paper focusses on the recent development in modelling, simulation and evaluation of a telecommunication system. Some of the changes in the modelling and analysing system are in the hierarchal, object oriented and intelligent modelling. A comparison on the various simulation programs being applied to day have been analysed with their mode of operation, benefits and drawbacks.

Index Terms- Modelling, network, simulation, telecommunication system

I. Introduction

The telecommunications field has experienced an unprecedented evolution in the transmitted traffic, applied technologies and the user’s universality. In the past, the telecommunication networks focused on transmitting voice traffic through the use of circuit switching technologies. This has gradually evolved to use of packet switching thus enabling voice digital transmission of videos, data and voice.

This sudden change in the telecommunication services and technology in the processes of switching, computing, transmission and integration of digital data, has brought about an evolution in the analysing, designing and evaluation of the networks. This has increased the system’s complexity and has commenced the use of computer modelling and simulating in designing complex telecommunication system because of their high capacity, required efficiency and versatility. It has also been done to overcome the complexity of distributed working environments such as grids, P2P networks and grids in computations.

II. SIMULATION

In simulating a telecommunication system, there are three main simulation languages that are used. These are;

- Communication oriented languages.
- Communication oriented simulators.
- General-purpose simulation languages.

III. RECENT NETWORK SIMULATORS

There have been various developments in the simulation networks. An example is in OPNET, where it has had its performance capabilities improved. Its end-to-end visibility has been increased. It also has upgrades on its analyst software, ACE. Other simulators have been improved to increase their versatility. The following table indicates the various simulators and their improved adaptations.

---

Table 1: Comparison of network simulators

<table>
<thead>
<tr>
<th>Simulator</th>
<th>Classification</th>
<th>Usage Mode</th>
<th>Benefits</th>
<th>Drawbacks</th>
<th>Supported network protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPNET</td>
<td>Commercial</td>
<td>Enterprises</td>
<td>- User-friendly</td>
<td>Expensive due to high licensing fee</td>
<td>Ethernet, Fiber, ATM, Frame relay</td>
</tr>
<tr>
<td></td>
<td>Academic</td>
<td></td>
<td>- Simulations results can be customized</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Model library is comprehensive</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Modelling detail is high level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QualNet</td>
<td>Commercial</td>
<td>Enterprises</td>
<td>- High support capacity</td>
<td>Has no model construct that is pre-defined</td>
<td>WAN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Can run on several OS’s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Easy results verification through code inspection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NetSim</td>
<td>Commercial</td>
<td>Large-scale</td>
<td>- Can run on several OS’s</td>
<td>- Only limited to academic work and research</td>
<td>WLAN, TCP/IP, ATM and Ethernet</td>
</tr>
<tr>
<td></td>
<td>Academic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shunra VE</td>
<td>Commercial</td>
<td>Enterprises</td>
<td>- Has real-life applications</td>
<td>- Very expensive</td>
<td>Hub and spoke, N-tier and point-to-point</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- It is hardware based</td>
<td>- Requires a comprehensively constructed infrastructure</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Uses an empirical model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ns-2</td>
<td>Open source</td>
<td>Small-scale</td>
<td>- Usable on various OS’s</td>
<td>- Has no graphical presentation for simulation results</td>
<td>TCP/IP Multi-cast routing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Not user-friendly</td>
<td></td>
</tr>
<tr>
<td>GloMoSim</td>
<td>Open source</td>
<td>Large scale</td>
<td>- High scalability</td>
<td>- limited to wireless networks only</td>
<td>Wireless networks</td>
</tr>
<tr>
<td>OMNeT++</td>
<td>Open source</td>
<td>Small-scale</td>
<td>- Architecture is modular</td>
<td>- Difficult to use</td>
<td>Wireless networks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Implementation is detailed</td>
<td>- Long simulation thus slow</td>
<td></td>
</tr>
<tr>
<td>P2P Realm</td>
<td>Open source</td>
<td>Small-scale</td>
<td>Can optimise neural networks</td>
<td>- Still being developed</td>
<td>P2P</td>
</tr>
<tr>
<td>GTNets</td>
<td>Open source</td>
<td>Large-scale</td>
<td>- Mostly resembles a real-life network</td>
<td>- Still being developed</td>
<td>Ethernet, wireless and point-to-point</td>
</tr>
</tbody>
</table>

IV. SIMULATION STRUCTURE

A simulation is defined as a stochastic functional relationship that links the input and output parameters. In this process, the programmed model indicates values which act as representatives of the network. This is as a function of the input parameters that are assigned to the model and its operational characteristics. The reason as to why the network systems are modelled is the needed relationship is not known thus important to obtain the design process characteristics.

A simulation model is set up to handle any obstacles that may limit the simulation realisation in the network design. Some of the barriers that arise include simulation stochastic nature, complexity and model size and the lack of an inter-disciplinary technique for integrating the various participants in the project.
The following is an example of a simulation structure;

V. NETWORKS MODELLING

There have been several changes in modelling of networks. For instance, there has been a shift from the use of general-purpose simulation languages to the use of specific software packages designed to specifically model the discrete event systems. This has greatly improved the validity of the simulating models. An example of simulating software under use is COMNET III. The structure of this software eases the process of modelling a network topology, communication protocols, and traffic. It also has a comprehensive performance report which aids the user in evaluation of every applicable phase of the modelled network.
VI. TRAFFIC MODELLING

There are various methods used in validation of the process of network traffic such as its identification, classifying, parametrization and statistically validating it. The method used in analysing the traffic data is statistical inference. The first step in this process is identifying the probability distribution for the collected data. Afterwards, the probability distribution parameters are projected where their accuracy degree is evaluated statistically. A diverse stochastic process is best represented using both continuous and discrete probability distributions. In this case it displays a high degree of fidelity.

In modelling network traffic using the probability distribution technique, there must be identification of the real data. Data generation is done through the use of a theoretical probability distribution that is known. Such a distribution parameters are calculated. These two processes, classification and parametrization, need a formally conducted evaluation in determination of the similarity between the theoretically generated distribution data and real data, with a high confidence level.

The determination of resemblance degree of the real and theoretical distribution data is subjective. The technique subjectivity is centred on graphical methods. These are very essential in the data validation stages. The statistical validation techniques are based on the hypothesis formal evaluation. The hypothesis is that the observed traffic is distribution function samples, \( F(x) \). The null hypothesis evaluation applies statistical methods such as the Chi-square, Kolmogorov Smirnov and Anderson Darling tests. The procedure for using the Chi-square method would be:

I. Raw traffic data pre-processing
II. Definition of data and constructing the traffic histogram
III. Parametrization the model selected by applying the technique of maximum-likelihood estimators
IV. Creating the histogram of the model
V. Evaluating the Chi-square method, histograms and data similarity.

The experimental design is rarely used in project simulations. The reason is that one is required to have a broad understanding of the statistical principles and the simulation process. However, it has a benefit in that one requires a minimal background of computer tools.

Some of the design techniques used are factorial, random design with blocking, fractional factorial design and a complete random design. The complete random design is applied as it is simple to analyse and design. It is centred on random distribution of the experimental and treatment units. If the blocking factor is included, homogeneity of the environment for the experimental blocks through the distribution of the experimental and simulation blocks. A 2k binary factorial design is a simple concept that is applied in numerous design problems. In this type of a design, the impact of k factors on the system’s performance is analysed. Each of the factors which is taken as the control input, is only allowed to have one of the two values that are possible.

If the factor’s number is high and the outcome of combining more than two factors is taken as negligible, the fractional factorial design can be used to reduce the number of experiments. In this fractional factorial concept, \( 2^{k-p} \), a fraction, \( \frac{1}{2^p} \), of the \( 2^k \) experiments is done. This is expected to give the relevant effects of the k number of factors. However, because of the sampling and simulation process stochastic nature, only a particular realization of the model will be achieved. This can lead to drawing of erroneous conclusion about the system being modelled.

Due to the stochastic nature of the system, there is no identification, and definition of the model’s operating process using a deterministic mathematical model. However, a limitation in information obtaining of a simulated model is still possible.

VI. MODELLING TECHNIQUES

INTELLIGENT MODELLING SYSTEM

The basis for an intelligent modelling system is a dynamic multi-agent resource conversation process. Its approach is based on graphs and frames concept. This can be implemented using an SQL server DBMS. Knowledge formalization is achieved using an expert

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system shell. At the system analysis stage, extended UML class diagrams are used for the semantic network which is frame based. The builder implementation is carried out using an UML sequence diagram. In this method, a flow chart is visually used to indicate the solution flow for the problem at hand. If the solution is in a form of a procedure sequence, the method hops from one frame to another. This method can thus be said to have a visual object-oriented ontology while the output mechanism constructor is knowledge-based.

Figure 2: Simulation of a WLAN using OPNET

The algorithm for the frame concept is as follows:\(^5\):

\[
FC = (FN, FT, AI, BSS, SLS) \\
SLS = (CS, AS) \\
CS = \{(CN_1, CR_1), \ldots, (CN_N, CR_N)\} \\
AS = \{(AN_1, VR_1, AV_1), \ldots, (AN_m, VR_m, AV_m)\}
\]

In the above FC is the frame concept while FN is the frame name. FT is the frame type while AI is the application information.

Some of the techniques applied in artificial modelling techniques are the fuzzy logics and Artificial Neural networks\(^6\).

This modelling allows the on and off switching of base stations and the transport networks. If modelled for a particular region, if there is need to rent or construct a certain element, the parameters are changed.

HIERARCHICAL MODELLING APPROACH

For most intelligent systems design and modelling, the biggest bottleneck is conceptual analysis. The hierarchical system is a methodological design used formally defining the system and decomposing it into tiers or blocks. At the top of the hierarchy, the tiers have the least comprehensive views. They only indicate the design system characteristics and common features. As the hierarchy lowers, details increase as the system is not taken as one unit but as sections of a block.


Each of the tiers gives its own views about the system. A tier element, k-th, is taken as a (k-1)th tier system. Any advancement from tier to tier is directional. It can either be a top to down system, known as deductive descending or bottom up system known as inductive ascending. An example of this is using OPNET.

VII. STATISTICAL ANALYSIS OF A SIMULATED MODEL
There are three main methods used in the statistical analysis of a simulated model. Various improvements have been made to these methods to eliminate any erroneous conclusions. The analysis methods are:

- Point estimation technique - network packet delay and average link utilization
- Estimation of the intervals - this is for parameters determination using a certainty degree estimation
- Testing the hypothesis

VIII. FUTURE RESEARCH
There is minimal research on the development of non-linear models. The NARMAX model used to investigate this, indicated that the results displayed adaptive control mechanisms. This forms a great future research area.

IX. CONCLUSION
There have been various developments in the modelling, simulation and analysis of a telecommunication network system. This has been done to overcome the complexity of distributed working environments such as grids, P2P networks and grids. Parametric approaches have been undertaken to improve the robustness of the systems. This is done in bid to increase its versatility, correctness and capacity without burdening the actual telecommunication network. The various techniques used include hierarchical and intelligent modelling.

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A Survey on Cryptography Algorithms

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Abstract- With the major advancements in the field of technology and electronics, one persistent obstacle has proven to be one of the major challenges, namely: Data Security. To get connected securely and quickly through the electronic data transfer through the web, the data should be encrypted. Encryption is the process of transforming plain text into ciphered-text, which cannot be understood or altered easily by undesirable people. It can also be defined as the science that uses mathematics in data encryption and decryption operations. In this paper, we discuss several important algorithms used for the encryption and decryption of data in all fields, to make a comparative study for most important algorithms in terms of data security effectiveness, key size, complexity and time, etc. This research focused on different types of cryptography algorithms that are existing, like AES, DES, TDES, DSA, RSA, ECC, EEE and CR4...etc.

Index Terms - Cryptography, Information Security, Encryption, Decryption.

I. INTRODUCTION

Information security can be summed up to info, a group of steps, procedures, and strategies that are used to stop and observe illegal access, trouble-shooting, revelation, perturbation and adjustment of computer network sources. Enhancing the privacy, eligibility and reliability of the work requires a lot work to strengthen the current methods from constant trials to break them and to improve new ways that are resistant to most kinds of attacks if not all [1].

Accordingly, it was proven that encoding is one of the most reliable strategies used to secure information since the ancient days of the Romans who used similar methods to enable security on their valued information and documents. Data encoding is the process of changing the form of the data into certain symbols through the use of meaningless codes. The process of encoding and decoding depends solely on a single key which is known as identical key cryptography. In this process, the same key is used for both the processes of encryption and decryption. A safe channel is needed between the sender and the receiver to commute the secret key. Double cipher modes are tackled by a symmetric algorithm: block cipher and stream ciphers. The block cipher works on fixed-length groups of bits, named blocks, without transformation specified by a symmetric key. A stable
shape is handled by a bunch of block ciphers. It contains of many similar rounds of processing wherein each round, a substitution is done on one half of the information tackled, followed by a permutation that intermingles with the two halves. The basic key becomes larger, so the multi-label keys are used for every round. A symmetric key cryptography points to the cryptographic algorithm that needs two different keys: the first of which is hidden whereas the other is public [1].

Though they are not the same, but they are mathematically connected. The public key is used to encode a plain text, while the private key is used for the decoding of the cipher text. In [2], the asymmetric enciphering strategies are roughly 1,000 times slower than symmetric encoding, which makes it unfeasible upon encoding big amounts of information. Additionally, to have similar security power as the symmetric algorithm, the asymmetric algorithms most use more powerful keys than symmetric enciphering step. The category of main encoding techniques is illustrated in Figure 1.

A. Encryption and Decryption:

Encryption is altering the database into non-recordable text. Decryption presents the reverse process of encryption where it converts the cipher text to an ordinary text. A cipher is double algorithms, which invents the encoding and decoding processes.
The extensive process of a cipher is dominated by the algorithm and a key. It is secret, a brief group of symbols, that would decode the encrypted data [3].

![Diagram of encryption and decryption process]

**Figure 2: PROCESS OF ENCRYPTION AND DECRYPTION**

**B. Goals of Cryptography:**

Cryptography is used to achieve many goals and some of the goals are the following list shows:

- **Authentication:** is the process of offering identity to a person to break special resource using keys.
- **Confidentiality:** is the ultimate target of encryption that confirms that only the cipher-key owner receives the message.
- **Data Integrity:** is the operation that has the access of modulating the database that belongs to a specific group or person.
- **Non-Repudiation:** ensures that both the sender and receiver acknowledge the delivery of the report.
- **Access Control:** confirms that only the group with correct authentication is eligible to log into the delivered message.

**C. Terminology:**

<table>
<thead>
<tr>
<th>Term</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain Text</td>
<td>the ordinary message that will be delivered to the other side</td>
</tr>
<tr>
<td>Cipher Text</td>
<td>The original text is encoded into a symbolic format</td>
</tr>
<tr>
<td>Encryption</td>
<td>The technique of changing the ordinary text into unreadable message</td>
</tr>
<tr>
<td>Decryption</td>
<td>It is the opposite operation of the last one</td>
</tr>
<tr>
<td>Key Size</td>
<td>To encode and decode, key is essential, and the length of the key determines the degree of safety the more the key size, the more the security is</td>
</tr>
<tr>
<td>Block Cipher</td>
<td>It encrypts a group of plaintext symbols as are block</td>
</tr>
</tbody>
</table>
It converts one symbol of plaintext directly into symbol of cipher text

The of processing the ordinary text into an encrypted one

The period of decoding the decrypted message into readable text

The amount of time passing through enciphering measured in megabytes

D. Description of Cryptographic Algorithms:

There are two kinds of encoding. Those two types are the symmetric and asymmetric encoding algorithms. Several of those algorithms will be included herein such as: AES, DES, 3DES, E-DES, BLOW FISH, SEAL, RC2, RC4 and RC6 which all have to do with bilateral algorithms. In contrast to RSA, ECC, EEE, DH, ELGAMAL ALGORITHM and DSA, which are relevant to unilateral algorithm.

1. DES

DES was first introduced in IBM by Horst Fiestel in the year 1972. The goal of the DES algorithm is to offer a strategy to secure crucial financial database [4]. The encipher instructions are:

- DES receives data of 64-bit long ordinary message and 56 bit key and comes up with 64-bit block.
- The ordinary text block needs to modulate the bits.
- The 8 similar bits are eliminated from the key through exposing the key to its key permutation.

The readable message and the key will be produced as the following steps show:

- The key is divided in to two 28 halves.
- The half is rotated by one or two bits, according to the round.
- The two parts reunite and undergo to the round permutation to decrease the key from 56 bits to 48 bits. These pressed keys are used to encode the round’s plaintext block.
- The shitted key parts from tip 2 are used in the coming round.
- The database block divides inti two 32-bit parts.
- A part will be expanded in terms of permutation to raise the size to 48 bits.
- Result of the sixth step is for OR’ed only, with 48 bit key from tip number three.
- The outcome of 7th instruction is set s-box, that replaces key bits and cut down the 48-bit block to 32 bits.
- The consequence of the 8th tip, will be permuted by p-box.
- The result of the p-box belongs to OR’ed solely, will the next part of the format block. The bipartite format parts are exchanged and form reservoir of the coming stage [4].

These steps are clarified in the table below Figure 3.
2. Advanced Encryption Standard (AES)

AES is an up-to-date ciphering strategy suggested by NIST to substitute DES back in 2001. AES could provide any group of databases [5]. During encryption-decryption, the AES process encodes 10 rounds for 128-bit keys, 12 rounds for 192-bit keys and 14 rounds to 256-bit keys to come out with the last encoded message [6]. AES allows in 128-bit information length that can be split into 4 fundamental active blocks. Those parts are dealt with as a line of bytes and combine a matrix of 4*4 named “the state”.

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www.ijsrp.org
For encoding and decoding, the cipher starts with an "Add round key stage". However, soon before the eventual round, the output encounters 9 basic rounds, through each 4 transformations take place; 1) Sub-bytes, 2) Shift-rows, 3) Mix-columns and 4) Add round Key.

In the last tenth round, mix columns transformation is not available [7] [8]. The entire operation is Figured out in Figure 4.

Decryption is the opposite process and uses opposite steps [9]:

- **Substitute Byte transformation:**
  AES consists 128-bit data block, that is to say every database item has 16 bytes. In sub-byte transformation, every byte of a data item is changed in other piece by implementing 8-bit substitution box known as the Rijndael s-box.

- **Shift Rows transformation:**
  This transposition is easy, the bytes in the rest three lines of the state, reliable on the row position, are shifted in a cycle way. In the second line, 1-byte circular left shift is done. While the third and fourth row, two bytes and three byte left circular shifts take place successively.

- **Mix columns transformation:**
  Here the is counterpart to a multiplication set of every column of the states. A stable matrix is multiplied to every. In this process bytes are dealt with as multi-names.

- **Add round key transformation:**
  A bit-like XOR between 128-bits of current state and 128-bits of the round key. This transmutation is the opposite.
3. **Triple DES (3DES)**

The Triple Data Encryption Algorithm (TDEA or 3DES) was developed to tackle the flaws in DES whilst preserving the same cryptography. 3DES key size of DES (56-bit). This is through implementing the algorithm triple successively with 3 multiple keys. The total size is 168 bits. TDEA uses triple 64-bit DEA keys (K1, K2, K3) in the encode-decode-encode (EDE) state [5]. The standards define three major choices:

- The 1\(^{st}\) choice is the preferred one (K1 ≠ K2 ≠ K3 ≠ K1).
- The 2\(^{nd}\) choice uses dual independent keys (K1 ≠ K2 & K3 ≠ K1).
- The 3\(^{rd}\) choice uses triple similar keys (K1 = K2 = K3).
Those choices are equivalent to DES Algorithm. In 3DES, the 3-times iteration is applied to increase the encoded level and average time. It is a known fact that 3DES is slower than other block cipher methods [11].

4. Educational Data Encryption Standard (E-DES)

It is used as a support for DES [10]. The fundamental transformations suggested to apply E-DES, which has larger key and block size a developed F function, enhanced key program and extra complicated permutation tasks [1]. Aside from that, the suggested cipher implements one of the contents from AES, which is the substitution box. E-DES depends mainly on the Feistel...
network with sixteen rounds, in which the 1st process is the implementation of the primitive-permutation of the plaintext. After that, each round composes of the following:

1. The permuted plaintext is divided into 2 parts, left and right.
2. The right one shifts to the left straightforward, and the left one is XOR’ed with the output of the function F.

Finally, after sixteen rounds, the opposite primitive permutation is done, coming up with the ciphered text block. This process is explained below Figure [6]. The basic distinction between the recommended S-box in E-DES and the usage of the

Figure 6: GENERAL ENCRYPTION STRUCTURE
S-box in AES is the reliability between the varied S-box suggested for every 8-bit blocks. Every substitution box, that gets 8-bits input and results in eight bits output, composed of sixteen lines and sixteen columns bytes [1].

5. Blowfish Encryption

Ultimately, the Blowfish ciphering algorithm needs 32-bit microprocessor at an average of one byte for each twenty-six-hour cycles. Blowfish consists of sixteen rounds. Each round has the XOR process and a task. Also, the round contains key expansion and database encoding. The key for stimulating primitive ingredients of one round and database encoding applies sixteen rounds feiestel network strategies [15]. Figure 7 explains how blowfish algorithm functions.

6. SEAL Algorithm

SEAL is a length-raising “illusive random” that depicts 32-bit string N- to L-bit string SEAL under a hidden 160-bit key. The output length L is intended to be diverse; however, in general bound to 64 kilobytes. It equals 64 kilobytes (214 32-bit words). However, the results can be deducted with a smaller output length [16]. The key usage is to Figure out 3 secret charts: R, S, and T; these charts have 256, 256 and 512 32-bit values respectively that are induced from the Secure Hash Algorithm (SHA)
[17] applying a as the hidden key and re-archiving the 160-bit output to 32-bit output words. SEAL is the fruit of the dual shower source clarified. The first generator implements a systematic relies on the deducted charts R and T depicted at Figure 8. It maps the 32-bit string n and the 6-bit counter.
Figure 9: THE FIRST GENERATOR OF SEAL

Figure 8: THE SECOND GENERATOR OF SEAL (ITH ITERATION)
The second source applies a system, relying on the deducted charts depicted at Figure 9. There are extra explanation of SEAL and details in [17] [18]. The algorithms have 3 steps:

1. The interior charts under the secret key (a) are computed.
2. A0, B0, C0, n1, n2, n3, and n4 from n1 and chart R are computed.
3. The 2nd source moves the Ai, Bi, Ci, and Di blocks.

7. RC2

RC2 is a block encoding algorithm that was introduced all the way back in the year 1987. It is meant to replace the DES. RC2 applies exclusive size key from 1 byte to 128 bytes. Both the input and output block size of 64-bit per one. This algorithm was set to apply on 16-bit microprocessors. In the case having the encoding already done, the algorithm would work twice as fast as the DES on IBM [19].

8. RC4
It is a stream cipher, symmetric key encoding algorithm. The algorithm is mutual for both encoding and decoding. The database stream is XORed with a group of generated keys. The key stream does not rely on plaintext ever. Vernam stream cipher is quite common, because of its simplicity. It is used in SSL and WEP. The WEP stands for Wireless Equivalent Privacy which is a protocol that also uses the RC4 algorithm for confidentiality. It was considered safe until it was violated by the BEAST attack [19].

9. RC6

RC6 was introduced in 1997. It is a block cipher that applies 128-bit block size and provides 128, 192, and 256-bit key
sizes. Additionally, RC6 aims to meet the demands of AES. It is proven to be better than the RC5 algorithm as it offers more security from attacks. RC6 uses four registers. It also needs less rounds and give more throughout [19].

10. RSA

RSA was invented by Ron Rivest, Adi Shamir and Leonard Adleman back in 1978. It is one of prominent public key encoding systems for key exchange, digital signatures or encryption of blocks of database. The RSA algorithm implements different size encoding block and a variable size key. It is an asymmetric encoding system that relies on numeral synthesis. It employs two basic numbers to come up with both the public and private keys. Sender encipher the message by receiver public key, then the message delivered to receiver. Hence fore he decrypts it using his personal private key [13, 14]. RSA has three steps; key generation, encoding and decoding. On the other hand, RSA has many faults, that is why it is not good for commerce. [11]. Figure 13 showcases the order of steps followed by RSA algorithm for the cryptography of multiple blocks.

a) Key Generation

Choose two distinct large random prime numbers p and q such that p \neq q.
Compute n = p \times q.
Calculate: \phi (n) = (p-1)(q-1).
Choose an integer e such that 1 < e < \phi (n)
Compute d to satisfy the congruence relation d \times e = 1 \mod \phi (n); d is kept as private key exponent.
The public key is (n, e) and the private key is (n, d). Keep all the values d, p, q and \phi secret.

b) Encryption

Plaintext: P < n
Cipher text: C = P^e \mod n.

c) Decryption

Cipher text: C
Plaintext: P = C^d \mod n.
11. ECC

Elliptic Curve Cryptography is an asymmetric algorithm that utilizes varied keys to encode and decode. It was invented by V. Miller (IBM) and N. Koblitz (University of Washington) in 1985. ECC was founded on algebraic structures of left-shaped carves in limited domains. It is effective enough to ensure security with a 164-bit key. That system demands a 1024 bit key to fulfil security. ECC affords the ultimate security with the same bit sizes. It is good for battery backup, too since it consumes less energy [5]. The main advantage of ECC is that its utilization of small key lengths which results in quick encoding and consuming minimal energy. On the contrary, of its disadvantages is inducing the size of the ciphered text and needs extremely sophisticated equations. Finally, the complexity of encoding algorithm rises.

12. ElGamal Encryption System

ElGamal Encryption System relies on the complexity of the unique algorithm problem, in which, it is easy increase numbers of grand powers. However, it is more difficult to do the opposite computation of the distinctive logarithm. ElGamal Encryption is
based on specific parameters that have the effect on the process, pace and safety of the algorithm. It is one of varied encoding plans that use Adhoc system in the encoding operation [5].

13. Diffie-Hellman

This algorithm was established by Diffie-Hellman in 1976. In this algorithm, every group comes up with a key pair and distributes the public key. The Diffie-Hellman algorithm offers two users to find a shared secret key and get in touch over an insecure communications channel. However, one of the main disadvantages of this algorithm is that the communication is performed through it which means that it can be violated in the middle of the attack [3].

14. DSA

A Digital Signature Algorithm (DSA) is a public key encoding algorithm established to secure the privacy of numeral text. The DSA was founded by NIST. A text is signed by a secret key to invent a signature and the signature is checked opposite to the text by a public key. Likewise, any group can check the authenticity signatures; however, only the party with the secret key could sign the texts. An available numeral signature offers a recipient a cause to think that the message was invented by a known sender who has the secret key, and that it was not modulated in transferring [4].

II. Literature Survey

Several works in the past have attempted to discover which algorithm would work best for encryption and decryption. The work presented by Singh et al. [20] is a prime example of that as it compared between the different symmetric algorithms including the DES, 3DES, AES and the Blowfish algorithms. The work found that Blowfish was the best amongst the other methods despite their popularity in the field of encoding and decoding. Accordingly, it was found that the AES algorithm was not proficient enough in comparison to other algorithm, for it needs higher processing time.

Similarly, the work presented by Cornwell [21] found that the Blowfish algorithm had the ability to support security for a relatively long time without any suspicious violations of the code. According to the researcher, the Blowfish algorithm is superior in terms of security and efficiency. However, further research should be carried on in order to re-estimate the results discussed by the Cornwell research on Blowfish to provide more evidence on the results.

In other study that was presented by Tamimi [22], two modes of performance were employed, namely the ECB and CBC. Those modes are used to compare the time it takes for each of them to be run and processed. According to the work and in
what agrees with all of the previous studies aforementioned, Blowfish has proven to be the best out of the compared algorithms in the work due to the lack of efficiency in time when it comes to the AES and the need to processing more data.

Many authors and researchers have found in Blowfish an ideal method for encryption and decryption including Nadeem [23] that found the in the many advantages of Blowfish a mean to overcome the competition in other algorithms. Additionally, the work presented by Nadeem concluded that AES is far more developed than DES and 3DES. It was also found that DES is far better than 3DES where the latter requires thrice the time when it comes to processing information.

In another work offered by Dhawan [24], it was found that AES carried out other algorithms in number demanding operations a second in varied user load and in the reacting time with multiple user load circumstances.

Singh et al. [25] presented a work that ran a comparison between the most popular encoding algorithms. According to the work, the most popular algorithms were AES, DES, 3DES and Blowfish in the terms of security and energy consumption. The results of the comparison contrasted with the some of the previous studies and showed that AES is better than the basic form of the Blowfish algorithms. However, to make BA stronger against every type of attack, extra keys could be added to substitute the old XOR with a new operation.

In the work presented by Agrawal et al. [26] after long research about DES, 3DES, AES, and Blowfish, they confirmed the superiority of the Blowfish algorithms, in terms of key size and security. Blowfish algorithm F function enhances supreme stage of security to encode the 64-bit plaintext database. Besides, Blowfish algorithm works quicker than the rest common in identical key encoding algorithms.

Similarly, Seth et al. [27] compared three algorithms: DES, AES and RSA. They inferred that RSA requires the longest encoding time and higher memory than the other two algorithms; however, with minimal output byte in RSA algorithm. Meanwhile, they also found that DES utilizes minimum enciphering time while AES requires the smallest storage memory. Furthermore, encoding time in both AES algorithm and DES algorithm is almost the same.

Mandal et al. [28] Figured out that the AES is distinctive over the other 3DES and DES in throughput and decoding time in their work.

Apoorva et al. [29] concluded that blowfish in the best algorithm to be used in terms of security and time to process because it consumes little time in comparison to the rest.

In the work presented by Abdul et al. [30], numerous algorithms were studied including: AES, DES, 3DES, RC2, BLOWFISH and RC6. The conclusion of the comparison ran at the work was that no dramatic difference in hexadecimal base encryption or base 64 ciphering. Also, Blowfish has proven to perform better than the rest when transforming the pocket size. In
addition, the work showed that the performance of 3DES is mediocre when compared to DES algorithm. All in all, the big key size could provide considerable improvement in the battery and time passed.

Thakur et al. [31] ran a comparison between DES, AES and Blowfish moderately where the outcome proved that Blowfish is the best and ideal algorithm out of the three when it is in the terms of performance.

Marwah et al. [32] also compared three algorithms, namely: DES, 3DES and RSA. The result is that the privacy ensured by 3DES is better than that of DES and RSA. DES is economical in energy memory required as well as fast in encoding and decoding database time. DES is vulnerable though, in comparison to 3DES and RSA.

The work of Alam et al. [33] has proved that 3DES requires more energy and processes less input than those of DES, this is because of its triple time feature. However, RC2 proved to be quicker due to smaller sizes of the throughput if contrasted to Blowfish. Blowfish input value is bigger than 3DES, DES, CAST-128, IDEA and RC2. Blowfish consumes the least power. Eventually, it turns out that Blowfish is the best, in terms of time, throughput and power.

Saini [34] sums up that the superior algorithms are prominent for their popularity. An efficient cryptography achieves two parts of an equation, possibility and acceptability.

### III. COMPARISON OF CRYPTOGRAPHIC ALGORITHMS

The table 1 gives the comparison between all algorithms previously discussed in this paper with respect to create by, year, key size, block size, round, structure, flexible, and features.

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Created By</th>
<th>Year</th>
<th>Key Size</th>
<th>Block Size</th>
<th>Round</th>
<th>Structure</th>
<th>Flexible</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>DES</td>
<td>IBM</td>
<td>1975</td>
<td>64 bits</td>
<td>64 bits</td>
<td>16</td>
<td>Festial</td>
<td>No</td>
<td>Not Strong Enough</td>
</tr>
<tr>
<td>DH</td>
<td>Whitfield Diffie and Martin Hellman</td>
<td>1976</td>
<td>Variable</td>
<td>-</td>
<td>-</td>
<td>Public key Algorithm</td>
<td>Yes</td>
<td>Good Security and Low Speed</td>
</tr>
<tr>
<td>E-DES</td>
<td>IBM</td>
<td>1977</td>
<td>1024 bits</td>
<td>128 bits</td>
<td>16</td>
<td>Festial</td>
<td>-</td>
<td>Good Security and fast Speed</td>
</tr>
<tr>
<td>RSA</td>
<td>Rivest Shamir Adleman</td>
<td>1977</td>
<td>1024 to 4096</td>
<td>128 bits</td>
<td>1</td>
<td>Public Key Algorithm</td>
<td>No</td>
<td>Excellent Security and Low Speed</td>
</tr>
<tr>
<td>T-DES</td>
<td>IBM</td>
<td>1978</td>
<td>112 or 168</td>
<td>64 bits</td>
<td>48</td>
<td>Festial</td>
<td>Yes</td>
<td>Adequate Security and fast</td>
</tr>
<tr>
<td>ECC</td>
<td>Neal Koblitz and Victor Miller</td>
<td>1985</td>
<td>More than symmetric and variable</td>
<td>Variable</td>
<td>1</td>
<td>Public Key Algorithm</td>
<td>Yes</td>
<td>Excellent Security and fast</td>
</tr>
<tr>
<td>EEE</td>
<td>Taher Elgamal</td>
<td>1985</td>
<td>1024 bits</td>
<td>-</td>
<td>-</td>
<td>Public Key Algorithm</td>
<td>Yes</td>
<td>Enough secured and fast Speed</td>
</tr>
<tr>
<td>RC4</td>
<td>Ron Rivest</td>
<td>1987</td>
<td>Variable</td>
<td>40-2048</td>
<td>256</td>
<td>Festiel Stream</td>
<td>Yes</td>
<td>fast Cipher</td>
</tr>
<tr>
<td>RC2</td>
<td>Ron Rivest</td>
<td>1987</td>
<td>8,128,64 by 64 bits</td>
<td>16</td>
<td></td>
<td>Festiel</td>
<td>-</td>
<td>Good and fast Security</td>
</tr>
<tr>
<td>Algorithm</td>
<td>Creator</td>
<td>Year</td>
<td>Key Size</td>
<td>Block Size</td>
<td>Round</td>
<td>Structure</td>
<td>Public Key</td>
<td>Speed</td>
</tr>
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<td>-------</td>
</tr>
<tr>
<td>BLOWFISH</td>
<td>Bruce Schneier</td>
<td>1993</td>
<td>32-448</td>
<td>64 bits</td>
<td>16</td>
<td>Festiel</td>
<td>Fast Cipher in SSL</td>
<td>Yes</td>
</tr>
<tr>
<td>SEAL</td>
<td>Phillip Rogaway and Don Coppersmith</td>
<td>1994</td>
<td>160 bits</td>
<td>32 bits</td>
<td>2</td>
<td>Public Key Algorithm</td>
<td>Not Strong and fast Speed</td>
<td>Yes</td>
</tr>
<tr>
<td>DSA</td>
<td>NIST</td>
<td>1997</td>
<td>variable</td>
<td>-</td>
<td>-</td>
<td>Public Key Algorithm</td>
<td>Good Security and fast Speed</td>
<td>Yes</td>
</tr>
<tr>
<td>RC6</td>
<td>Ron Rivest et.al</td>
<td>1998</td>
<td>128 bits to 256 bits</td>
<td>128 bits</td>
<td>20</td>
<td>Festial</td>
<td>Good Security</td>
<td>Yes</td>
</tr>
<tr>
<td>AES</td>
<td>Joan Daeman &amp; Incent Rijmen</td>
<td>1998</td>
<td>128,192,256 bits</td>
<td>128 bits</td>
<td>10,12, 14</td>
<td>Substitution Permutation</td>
<td>Security is excellent. It is best in security and Encryption performance</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### IV. RESULT AND DISCUSSION

From the above, the comparisons of the algorithms are based on creator year, key size, block size, round, structure, flexibility and features. The results showcase that the algorithms AES, Blowfish, RC4, E-DES and TDES are the fastest in encryption time, speed, flexibility. The results also prove that the AES algorithm is the best in security, flexibility and encryption performance strongest. It is most efficient when compared to others.

### V. CONCLUSION

This paper presents a survey of the most important cryptography algorithms up to date. These cryptographic algorithms are studied and analyzed well in order to help in enhancing the performance of the current cryptographic methods. The result shows the techniques that are useful for real-time encryption. All encryption methods have proven to have their advantages and setbacks and have proven to be appropriate for different applications. The comparison between Symmetric and Asymmetric algorithms shows that Symmetric algorithms are faster than their Asymmetric counterparts. Through the previous studies and the result of comparison, we find that the most reliable algorithm is AES in term of speed encryption, decoding, complexity, the length of the key, structure and flexibility.

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### References


CFD Simulation of the Air Flow around a Car Model (Ahmed Body)

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Abstract—this paper describes the flow simulation focuses on the simulation around Ahmed body car with slant angle of 40°.

Computational Fluid Dynamics (CFD) is the proper approach to deal with these complicated equations and obtain the numerical solutions of these complicated flows equations.

The researchers conclude that CFD simulation has been carried out to investigate the flow characteristics over a model car (Ahmed Body). The aim was to calculate the aerodynamic coefficients from the CFD simulation and compared them with the available experimental data. The numerical results are agreed in decent way with experimental data.

Keywords—CFD, Ahmed Body, Air Flow, Simulation

INTRODUCTION

This paper is investigating the flow simulation focuses on the simulation around Ahmed body car with a slant angle of 40° (CL= 0.037, CD= 0.32 & CM= 0.036).

From the literature review, slant angle of 40° is not the ideal angle for Ahmed car body. However, the literature shows that the proper angles lie between 10-25°.

In this analysis, a realizable k-ε model with 2nd order accuracy. The flow governing equations within a CFD solver (ANSYS-Fluent) will be applied.

These are the continuity, momentum and energy equations. These equations are non-linear, partial differential equations (PDE’s) and high orders, hence the analytical solution is impossible to obtain, (Saad & Ragavan, 2013). Computational Fluid Dynamics (CFD) is the proper approach to deal with these complicated equations and obtain the numerical solutions of these complicated flows equations (Kuzmin, 2010).

CFD APPROACH AS DESIGN TOOL IN AUTOMOTIVE INDUSTRY

CFD simulations is an efficient tool in automatic industry used extensively for design. This allows the designers to obtain a quick and proper analysis before go ahead to the final step. Recently, CFD approach has been adopted effectively within the automotive industry, with several new methods for car design (Smith, 2008).

CFD analysis in car industry is used in the determination of the applied forces and that of the vehicles wake during moving. CFD also is used to analyze the effect of wake on the vehicle’s efficiency and capability in comparison with other cars (Thabet and Thabit, 2018).

In vehicle’s industry, Ahmed Car Body is the standard model that can be used as validating case, in industry and CFD simulation (Davis, 2015). Ahmed Body is a generic car-type bluff body with a slant back has different angles from 0 – 40 degree. It is usually used as a benchmark test case for simulating the external aerodynamic flow characteristics over a car model (Hinterberger, et al., 2004).

MAIN COMPONENTS IN A CFD SOLVER

CFD tool has three main components that is used to handle the object from the start point till analyzing the results (Thabit and Younus, 2018) These components can be summarized a follow:

A. Pre-Processing:

This involves creating the geometry, computational domain
and meshing. Meshing is to discretising the computational domain into small control volumes, which are known as cells. The solution accuracy is a function of the number of generating cells in the computational domain.

B. The Solver:
This is the main part in the CFD simulation, where the flow governing equations will be discretised and solved.

C. Post-processing:
This is the final step in the CFD simulation process, which deals with extracting the important flow parameters such as velocity, density, pressure and forces. The simulation results will be compared to the experimental data and other numerical simulations.

AIMS & OBJECTIVES
The aim of this assignment is to perform a mathematical and CFD analysis on the flow over Ahmed Body and compared the numerical results with the available experimental data. The study will be carried out using both Solidworks and ANSYS software to create the geometry and obtain the numerical solution, respectively.

PROBLEM ASSUMPTIONS
From the given data in the assignment, the follow points will be assumed during the CFD simulation of the present problem. There is no heat transfer between the flow and the geometry. Air velocity at the inlet section is constant value during the solution. All the object boundaries will be dealt as walls with no slip shear condition. Because the Mach number is less than 0.3, hence the flow will be assumed as incompressible flow.

NUMERICAL METHODS:
D. Governing Equations:
To simulate the incompressible flow, Navier-Stokes equations for this flow type will be solved. The form of these equations based on the flow assumption follows:

1) Continuity Equation:
\[
\frac{\partial p}{\partial t} + \nabla (\rho u) = 0
\]

For an incompressible flow
\[
\frac{\partial p}{\partial t} = 0, \quad \nabla \cdot (\rho \vec{V}) = 0
\]

Thus,
\[
\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0
\]

Where,
\[
\rho = C, \quad \nabla \cdot \vec{V} = 0
\]

2) N-S Equations:
   a) X-direction component:
\[
\frac{\partial (pu)}{\partial t} + \nabla (puV) = - \frac{\partial p}{\partial x} + \frac{\partial (\tau_{xx})}{\partial x} + \frac{\partial (\tau_{yx})}{\partial y} + \frac{\partial (\tau_{zx})}{\partial z} + pf_x
\]

b) Y-direction component:
\[
\frac{\partial (pv)}{\partial t} + \nabla (pvV) = - \frac{\partial p}{\partial y} + \frac{\partial (\tau_{yy})}{\partial y} + \frac{\partial (\tau_{zy})}{\partial z} + pf_y
\]

c) Z-direction component:
\[
\frac{\partial (pw)}{\partial t} + \nabla (pwV) = - \frac{\partial p}{\partial z} + \frac{\partial (\tau_{zz})}{\partial z} + pf_z
\]

E. Boundary Conditions
The following boundary conditions are applied during the solution in ANSYS-Fluent.

- Velocity-inlet BC: Inlet plane.
- Symmetry BC: Enclosure surfaces (no-slip conditions).
- Walls BC: Road and object surfaces.
- Pressure-outlet BC: Outlet plane.

F. Flow Inlet Parameters:
\[
\mu = 1.789 \times 10^{-5} \text{ kg/m.s.} \\
\nu = 15.13 \times 10^{-6} \text{ m}^2/\text{s.} \\
\rho = 1.225 \text{ kg/m}^3. \\
V = 40 \text{ m/s.} \\
Re = 768,000 \text{ (based on object’s height).} \\
I \leq 0.25% 
\]

G. Car Model Geometry:

Figure 2 shows the layout of the geometry provided in the assignment cover sheet for Ahmed Body Car with a slant angle \( \phi \) equals to 40°. From the figure below, the horizontal length covered by the slant (L) and its height (H) can be calculated as follow:

\[
\cos \phi = \frac{\text{horizontal distance covered by slant (L)}}{\text{Slant length}} \\
\cos 40 = \frac{L}{222} \\
L = 170.06 \text{ mm}
\]

Hence,
\[
x = 1044 - 170.06 = 873.94 \text{ mm}
\]

\[
\sin \phi = \frac{\text{vertical distance covered by slant}}{\text{slant length}} \\
\sin 40 = \frac{H}{222} \\
H = 142.70 \text{ mm}
\]

Hence,


\[ z = 288 - 142.70 = 145.30 \text{ mm} \]

Using Solidworks software, CAD model for Ahmed Body is created and exported with IGS extension to be dealt in ANSYS Workbench. Figure 3 shows the Car Model Geometry for Ahmed Body.

**Fig. 3.** Ahmed Car Body CAD Model

**H. Computational Domain:**

ANSYS software tools (workbench, Design Modular, Meshing tool & Fluent solver) are used to carry out the flow simulation.

Figures 4 and 5 show a screenshot during preparing the solution and creating the enclosure by using ANSYS workbench, and Design Modular, respectively.

**Fig. 4.** Fluent Solver

**Fig. 5.** Enclosure Option Box

Figure 6 shows the Car Model with the enclosure created in Design Modular.

**Fig. 6.** Geometry and Enclosure

Figure 7 shows the Boolean operation on Ahmed Body and fluid body.

**Fig. 7.** Boolean operation on Ahmed Body and fluid body

**I. Meshing:**

The length of the first cell away from the surface (y) to calculate effectively the wall shear stress during the simulation should be calculated carefully. To do so, \( Y^+ \) calculations should be performed to calculate the value of (y) before start meshing process.

1) **Reynolds Number (Re):**

\[
Re = \frac{\rho v l}{\mu} = \frac{vl}{v}
\]

\[ Re = 40 \times 0.288 \]

\[ Re = 768,000 \]

2) **Skin-Friction Coefficient (Cf):**

\[
C_f = [2 \log_{10}(Re_x) - 0.65]^{-2.3}
\]

\[ C_f = [2 \log_{10}(768,000) - 0.65]^{-2.3} \]

\[ C_f = 3.925 \times 10^{-3} \]

3) **Wall Shear Stress (\( \tau_w \)):**

\[
\tau_w = C_f \times \frac{1}{2} \rho U_{freestream}^2
\]

\[ \tau_w = (3.295 \times 10^{-3}) \times \frac{1}{2} \times 1.225 \times 40^2 \]
\[
\tau_w = 3.847 \text{ Pa}
\]

4) **Friction Velocity:**

\[
u^* = \frac{\tau_w}{\rho}
\]

\[
u^* = \frac{3.847}{1.225}
\]

\[
u^* = 1.772 \text{ m/s}
\]

For most near-wall modeling, \( Y^+ \approx 1.0 \). (Salim & Cheah, 2009)

Therefore,

5) **Wall Distance (y):**

\[
y = \frac{y^+ \mu}{\nu^*} \\
y = \frac{1.0 \times (1.789 \times 10^{-5})}{1.225 \times 1.772} \\
y = 8.241 \times 10^{-6} \text{ m}
\]

Therefore, the boundary layer thickness (wall Distance) for this analysis is 8.241x10-6 m.

Figure 8 shows screen shots of the final mesh used in the present analysis.

![Screen shots of the final mesh](image_url)

The maximum number of elements (cells) generated in this grid is about 500,000 cells; since this is the allowable number of cells you can generate using the student license.

**SOLUTION PROCEDURES:**

J. **CFD Model Set-Up:**

Figures 9, 10, and 11 show screen shots of the solution general setting model selection and turbulence model in ANSYS Fluent solver for the investigated flow, respectively.
Fig. 11. Turbulent model selection

Figures 12, 13, and 14 show screen shots for the material setting boundary conditions and reference values in ANSYS Fluent solver for the investigated flow respectively.

Fig. 12. Air properties

Fig. 13. Boundary Conditions

Fig. 14. Reference Values

K. Numerical Schemes:

The numerical schemes used in the current simulation can be summarized as follows methods:

- Coupled Scheme: This scheme is used for Pressure-Velocity Coupling Method, which enables the full pressure based solver, which has superior performance.
- Least-Squares Cell-Based: This is used for the gradients within the interpolation methods. This scheme has the same accuracy as the node-based gradients, however, is less computationally intensive.
- Second-Order Upwind: The scheme is used for interpolation process, which pressure, momentum and turbulence act upon. This will give better accuracy.

L. Solution Controls:

Figures 15, 16 and 17 show screen shots for the solution control residual monitoring and solution initialization, respectively.
RESULTS ANALYSIS:

M. Convergence History:

Figure 18 shows a screen shot from the solution convergence history at about 250 iterations.

N. Static Pressure Contours:

Figure 19 shows a screen shot of the static pressure contours around Ahmed Body. From the figure, it can be seen that the highest value of static pressure is located at the centre of the oncoming Ahmed body and the minimum value is located the separated flow region.

O. Velocity Magnitude

Figure 20 shows a screen shot of the velocity magnitude pressure contours around Ahmed Body.
**P. Axial Velocity**

Figure 21 shows a screen shot of the contours of axial velocity component of the flow around Ahmed Body.

**Q. Pressure Coefficient:**

Figure 22 shows a screen shot of the pressure coefficient distribution on the top surface of Ahmed Body.

**R. The plot Comparison with Experimental Data**

Table 1 shows the values of the important parameters obtained from the simulation.

![Table I: Values of the Important Parameters](image)

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient of Lift</td>
<td>0.036860</td>
</tr>
<tr>
<td>Coefficient of Drag</td>
<td>0.32346</td>
</tr>
<tr>
<td>Coefficient of Moments</td>
<td>0.035953</td>
</tr>
<tr>
<td>Vertex Average of Velocity Magnitude</td>
<td>5.4590 ms-1</td>
</tr>
<tr>
<td>K</td>
<td>0.00019799</td>
</tr>
<tr>
<td>Epsilon</td>
<td>0.00057902</td>
</tr>
</tbody>
</table>

Table 2, figure 23 and figure 24 show the data from the experiments.

![Table II: Data of the Experiments](image)

<table>
<thead>
<tr>
<th>Rear slant angle (°) (In Degrees)</th>
<th>C_d</th>
<th>C_l</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.50031e-01</td>
<td>-1.17457e-01</td>
</tr>
<tr>
<td>5</td>
<td>2.37215e-01</td>
<td>-1.49709e-02</td>
</tr>
<tr>
<td>7.5</td>
<td>2.34631e-01</td>
<td>2.92149e-02</td>
</tr>
<tr>
<td>10</td>
<td>2.36738e-01</td>
<td>8.29710e-02</td>
</tr>
<tr>
<td>12.5</td>
<td>2.41644e-01</td>
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</tr>
<tr>
<td>15</td>
<td>2.46833e-01</td>
<td>1.85001e-01</td>
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<td>2.83622e-01</td>
</tr>
<tr>
<td>30</td>
<td>2.97872e-01</td>
<td>3.47783e-01</td>
</tr>
<tr>
<td>35</td>
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<td>2.05502e-01</td>
</tr>
<tr>
<td>40</td>
<td>2.50360e-01</td>
<td>8.36791e-01</td>
</tr>
</tbody>
</table>

![Fig. 23. Experimental CD (Banga, et al., 2015)](image)
Fig. 24. Experimental velocity magnitude (Banga, et al., 2015)

CONCLUSIONS AND RECOMMENDATIONS

CFD simulation has been carried out to investigate the flow characteristics over a model car (Ahmed Body). The aim was to calculate the aerodynamic coefficients from the CFD simulation and compared them with the available experimental data. The numerical values obtained were; CL=0.0368, CD=0.323 and CM=0.036, respectively. The numerical results are agreed in decent way with experimental data.

REFERENCES


The Unresolved Religious Issues as Factors in Public Criminalization: A Sociological Perspective

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ABSTRACT

Sociology as an academic discipline emerged from the crises of industrial revolution and French socialist revolution of European society in the 17th and 18th century. It was then founded from social problems associated with all forms of deviance and crimes. This paper is a focus on some of the unresolved issues related to religion which is a common practice of almost all societies of the world. Those issues are serious factors in the process of criminalization of members of the general public. Worldwide demographic distribution of 2010 indicated that; Christianity (31.5%), Islam (23.2%), Irreligion (16.3%), Hinduism (15.0%), Buddhism (7.1%), Folk religions (5.9%) and Other religions (1%). There are many fundamental questions which are unanswered by religion. The concept of God is unresolved. And because the concept of God is unresolved the contradictions prevailed by the existence of several religions is also unresolved. Why do we have many religions if there is only one God? Why are the contradictory principles from the different religions? Why are the contradictions attributed to one God? Ridiculously, religious doctrines are sources of social law affecting legislative and judicial matters as well. In fact norms that were created by the principles of those doctrines remain sources of social control, laws made and enforced accordingly. Religion undermines democracy and promotes dictatorship and monarchy which are contradictions to successful enforcement of human rights. It justifies and encourages terrorism, threats and insurgencies and all related crime including frauds, robbery, slavery and humiliations. So long as the foundation of religion is falsehood and freedom is compromised to threat and unconditional belief and forceful acts on false recommendations, societies dominated by religion must experience all forms of conflicts including murder and assaults. The recent case of Boko Haram is a good example of failure of religion to prove itself as humanitarian gesture determined by super power called God. And to have peaceful co-existence of members of different socio-religious groups, religious practices must be purely a personal and private affair. There should be total withdrawal of states involvement on matters of religious practices as recommended by the constitution. State construction of worship centers should be criminalized and politicians insisting on such rites during campaign should be disqualified by INEC. State must stop religious preaching in the public by all religious groups to avoid inter and intra-religious conflicts.

Index terms: Crime, Religion, Sociology, Unresolved,

INTRODUCTION

Religion has remained from time immemorial as an institution of societies. It has been established that the earth didn’t contain the substance of human beings before 10million years ago. In fact the result of discoveries indicated that the modern human being of the contemporaries existed from about 150-60,000 years ago. While of the beginning the human beings were simple economic activities, their lives evolved with development of culture which were inclusive of religious activities. While dominant religious philosophies like Islam and Christianities claimed religious activities started with the first human species that existed, which was discovered to have existed in less than 150,000 years ago (Ruddiman,2005; Steffen et-al, 2011)

Even with that philosophy, religious activities of the first group of human beings was characterized by critical and unresolved issues most of which were contradictory, paradoxical and challenging. Those were factors leading to deviance or criminality of members of the group. This paper is an attempt to explore into such issues and their relationship with public criminalization. The following are therefore asked and begged for their answers. What is Religion? Why region? What is the relationship between those
issues and public criminalization? To what extent religion is a factor in development and underdevelopment? What sociological solution to those religious issues that factor in public criminalization?

WHAT IS RELIGION?

In world cultures, there have been many different groupings of religious belief. In Indian culture, different religious philosophies were traditionally respected as academic differences in pursuit of the same truth. In Islam, the Quran mentions three forms of religion: Muslims, the People of the Book, and idol worshipers. Initially, Christians had a simple dichotomy of world beliefs: Christian civility versus foreign heresy or barbarity. In the 18th century, "heresy" was clarified to mean Judaism and Islam; along with paganism, Religious traditions fall into super-groups in comparative religion, arranged by historical origin and mutual influence. Abrahamic religions originate in West Asia, while Indian religions in the Indian subcontinent (South Asia) and East Asian religions in East Asia. Another group is the Afro-American religion, which have their origins in Central and West Africa (https://en.wikipedia.org/wiki/Major_religious_groups).

Middle Eastern religions are; Abrahamic religions are the largest group, and these consist mainly of Judaism, Christianity, Islam, and the Bahá’í Faith. They are named for the patriarch Abraham, and are unified by the practice of monotheism. Today, at least 3.8 billion people are followers of Abrahamic religions and are spread widely around the world apart from the regions around East and Southeast Asia. Several Abrahamic organizations are vigorous proselytizers; Iranian religions, partly of Indo-European origins, include Zoroastrianism, Yazdânism, Ætsæg Din, Ahl-e Haqq and historical traditions of Gnosticism (Mandaicism, Manichaeism). Indian religions, originated in Greater India and partly of Indo-European origins, they tend to share a number of key concepts, such as dharma, karma, reincarnation among others. They are of the most influence across the Indian subcontinent, East Asia, Southeast Asia, as well as isolated parts of Russia. The main Indian religions are Hinduism, Jainism, Buddhism and Sikhism. East Asian religions consist of several East Asian religions which make use of the concept of Tao (in Chinese) or Dō (in Japanese or Korean). They include many Chinese folk religions, Taoism and Confucianism, as well as Korean and Japanese religion influenced by Chinese thought (https://en.wikipedia.org/wiki/Major_religious_groups).

African religions are the religions of the tribal peoples of Sub-Saharan Africa, but excluding ancient Egyptian religion, which is considered to belong to the ancient Middle East. African diasporic religions practiced in the Americas, imported as a result of the Atlantic slave trade of the 16th to 18th centuries, building on traditional religions of Central and West Africa. Indigenous ethnic religions were found on every continent, now marginalized by the major organized faiths in many parts of the world or persisting as undercurrents (folk religions) of major religions. Those are traditional African religions, Asian shamanism, Native American religions, Austronesian and Australian Aboriginal traditions, Chinese folk religions, and postwar Shinto. Under more traditional listings, this has been referred to as "paganism" along with historical polytheism. New religious movement is the term applied to any religious faith which has emerged since the 19th century, often syncretizing, re-interpreting or reviving aspects of older traditions such as Ayyavazhi, Mormonism, Ahmadiyya, Pentecostalism, polytheistic reconstructionism, and so forth. Worldwide demographic distribution of 2010 indicated that; Christianity (31.5%), Islam (23.2%), Irreligion (16.3%), Hinduism (15.0%), Buddhism (7.1%), Folk religions (5.9%) and Other religions (1%) (https://en.wikipedia.org/wiki/Major_religious_groups).

The advantage of Islam and christianity ahead of other religions is the wide travelling behaviors of their pioneers that kick-started the Islamization and Christianization at their origins. The Arabs travel far towards Africa and Asia for trans-saharan slave trade and other missions. They also devised peculiar methodology characterized by threatening other social and religious groups, resulting in humiliating many and conquereance of several others. For instance Islam claims to be the only approved and acceptable
religion from God. All other religious groups are condemned as atheism and deviancy that will end in hell fire, unless repent to and convert to Islam, by testifying that there is only one God and that Muhammad is the messenger of Allah. And for Christianity there is only one savior on earth and that is Jesus Christ. And nobody is safe unless he testify that Jesus is God and son of God who was descended to live with human beings and died for their sins. One you testify christianity you have your sins cleansed as he has already died for your sins.

For instance Islam missionaries were empowered by the teachings of the Qur’an that non muslims can be advised to join Islam, and when they resist they can be threatened by taxing them heavily before they could be allowed to live within the boundaries of Islamic societies. It is either you continue to pay heavy tax to live as non-believer or join the religion of Islam to live without Islamic threats and coercions. Furthermore Islam is so cultic that once you join it you are not allowed to withdraw. Once a muslim is always a muslim and withdrawing is visited with death penalty in shariah established societies.

In whatever name a religion may be the fundamental phenomenon is characterized by principles and practice. The principles are the guidelines and the concept which are the abstract and action and activities which are the practices including creating worship centers applying the principles accordingly. There are shrines, temples, and others including mosque, church etc.

The principles of religion include the belief in the concept of God. Simply belief that there is God or Supreme Being and confirm your belief by practicing some form of rituals testifying that they are in line with those principles. Religion is therefore a belief in the distance of supernatural being and practice of rituals to that effect.

**WHY RELIGION?**

Religion from all exhibitions is ignorance and viscous circle of ignorance. It is a simple commitment to fully belief in the unknown as if they are known and confirmed to have known. This is blank testimony to lies and falsehood.

Every research begins with hypotheses (a prediction base on a belief determined to be confirmed or otherwise). However, research must lead to knowledge by digging to uncover the unknown to know what is knowable. Discoveries will disapproved or approve hypotheses. Approved hypotheses are confirmed and exhibited as knowledge. Research is therefore knowledge seeking determination supported by full package of freedom strengthening the researcher to freely discover the knowledge facts. It is therefore leading to science and permanent legacy of referral material.

The first aspect of religion which is to believe in the existence of Supreme Being is synonymous to hypotheses. However, hypotheses on whether there is Supreme Being remain an aspect yet to be discovered. Unfortunately discoveries about such hypotheses have been criminally and religiously restricted, that researches are hardly freely conducted to discover the truth or falsify the fact that there is no supreme being.

Religion is not requirement of life particularly in ages of free discoveries in line with science and technology. God is not discovered and it cannot be discovered scientifically. Religion therefore shape ignorance and discourage basic knowledge of nature and other realities. Religion is therefore falsehood created by actors, supported by falsehood and perpetuate falsehood altogether. Religion therefore must be associated with underdevelopment.

The second aspect of religion which is the practices, worships and rituals are practical aspect that can be empirically discovered of their activities and bases. Worship centers are existing time immemorial, all built by people at different times.
Instructions about religions are ordered by human beings mostly claimed to be from the Supreme Being. The method used in its formation and perpetuation are dominant ones. Religion may be a necessity in the pre-science and technology age but certainly a misplaced priority in the modern and contemporary age.

UNRESOLVED ISSUES IN RELIGION

There are many fundamental questions which are unanswered by religion. The concept of God is unresolved. Because the concept of God is unresolved the contradictions prevailed by the existence of several religions is unresolved. Fundamentally what is God? , why do we have many religions if there is only one God? Why are the contradictory principles from the different religions? Why are the contradiction attributed to one God? Are those principles simple opinion of founder of the various religions and confirmed the non-existence of God?

God has been described as everything from an impersonal life-force to a benevolent, personal, almighty Creator. He has been called by many names, including: "Zeus," "Jupiter," "Brahma," "Allah," "Ra," "Odin," "Ashur," "Izanagi," "Viracocha," "Ahura Mazda," and "the Great Spirit" to name just a few. He's seen by some as "Mother Nature" and by others as "Father God." He always addresses Himself as "Father," never "Mother." He calls Himself "a Father to Israel". His prophets acknowledged Him as Father by saying, "You are our Father, we are the clay, and you our potter; And all of us are the work of Your hand," and "do we not all have one Father? Has not one God created us?" Never once does God refer to Himself as "Mother" and never once is He called such by the prophets to whom He spoke. Calling God "Mother Nature" is comparable to calling your earthly father "Mom." (http://www.AllAboutGod.Com).

God has different name in different language. God means the creator of the Universe or the Supreme Being. In Hausa it is called Ubangiji. In Arabic it is called Allah. It is simply a spiritual powerful super force that generates all forces and believed to exist spiritually and materially, as well commanding material existence and actions visible in human surrounding and nature. While that may be general position of most religions, it is not discovered as truth and absolute truth; nor can this be discovered again on scientific bases. This will remain hypotheses forever. It is therefore a serious religious but sociological and scientific issue which is yet to be categorical resolved in general life conduct and academic operations.

Associated to the concept of God are concepts of spirits, including angels, devils, souls and projected spiritual powers of prophets, ancestors, and their relationship with the concept of God. While the prophets and the ancestors are human beings, their spiritual exhibition are claimed and cannot be testified, it is therefore hypothetical, undiscovered and predominantly falsehood. The messages from those sources are also hypothetical, and cannot be discovered in anyway. Paradoxically people are criminally mobilized to belief in the falsehood. If all the messages claimed by the prophets are simple opinion of the prophet or their dreams, hallucination and deep thoughts linking to their own psychologically created images called God, obviously the world population must have been deceived, reframed, redirected, restructured and continuously reorganized on those bases. This fundamental researchable issue is yet unresolved.

THE UNRESOLVED ISSUES AND PUBLIC CRIMINALIZATION

The concept of God, spirits, prophets, ancestors etc are yet to be proven scientifically as undisputable truth and therefore unresolved in social life and in the academia. However, those issues are very fundamental in social making and construction in the past and the present. Take for example the Qur’an and the bible as sources of religious doctrines. The bible was accessed through
Jesus and the Qur’an was accessed through Prophet Muhammad. But they are yet to be discovered to have originated from the Supreme Being as the Supreme Being is yet to be discovered scientifically.

Ridiculously, religious doctrines are sources of social law and including legislative and judicial adjudicative matters. In fact norms that were created by the principles of those doctrines remain sources of social control, laws made and enforced accordingly. If those doctrines form aspects of some societal laws and their operations, the world population is being criminalized religiously and therefore the basis of such criminalization is falsehood and illusion.

Religion has further created confusion by creating conflicting values and projecting it as eternal values, deceiving and streamlined adherents on such bases contrary to those that modernization created such as democracy, fundamental freedom, social and natural rights which completely contradicted religious philosophy of dictation, coercion, threat and bondage. Religion has made it difficult to freely conceptualize independent law which has no bearing to religions. It also created cultism by creating and establishing threatening members against the new laws that obviously undermines religious doctrines and strengthens legislated laws. Those that are mobilized through religions to develop religious social lives, live in conflict with establish laws. This is why we had in history religious conflicts such maitatsine, Boko haram, shiah riots, ISIS, al-shabab, al-qaida etc.

Unresolved issues like the Qur’an, bible, spirits, ancestors, prophets etc as sources of indoctrination have at same time serve as sources of creating disunity, misunderstanding and chaos. If for instance the bible says “Jesus is a son of God” to the Christians, the same God is claimed to have falsified himself by saying “God has no son” to the muslims. Each one is claiming the originality of his holy book as the same God who is the only one and never lied. This either proved that the bible and the Qur’an are fabricated documents by their authors or there are two Gods or many Gods exist to the service of every religion. Christians and Muslims have been killing each other on those grounds. Almost all religious groups are conflicting groups against each other. Number of religious groups in existence may likely to be the number conflicting religious bases groups in the community. Because of the differences there are inter and intra religious conflicting groups. Religion is therefore major source of public criminalization.

RELIGION, DEVELOPMENT AND UNDERDEVELOPMENT

Development is a psychological satisfaction of the circumstance you find yourself. It involves freely tapping of natural resources available for a community and collectively utilizing it for the improvement of the standard of that group. If you are talking about Nigeria, development is the collective utilization of both natural and social resource of the Nigeria community for the improvement of the standard of living of the populace. The natural resources in Nigeria include the abundance of land for agricultural purpose, abundance of land for mining of mineral resources such as granite, copper, iron ore, gold, and diamond. Abundance of land for rearing of animals and livestock production. Rivers and oceans for navigation, as well as riverine businesses including for fishing, irrigation and transportation. It also involves the mobilization of the human resources for various professions and occupations to cover up the offices in economic, political and social institutions of the society. Produce experts in economic management such as bankers, organizational managers, politicians and political office holders and social sector officials such as medical doctors, social workers, securities, militaries and paramilitaries etc. Recognizing, accessing and mobilizing these resources and using them for the up keep of the society is called development.

Paradoxically the reality will display that Nigeria’s resources are in abundance and not judiciously tapped and utilized. The large population is left with majority unemployed as a result of poor industrialization. The major mineral resources, the crude oil is criminally tapped and funds realized predominantly siphoned into few pockets, with less than 5% of the population controlling over...
90% of Nigeria’s wealth. The youth are not mobilized into the abundance of the agricultural land because of deviation of farming as a profession resulting from poor agricultural education, mechanization and mobilization. Virtually all sectors of the economy are left untapped or tapped not judiciously. Currently there are often farmers and herdsmen clashes in Taraba, Benue, Plateau, Adamawa and some eastern state of Nigeria. Thousands have died in such clashes. There are cases of bandits and cattle rustlers that kill herdsmen and rustler away their cattle. Just early June 2018 about 23 people were killed, several homes torched, and villages burnt down in Zamfara state (http://googl/FKBTAv). These are effects of poor policy and poor implementation of some proper policies and rules by law enforcement agencies.

Manifestation of underdevelopment includes prevalence of corruption, high rate of unemployment, illiteracy, ethnicity, religions bigotry and dependency. Nigeria is a dependent capitalist economy and therefore it must be characterized by high value to bureaucracy and attachment to bureaucracy. Resources of the country are centrally owned by government. The land and its continent including minerals belong to government. Resources of government are generated from these abundance of natural gifts such as crude oil and exports of minerals. The population is also mobilized and taxed according to their personal income and value added tax. Every business is taxed from all sources of public service. Industries are taxed by power supplies, by quantity of products, by assets invested, by profits generated, by business premise attestation, by insurances including health, risk management, pension operation etc. There is tax for import, export, tourism visa, for infrastructural utilities such as airports, water ways, port authorities etc. It is therefore an obvious fact that wealth is with the government and the only source of public enrichment is through the approval of government. Income per person is obviously determined by government through salaries and wages commission. There is a serious gap between the laws and the operations. Laws are predominantly violated and offices are virtually abused and so corruption is so apparent that such revenues are not generated expectedly, those generated are also not adequately remitted and those remitted are not adequately accounted for.

According to Ibrahim (2003) survival of democracy in Nigeria depend on the capacity of stakeholders in the policy to combat the ravage of corruption. The structure of Nigeria policy is characterized by excessive personalization of power, which provided a culture of unbridled corruption.

The Lawrence Anini saga was one of the dramatic illustration of growing criminalization of the Nigeria state and society. By 1985 Anini controlled a well armed criminal gang. Anini had a score to settle with the police because in September 1985, the police had raided his modest family shop in Ibadan, killed his father and his junior brother. In august 1986 2 members of his gang were arrested and killed by police regardless of bribes they collected. Anini felt double-crossed and publicly announced that he would kill 100 police officers. In three months he killed 9 police officers. Yet Anini become a very popular jack – hero during the period. Anini was described as Nigeria’s Robin Hood, a revolutionary who would clean up the corrupt Nigerian system. Anini also raided rich people and banks in broad day light and distribution part of his booty to cheering crowds. He was nick name “Anini the law” because he was killing police officers. When Anini was finally captured on 3 December 1986 another 11 police officers in the criminal investigation department in benin city were also arrested as part of his accomplice (Ibrahim, 2003).

The military in Nigeria has entrenched the culture of public corruption established by earlier civilian regimes. Military become power drunk and virtually transformed corruption into state policy. It actively pursued policies intended to guarantee impunity for corrupt state officials. Under the Babangia, Abacha, and Abubakar administration, what used to be known as corruption became the art of government itself (Ibrahim 2003).
A huge security apparatus with vast parallel and un-stated powers was established with the state security service (SSS), the directorate of military intelligence (DMI), special strike forces (SSF) at the national level. At the state level, military governors established their own terrorist units”, such as operation sweep (Lagos state), operation wedge (Ogun state), operation Gbale (Oyo state), operation storm (Imo state), operation wipe out (Rivers state), operation Zaki (Adamawa state), and operation Kwanta-kwanta (Bauchi state). These outputs were directed at terrorizing the population and carrying out very high levels of extra judicial killing (Ibrahim 2003).

Shortly after the death Abacha, $1.8 billion identified as placed by the late dictator in Brazil, Lebanon, Britain and Switzerland. About $675.2 million, E75.3 million and ₦252 million of state funds had been recovered from the family of Sani Abacha (totaling ₦64.6 billion, one quarter of the 1998 budget of federal government). About ₦8.6 billion was discovered from Ismaila Gwarzo security advisor. About $2,500 million was collected from state forms to pay Russian contractors working on the Ajaokuta state mill and only $500 was paid to the Russians. Some $2.2 billion was found in Abacha’s Swiss account (Ibrahim 2003). Chief George a chieftain of the ruling People’s Democratic Party, alongside principal officers of the Nigeria Ports Authority was convicted and sentenced to 2 years imprisonment. The Commission has recovered over $11 billion since its inception in 2003. The bulk of this, that is, $6.5 billion was recovered in the last two years alone. These recoveries include some part of the Abacha loot as well as recoveries arising from the bank sanitization exercise which the Commission embarked on with the Central bank of Nigeria. Expectedly, a substantial portion of these recoveries are Government Funds that have been siphoned and criminal proceeds from bank frauds. It will do us well to explain the avenues of recovery and the use to which this recovered fund are channeled. Restitution may not be the primary motive of the work of the commission but it is an important incidental of the investigation and prosecution of criminals. Thus in cases of official corruption and theft of Government funds, the proceeds of the crime are remitted to the office of the Accountant General of the Federation of Nigeria or that of the applicable State Government, as required by public service rules. Where the victim is a private entity, the proceeds of the crime are given to such private entity. See table for record of recoveries (Waziri, 2011).

Alfred Rewane a financier of NADCO, an opposition coalition of Abacha regime was killed. Kundirat Abiosa, the vocal wife of the detained winner of the June 1996 election, Bagauda Kaltou, the Kaduna correspondent of the News magazine was also killed. General Shehu Yar’Adua an ardent opponent of Abacha self-succession plan was also eliminated by state security agents (Ibrahim 2003).

Jolly Nyame former governor of Taraba state sentenced to 28 years imprisonment for corruption, in May, 2018. He is to serve 14 years in concurrent terms. EFCC was instructed by court to return looted funds to coffers of Taraba state (NTA news network Abuja 9:00pm).

As a major indicator of underdevelopment, corruption in recent time is responsible for instigating Boko Haram activities by preachers popularizing of jihad and establishment of shariah to enforce jihadist activities as a panacea to the prevailing corrupt practices and impunities of the authorities in Nigeria and particularly the northeast. Unfortunately no lesson has been learned by same authorities after all the suffering from terrorism and insurgency.

Northeast was globally focused to diminish Boko Haram activities by global military, financial and logistic support in the fight against terrorism and insurgency. While it is clear that Boko Haram activities have been pulled down by recapturing areas occupied by the terrorist group in September 2014 by the Nigeria armed forces, it is also very clear that the engagement and general episode of the military, the instrumentality of the federal government and total involvement of the state government in providing
logistic support to back up the armed forces, was characterized by corrupt practices at all levels. After victory the rehabilitation, reconstruction and resettlement of victims of boko haram terrorism was fully characterized by corruption in all levels. It was on record that there was full involvement of several countries of the world, as well as major informational bodies such the UN, EU, AU, ECOWAS etc by providing both financial and military support amounting to billions of dollars and billions of Nigeria. It is disturbing that a very good proportion of such contributions ended up criminally in very few officials’ pockets. For instance recently Borno State government claimed to have completed the rebuilding of about 80% of the houses destroyed in Bama. Contrarily, eye witnesses confirmed that less than 40% of Bama’s destroyed homes were actually rebuilt. The ministry of Rehabilitation, Reconstruction and Resettlement have criminally deceived the general public by reconstructing houses along the main road crossing Maiduguri to Mubi road and painted them so that every passerby will unconsciously appreciate the situation. Most of homes reconstructed are also perceptual deception of public as only the front phases are completed while the interior are left destroyed.

The fraud, deception and criminal exhibition by a state that witnessed thousands of its citizens killed further confirmed the irresponsible, insincerity and mockery of the religion they claim to practice. The actions are total contradiction to constitutional approvals, their claimed believed in God and Godly principles of anti-corruption and the associated punishment in the judgment by same God after death. Obviously religion is irrelevant in a scientific society, where religion is operated as sort of mockery used by the same non believer elites to radical the masses who may have been deceived to have faith, and maintained an adamant posture of having redress of this official cheating by God after death. It is very clear that with this imbalance and criminality, it is left for General Buhari to decide to call to book these criminals of corruption, deception and mockery to book or perpetuate illusion, injustice and criminal domination. Buhari we trusted can optimistically take necessary actions against these criminals of billions meant for rehabilitation, reconstruction and resettlement of Bama and other northeast Nigeria that have been devastated by boko haram since 2001 to date.

Another indicator of underdevelopment is the level of illiteracy of the entire population and the academic illiteracy in academic circles. The Minister of Education, Adamu Adamu said the country had about 65 million to 75 million illiterates, describing the figure as unbecoming and high, considering the country’s population. “Education is the bedrock of any country’s development and any country that does not educate its populace is bound to fail. Females account for nearly 60 percent of the country’s illiterate population. Nigeria will not achieve its development aspirations until it checks the high level of illiteracy by adoption of inclusive education where every Nigerian will be given the opportunity to go to school, regardless of background, ethnicity and gender. This was attributed to Boko Haram insurgency, saying that many of the sect’s followers only knew the Quran but could not interpret and digest its meanings. The most expedient approach is through selective, intensive and nationwide on-going campaign against illiteracy, targeting states and groups that have the highest levels of illiteracy, with girls and women as the main target.” “If a minimum of 10 literacy centres could be established in each of the 9,572 wards with each centre enrolling a maximum of 30 learners in two sessions per annum, 5.7 million adults would be made literate at the end of each year under the national literacy campaign. Thus, about 23 million people would be literate.” The minister lamented that in spite of the fact that the percentage of Nigeria’s budget committed to education is very low, nothing is allocated to research and development. He noted that and over 90 per cent of federal and state government annual appropriations for the sector is committed to payment of staff salaries. “Less than 10 per cent is for capital projects and procurement of teaching materials (Adedigbe, 2017).

In 2015, youth illiteracy for Nigeria was 9.43 million. Youth illiteracy of Nigeria increased from 5.19 million in 1991 to 9.43 million in 2015 growing at an average annual rate of 24.32 %. Have a question? Youth illiterate population is the total number of youth between age 15 and age 24 who cannot both read and write with understanding a short simple statement on their everyday life.
Youth literacy rate 72.8% WB
Youth female illiteracy 62.1% WB
Adult literacy rate 59.6% WB
Adult illiteracy 41,261,920 number WB
Adult female illiteracy 61.4% WB
Elderly literacy rate 26.4% WB
Elderly illiteracy 3,672,265 number WB
Elderly female illiteracy 59.5% WB

And those that have gone to school, a good proportion of them are academic illiterates who have gone to school but have little benefit from the facts of such literacy. Majority of such literate are unethical and therefore acting in contradiction to the principles and philosophies of the professions and training given to them. Take for instance, social scientists claiming to be religious and acting in haterates to those who stuck to guides of social science ethics.

If more than 30% of the population is illiterates, the 30% of Nigeria are excluded in the helm affairs of the country. They cannot be employed in the bureaucracies, they cannot decide for their communities, they can not officially communicate. Most of them are forced and condemned to be stage of manipulation by the privileged elites. They end up as criminals, hooligans, tedious workers and bondage servants of the elites.

And the remaining literates are not well educated and therefore dangerous for effective policy making and development. Most of them have gone to school but do not know the meaning of being to school. They are ignorant of the philosophy of education and so cannot be guided by the inculcated principles and ethics of their different training. Instead their actions are determined by historical, social and environmental mindset established by the normative principles of the society that culturally evolved without any professional demands. So they are incorporated and controlled by the upper privileged elites consciously. They are mediocres and if they are found to be teachers they will reproduce mediocrity and challenges. This is the impediment to development.

The religion on the other hand is a product of normative force and not professional orientations. Religion undermines freedom of determination planning, strategizing and effecting devices for future transformations and changes. Religions restructured, breeds and perpetuate underdevelopment and perpetual bondage. There is no bearing between development and religion. Where religion is dominant the people cannot be innovative, critical and independent. Therefore there is relationship between religion and underdevelopment but there is no relationship between religion and development. This is because religion undermines democracy and promotes dictatorship and monarchy which are contradictions to successful enforcement of human rights.

CONCLUSION

Religion as observed breeds crime and criminality, in every society by instituting culture of hate-rate against members of other religious groups. Religion in most situations teaches ethnocentrism and dictatorship. It predominantly justifies disunity, conquerance, domination and imperialism. It justifies social inequalities, stratifications and almost all forms of injustices emanating...
from that. And subsequently it justifies and encourages terrorism, threats and insurgencies and all related crime including frauds, robbery, slavery and humiliations. So long as the foundation of religion is falsehood and freedom is compromised to threat and unconditional belief and forceful acts on false recommendations, societies dominated by religion must experience all forms of conflicts including murder and assaults. The recent case of Boko haram is a good example of failure of religion to prove itself as humanitarian gesture determined by super power called God.

   Sociology is the scientific study of human behavior, its antecedence and its consequences. One of such behavior is the institution of religion created by man. Sociology of religion proved that man created religion, by creating the concept of God and attributing his own characteristic to same God and reflects on events as consequences of God’s determinations. This is completely hypothetical display that sociology discovered as total false. Generation of people are deceived, threatened and coerced to belief and practice some form of worship called religion in all societies. Very important part of time that could have been used for better engagement and productivity is criminally sacrificed for religious practices. A lot of revenue is lost on religious ground. A lot of lives are lost on religious ground. A lot of properties continuously destroyed on religious ground. The public is unduly criminalized by injecting hate-rate to one another on the bases of differences of religious backgrounds and denominations.

   Since sociology proved the claimed foundation of all religions as false, sociology clearly recommend for assessment of religion and its total eradication in the interest of prevalence of complete humanity and development. Certainly with the advancement of science and technology in the millinium, religion will soon disappear on earth. The replacement and displacement of religion by science and technology is the inevitable evaluation and revolution of human history. In the interim following are recommended.

RECOMMENDATION

1. Religious practices must be purely a personal and private affair.
2. There should be total withdrawal of states involvement on matters of religious practices as recommended by the constitution.
3. State construction of worship centers should be criminalized and politicians insisting on such rites during campaign should be disqualified by INEC.
4. State must stop religious preaching in the public by all religious groups to avoid inter and intra-religious conflicts.
5. Individually people can choose to be non-religious and there must be a clear state protection for them.
6. Informal schools such as church or bible training schools should be closed down.
7. Primary and secondary education must be compulsory and school age children must be in school during school hours and those outside must be taken to school by all cost.
8. Education must compulsory and free at the primary and secondary levels and considerably subsidize at the tertiary level.
9. All terrorist must be called to book.

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Wifi Enabled Smart Farm with Monitoring and Energy Theft Control System


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Abstract- Automated irrigation system focuses on optimizing the usage of water in agricultural land. In this project, we aim at establishing a very fast communication link with the farmer. This makes it easy for the farmers to monitor the soil and the crop conditions from very far locations. Because of its low cost, the system has the potential to be useful in water limited geographically isolated area. This system implement the automated irrigation and it sends the sensed value of soil temperature, moisture and humidity level to the concerned person through wifi. Wifi module can work across a range of around 150m & hence can provide remote controlling for large distances. The soil temperature, moisture and humidity values will be monitored continuously. Along with the help of a Real Time Clock module all the data is saved in order to track any sudden changes. In case of any energy theft taking place in the area, a specified person will be notified by beeping of a buzzer. The energy will be produced autonomously with the help of a solar panel & solar charger using Solar Tracker consisting of Light dependant resistor diodes to track maximum intensity of photons for the solar tracker. The project is scalable as long as they work on the same server. The project will be successful in increasing the competence of various farming activities. In order to increase the ease of working in the field for the farmer an automated irrigation system is build using wifi module to control the centrifugal pumps forcing the water to the fields by using an android application.

Index Terms- Wifi, Solar Tracker, Energy Theft

I. INTRODUCTION

Nowadays there has been a vast improvement in the field of automation especially in the Home Automation sector. The automation offers us the advantage of access to system from the comfort of our home. It also leads to savings in the long run since the remote access & automation also offer the option of centralized control. Almost all of the existing systems are based on the wired connection. The traditional systems of wired connections do not pose a problem as long as the system is planned before & installation is done beforehand.

Wireless systems are used every day in our life from home networks to office buildings. The WLAN systems are widely used in our daily life. There are several advantages of wireless systems over wired ones:

1. Installation cost of the system is reduced: The wired systems require use of cables to provide a communication link. The wireless systems require no such use of cables & thus reducing the cost of the cables.
2. Ease of installation & coverage: Wireless systems can be easily mounted easily anywhere. Moreover it can also be placed at any remote location unlike wired which would require use of long cables to accomplish this.
3. Integration with smart phones: Nowadays everyone has a smartphone, thus allowing the access to almost everyone with the password of wireless network.
4. Scalability: New modules or functions can be added easily to the existing system.

Wired connections require new node & additional cabling thus increasing cost.

Solar energy is nowadays considered an emerging field & one of the problems plaguing this field is its low efficiency. The output is still not maximised if the solar arrays are not positioned according to the position of the sun. Thus Solar Tracker is used to find the position of the array which corresponds to the maximum power generated by the solar array.

II. LITERATURE SURVEY

Recent developments in China have led to development in technology which has led to growing of off season crops in a controlled environment. These systems were based on WSN’s & IP cameras were installed to monitor the growth of the crops. Irrigation systems using GSM systems are gaining wide acceptance in developed countries like USA, England & Australia.

In Chennai, India a group of college students developed a dual axis MPPT controller which worked to provide optimum output of the solar PV array.

III. EQUIPMENTS USED

- Arduino-UnoMicrocontroller: Arduino Uno is used to
provide logic to the whole circuit. The whole system is managed & programmed with the help of this controller.

- **Esp-8266(Wifi Module):** To communicate with the Relay Card (which further controls the water pump), we have used the wifi module ESP-8266. This provides the internet connectivity to the whole system.

- **Temperature Sensor:** LM-35 temperature sensor is used to detect the temperature of the whole farming area.

- **Solar PV Array:** A solar PV array is used to convert the solar energy of the sun to electrical energy.

- **Current Sensor:** ACS-712 is used as the current sensor which is used in the energy theft system.

- **LCD Display:** 16 X 2 LCD is used to display the output parameters like voltage, current, total power of the solar PV array and wattage as well as energy in the energymeters used in energy theft.

- **Solar Charge Controller:** The solar panel output is connected to the whole system as well as the solar charge controller which is connected to a battery bank.

- **Relay Card:** A relay card is used to drive the centrifugal pumps in the irrigation-system.

IV. PROPOSED SYSTEM

- **Irrigation System:** An irrigation system is made with the help of a water level indicator & a water pump to help with the irrigation & aeration of the plants. This system is automated using the wifi module ESP-8266. The water level indicator is used to demonstrate the water level. If the water level is substantially low, then the farmer can turn on the the water pump using the mobile application.

- **Energy Theft Detection:** For energy theft detection a system is put in which consists of two energy meters. Thus, while this system will prevent energy theft from the power source, it also displays the voltage, current as well as the power consumed by the whole system.

- **Solar Tracking System:** A solar tracking system is put in place to follow the Sun as it moves from East to West. It produces energy with the help of a solar PV cell. The panel’s position according to the relative position of the sun. Two LDR diodes are connected on both sides of the solar panel to compare the intensity of sunlight on the panel then converting the electrical reading of the diodes into analog readings a logic is created to position the panels towards the higher photon intensity side.

V. PSEUDO CODE

The sun rises from east to west, if we call the LDRs present on the east side L and the LDRs present on the west side R then the code will be as follows:

```c
servo_angle = 0°
```

```
if (L > R) {
    servo_angle = servo_angle++
    /*During Early morning*/
} else if (L == R) {
    servo_angle = STOPS
    /*During Noon*/
} else if servo_angle == 180° {
    servo_angle = 0°
    /*Start next day*/
}
```

VI. WORKING OF THE SYSTEM

The whole system’s heart lies in the microcontroller ie. Arduino Uno. A number of such microcontrollers are used to run this system efficiently. The temperature sensor & water level indicator is used to provide data to the user. The user according to the data given by the sensors can decide if the water level is low. If the user wants to increase the water level of the irrigation field, the user can turn on the irrigation pump within the comfort of home, using his/ hers mobile phone’s wifi. This all reduces the effort of the farmers. An energy theft detection system has been introduced so as to detect the any sort of energy theft is going on in the system. This reduces the energy cost of the whole system which is incurred by the user. Thus this system will help in keeping the electricity bill in check. The system can alert the user of any energy theft from his power connection. This feature ensures that the user is not hurt economically.

The system also tells the user his energy consumption ie. the current, the voltage of the system, the power being consumed
& the total energy consumed by the user. Thus, the user is able to keep his expenses on energy in check. The energy obtained from the solar panels are used to charge the Lithium Polymer (LIPO) battery that is used to drive the whole microcontroller system. The solar tracker setup will be connected along with the battery to charge it simultaneously so that the system must be in the running state.

In Figure: Flowchart of the Energy Theft Detection System
In Figure: Block diagram of the system

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In Table: Voltage readings of the solar panels used having ratings as output=3W, Voltage at max.Output=10V, Current at max.Output=1.24A.
In Figure: Graph plotted against Date versus Time for the obtained voltages from solar panel.

Furthermore, to generate renewable energy, the system is connected to a solar PV array. This PV array is driven to produce maximum power that can be generated with the help of solar tracking. This technique is used to find out the optimum operating point i.e. the point where the solar PV panel will produce maximum power from the solar input given to it. This technique can be used with the help of multiple algorithms like incremental conductance, grey wolf etc. The Solar panel tracks the position of the sun & produces the output in the form of electrical energy. The solar PV array is connected to a solar charger which is connected to a battery bank. The battery bank can provide energy to the whole system during the periods of darkness or when sunlight is low.
VII. CONCLUSION

The whole farming system was successfully implemented. The irrigation system was working satisfactorily & the user was able to operate the water irrigation pump as per his requirement.

The energy theft detection device was working as per the requirements & detected the energy theft & was able to sound the buzzer when the energy theft was detected. The energy theft detection device was also able to show the consumer or the user his overall power consumption as well the voltage supplied to the system, current in the system & the energy in SI units.

The solar tracking mechanism was working as per the system requirements & we were able to find out the maximum power point of the solar PV panel with the help of this mechanism. The point which corresponded to the maximum power was detected & the solar panel was operated on that position.

Thus, the whole system was working according to our expectations.

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