

Smart Cultivation Partner

Mobile Application (Android) Service to Increase Cultivation and Sales

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Abstract- Mobile applications and services make things simpler fulfilling people daily needs. There is a lack of applications, which can be really useful for the professionals to improve their working capabilities. Though mobile phones are used by people living in rural areas, but there are hardly any relevant applications for them to improve their productivity. In this paper research team proposed one such mobile application “Smart Cultivation Partner”, which can be operated on their mobile phones. In Sri Lanka Farmers Faced many problems because they do not know such technical and technology skills. They cannot find the actual merchants, they do not know the actual prices, they do not know the suitable market for their sales, and also they cannot predicate the price of their cultivated products. This app will help to the farmers working with the motive of greater profitability by direct communication between farmers-to- Merchant, farmer-to-farmer and also farmers can know the contact details of the relevant agriculture and agrarian department. The system is an effort to fill the gap between farmers and merchants. It provides detailed information about which crop to grow in which season and which crop is suitable for that particular area in where the farmer is living. The proposed system will use the Global Positioning System (GPS) for location tracking. Predicate the prices of their cultivations in future using Data predictive mining. Farmer can provide inputs related to crops being cultivated and location specific information to get specific suggestions, alerts and recommendations to improve productivity. Whenever a farmer observes some anomalous behavior for crops or climate, the system is able to generate recommendations based on inputs provided. This device can help to them and achieve that goal.

Index Terms- Farmers, Data Mining, Android, Mobile application, Cultivation, Harvesting

I. INTRODUCTION

Cultivation is important to human beings because it forms the basis needs food security and also Farming has been an important part of civilization for thousands of years. In Sri Lanka Farmers Faced many problems because they do not know such technical and technology skills. Mobile phones have become an integral part and personality of the present generation and they like to embrace all the things in the scope of this modern technology. This modern generation is much more advanced of usage of modern technical gadgets. In fact, a lot of research is happening on the use of mobiles.so the project team decided to introduce a mobile application to the farmers. Farmers cannot

find the actual merchants, they do not know the actual prices, they do not know the suitable market for their sales, and also they cannot predicate the actual weather and price of their cultivation. There are no such a web/mobile apps in Sri Lanka to increase the cultivation and sales and also there are no apps to help to the farmers. [12]

Smart Cultivation Partner Mobile apps Service to help the farmers working with the motive of greater profitability by direct communication between farmer-to- Merchant, farmer-to-farmer and also farmers can know the contact details of the relevant agriculture and agrarian department .This service is also provide the new technology features news to introduce to the cultivations, new fertilizer, new crops details to the farmers. This service boosts business communication and brings transparency in the system. This innovative site allows a good farmer, retailer and Merchant communication. It provides an option of login to farmers and communicates to respective dealers. The farmers also have an option to submit their grievances and complaints to respective dealers or authorities using their farmer login on a separate complaints page and authorities will get access to that page regularly using their login id and passwords. The proposed system has lot of benefits to the user .that are Separate login areas with appropriated functionality for farmers, Merchants and administrator. An effective Graphical User Interface (GUI) so that rural people may easily use the service, this app can be used in 3 languages (Tamil, English, Sinhala), this app locate the actual location of the farmer and provide the suitable details, new technology news and videos can post to the farmers, Predicate the price of the vegetables using the previous data predicative mining. This App is to use for Vegetables, Fruits and Coconut Cultivation farmers .Farmers can advertise their vegetables and coconut details and estimate price, Pages where dealers / retailers may post their requirements and estimate price. A separate page where only farmers can post complaints and only assigned administrators can read and edit the page features. Farmers are notified of these notifications via Short Message Service (SMS) whenever new advertisements are published. Can be over for multiple villages to communicate and deal with each other. Farmers can directly contact Merchants by searching online. Farmers may submit their grievances online. Farmers get notification of any new offers/schemes. Farmers can compare price in different areas.

The application requires internet connectivity in order of installing the app and to work with it. But in our field of study of the research area the left out which were made by the existing applications were considered. As a result the system is to be developed mainly for the Sri Lankan citizens where they could

get an opportunity of tracking their cultivation. In this application data predicative mining algorithm (Time Series Algorithms and Neural Network Algorithms) is used to predicate the prices in the future. In this era time is the important factor here system can communicate instantly access the resource quickly, moreover farmer feel easier to handle their business. In the 21th century this process switch to Intelligent Systems (Smart Cultivation Partner) which is gives the sensation of farming. To overcome these issues project team has decided to propose this project to make the farming environment more efficient and productivity.

II. LITERATURE REVIEW

Agriculture is a major source of raw food production in the world where it plays the major part of the human food consumption. However, the uses of latest technologies in the field are not being implemented widely unlike in other industries despite the fact that the agricultural industry is in a declining state. Lack of interest among the current generation, absence of proper motivation factors, low marginal profits, use of outdated and time consuming methods and technologies for cultivation are few major factors which contributes to the downfall. The research will focus on eliminating hassles faced by the farmers by using the latest and innovative technologies and how they can be applied in real world farming activities. Agriculture is carried out for generations which means we have a huge data of the past cultivation methods. Data mining methods could be used for future recommendations and support services for farming. [10], [11]

According to [1] Kiran Shinde et.al provides an in-depth review of the use of data collection for cultivation guidance on topics such as Crop Recommendation and Crop Rotation Recommendation. The Data Tier consists of databases which consist of data of past agricultural activity, cost of agriculture, Fertilizers etc. The Business Tier consists of Servlet modules which consist of all the business logic for the system which are hosted on a separate application server. Several combinations of algorithm to be used to recommend certain crops based on the soil, location, season but no limited to demand / supply for the crop. System will generate some suggestions for the crops based on the Location, Season. [3] The suggestions will have a rating system which allows the user to decide on the crop to be planted. Apart from the crop recommendation, the system is capable of recommending crop rotation ensuring the high level of productivity. The frequency of the crop rotation will be displayed based on the crop type.

Sanjay Chaudhary et.al [3] emphasizes the use of GIS (Geographic Information System) in rural farming villages in India. The purpose of the GIS is to collect, record data about farming activities based on the location and use it when needed. Hence, this could be used by other applications and technologies which are targeted towards agriculture. Data collected will be stored in a database. GIS can store data, such as soil type, nutrient levels, temperature, administrative boundary etc. and assign this information to the specific geo location. Therefore, this can be useful for farmers on deciding their crops and location of the cultivation.

The above topic further discussed in the research done by Yvette E. Gelogo and Haeng-Kon Kim under the title —A Design of u-

farm Mobile Application Frameworkl (2014).[6][3]The research was regarding the development of a mobile assistant app for farmers which is similar to the above research done in India based on the data mining. The latter includes various outputs compared to the previous where this research encourages the use of the data for various purposes such as farmers in monitoring their resources, crops, generate reports and statistics. Further this research includes the usage of sensing devices as well. [2] This paper also includes the development of mobile gateway which makes it possible for integration for sensor devices. As per the framework and the architecture presented the in this research also presents the mobile gateway interface to support the mobile devices to be a device to receive sensing information from the sensor devices. It performs environmental (temperature, water level, humidity, plant growth and etc.) sensing capability. It's highly unlikely that rural communities will adapt towards an advanced app as suggested in the second research. More and training sessions should be conducted. Further, the requirement of data transfer technologies such as 3G, 4G, Bluetooth, etc. is also questionable when it comes to remote areas where the agriculture is prioritized. [4]

Wireless Farming: a mobile and Wireless Sensor Network based application to create farm field monitoring and plant protection for sustainable crop production and poverty reduction By Elias Edo Dube (2013).[6]The first one suggests the use of Wireless Sensor Networks (WSN) for the purpose as the world is ICT is moving towards —morel wireless approach. The research is based on farmers in Ethiopia and how they use WSN to monitor and control their farms. The main component of WSN is the use of mobile phone – which is something accessible for almost every sector of the population. It is notable that mobile phone penetration in Sri Lanka exceeds 100%. Therefore, going towards a WSN method suits our communities too. WSN devices can be divided into these units Sensing unit, Processing unit, Transmission unit, Power Unit. Possible details which are Soil Moisture, Soil pH, Air moisture and Air condition, Humidity, Weather Condition, Irrigation Water Resources

Monitoring System for Farming Operations with Wearable Devices Utilized Sensor Networks – The research done by the Tokihiro Fukatsu, and Teruaki Nanseki (2009) looks at an advanced usage of WSN device which includes wearable devices as well.[6][7] The system is based on a centralized Field Server System. A Field Server enables crop and environmental monitoring by using various sensors and cameras. However, it also points out the fact that farmers may also be used a data source where as it will be considered as a manual input method. Using them for inputting data on devices could be troublesome and will also affect their field work. A voice guided input system will be a good solution for this. The researchers have developed a Radio Frequency Identification (RFID) system for the purpose which communicates with the Field Server.Compared to WSN method, this one mainly focuses on farmer's activities to obtain data. Hence, a wearable device with RFID is being used.[5]

“Performance Analysis for DCAR and CMDC Using Shopping Complex Dataset” [13], in this paper, Shopping complex dataset is applied in the existing algorithms DCAR and CMDC for evaluating the experimental results to predict accuracy and time complexity. It is clearly stated that CMDC algorithm provides better accuracy than existing algorithm.

“Spatial data mining and geographic knowledge discovery- An introduction” [15], Due to the widespread application of geographic information systems (GIS) and GPS technology and the increasingly mature infrastructure for data collection, sharing, and integration, more and more research domains have gained access to high-quality geographic data and created new ways to incorporate spatial information and analysis in various studies.

III. METHODOLOGY

Smart Cultivation Partner was developed using the prototype methodology, this methodology was selected because there may be many complex situations. Repetitive behavior of this methodology in analysis, design and implementation phases gave more space for the development team to understand the requirement better and study the new technologies in the meantime. Using this methodology, the project team will perform the analysis, design and implementation phases concurrently whenever changes approached by the client. This would allow making changes to the project process by repeating the relevant phases with relevant corrections to accomplish the client requirements, if in case any deliverable fails. The advantage of using prototype methodology is after implement the prototype system gets the feedback, go back to the same process (analysis, designing, and implementation) and fix the errors according to the feedback. The following sections describe work done by the development team at each phase of system development lifecycle.

Planning

Initial planning for successful development of Smart Cultivation Partner was carried out in this phase. The project team identified the need for Smart Cultivation Partner by studying the issues with traditional cultivation sale system currently used by Sri Lankan Markets. Hence project team studied the current statics on traditional system and identified the project need. Project team then formulated the basic functionalities by explaining the needs at a high level of understanding. A project charter was created as a result. Eventually, Work Breakdown Structure (WBS) and Gantt chart were developed to determine how the project team will go about building Smart Cultivation Partner. Project team carried out feasibility analysis to identify potential risks associated with development and deployment of Smart Cultivation Partner.

Requirement Gathering & Analysis

In this phase project team began to understand the user requirement by analyzing the data gathered using various techniques. Initially data necessary for Analysis is collected as Primary data and secondary data. Project team carried out an Interview session with the farmers and merchants to gather accurate statistical information about traditional sales system used in Market. Statistic about current sales system, issues faced by farmers in cultivation, Predicate the prices in future, technical and technology skills in farming are the major areas covered during this interview. Furthermore, Project team conducted crucial literature review on Applications of GPS, Farming and cultivation, Android Application related to farming, data mining and similar systems related to efficient cultivation management system. As the final process of data gathering, project team distributed Questionnaires to open public of all categories in

order to study the system requirements from public point of view. The team also studied existing technologies relevant to the project in order to select the technologies to use in implementing the system. Project team initiated process modeling and data modeling by analyzing the gathered information. Use case diagram was created as a result of process modeling whereas Logical Entity Relationship diagram was created as a result of data modeling.

Designing

A proper design leads to flexible, secure and efficient system. More effort in designing phase makes implementation easy. Project team worked on various designing techniques with great concern to make sure that the client requirements finalized from analysis phase has been meeting as accurately as possible. Designing techniques used by the project team are as High-level Architecture Design, Hardware and software requirements, Database design, Class diagram, Test plans, Interface Deigning, Web interface designs, Android Application interface design, Flow Charts etc.

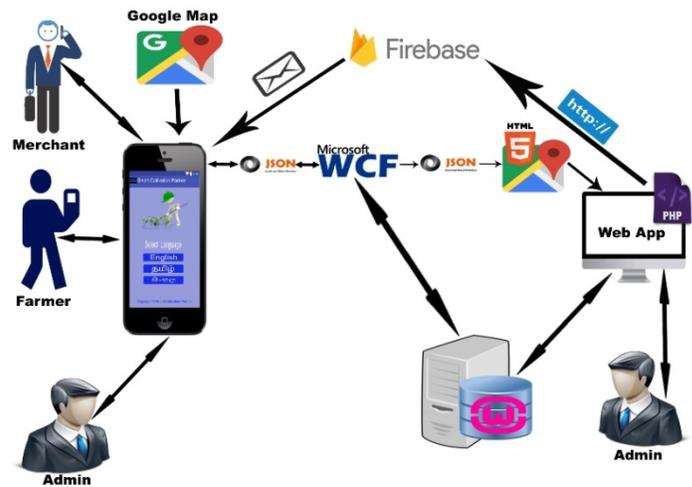


Figure 1 : High Level Diagram

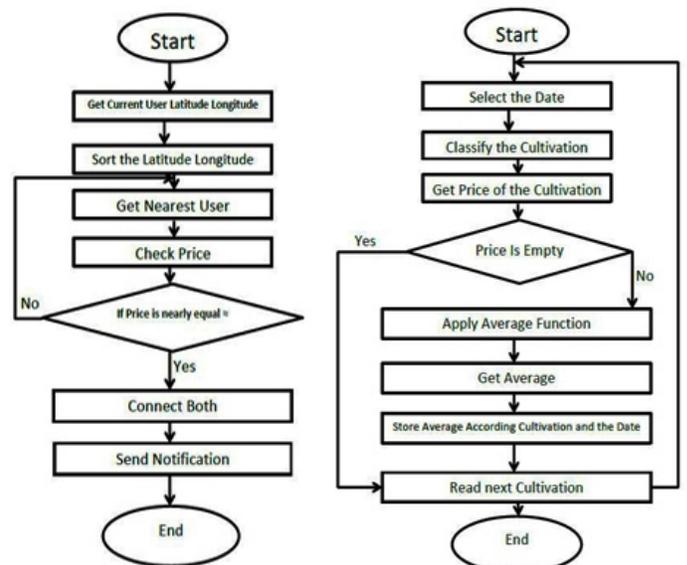


Figure 2 : Flow Chart of Nearest Location & Average

Implementation

Most amount of time was spent by the project team in this phase to build the system to fit the requirements and design constraints identified in the prior phases. The project team worked on the construction of Smart Cultivation partner by dividing it into several components. These following sections are implemented Mobile Application, Web Application, Database, Web service and Firebase.

Testing

Errors are unavoidable in any software products. Cost of these bugs may range from a penny to many millions. Quality and Success of Smart Cultivation Partner has a vital need of error-free operation. Initially Project team refined the test plans created at the design phase to create a new set of test plans to suit the final system. Web application, Android Application was identified as the major components for testing.

Unit testing

Overall all the individual components were tested using black box testing except some complex codes. Complex codes such as predication of price, sending and receiving notification, connect actual merchant with the farmer and real time monitoring were subjected to white box testing.

Integration testing

Integration testing was carried out as Use interface testing, use scenario testing and System interface testing. Navigation between different activities and fragments were tested in user interface testing whereas data flow between database and other components like mobile application were tested using system interface testing.

System testing

Smart Cultivation partner was tested as a whole to ensure errorless operation of entire system as a whole. Project team focused on overall usability of the system. Identified whether all the requirements of Smart Cultivation partner has been achieved.

IV. RESULTS

Here the final results of the system are shown with the screenshots of the interfaces. In this evidence section it briefly discuss about the output with the performance, reliability and the accuracy of the system.

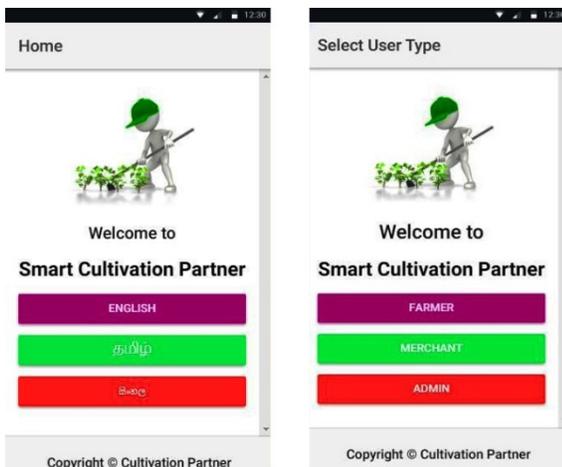


Figure 3 : Home & User Level

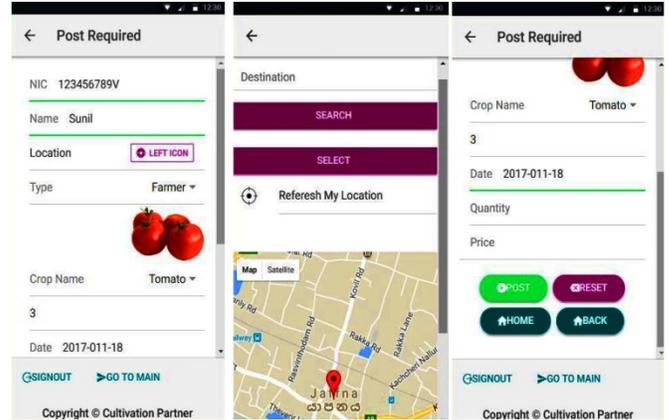


Figure 4 : Post Advertisements

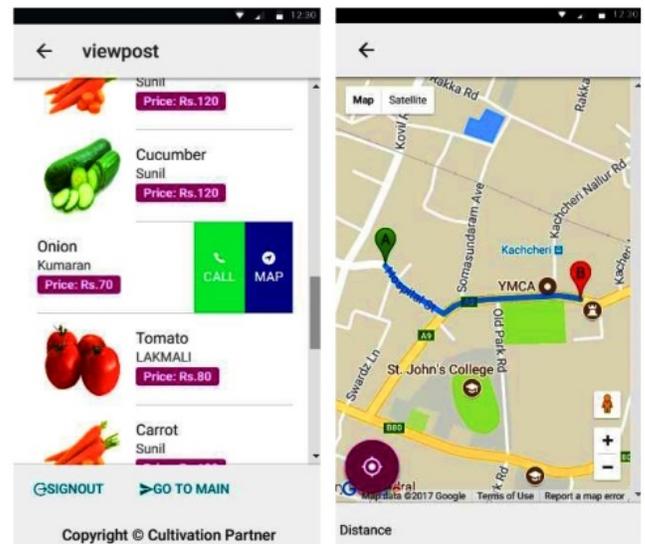


Figure 5 : View Post

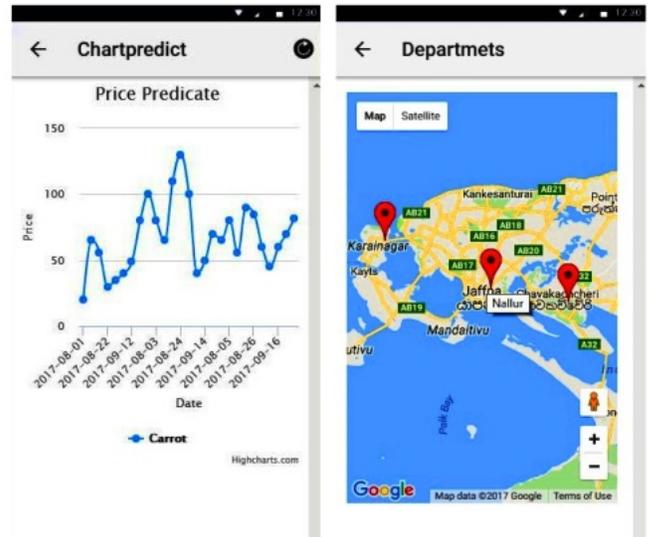


Figure 6 : Predicate Price & Department Details

- Main Window and Select the user level of the application (Figure 3)

In this interface user can select the preferred language using the button. After the button click it will be directed to the user level selection Activity. In this interface user can select their role it will be directed to the login Activity

- Post Advertisements (Figure 4)

This interface user needs to select the crop name, user type and also location. System will show the vegetable image to the user so user can easily use the system. Finally user need to enter the quantity and estimate price for their cultivation and then post it.

- View Crop Advertisement (Figure 5)

In this window farmer and merchant can view the crop advertisement. If farmer want to see the merchants post farmer need to select option to post by farmers and also merchant do the wise versa select posted by farmer.

- View Crop Predications and Departments Details (Figure 6)

Farmer and Merchant can view the past and future crop predications using this interface. First select the crop and select a range of date and click the view button.it will navigated to the crop predication interface. It will show the graph by using data predicative mining algorithms. This graphs change according the price and date

Reliability

The reliability of the overall program depends on the reliability of the separate components. The applications should have the ability for real time data transferring and the system should have high performance. Mobile app users will it easy to use the application even with a moderately budget level phone, since the app does not take much space, it won't affect the performance issues of the mobile phone.

Availability

The system is available whenever a user wants it. The system and its functions can be use whenever the user wants. The system would be fault tolerant, in other words system will be able to continue functioning when part of the system fails.

Security

The Managers have respective accounts with password that enables only the Manager/s to login onto the system. Passwords are required so that no one else can access the system or database. The security purposes in application it prompts a login which contains user name and passwords. All login user data are stored in the database.

Maintainability

The research team is responsible for this product and all the maintenance and modifications will be handled by research team. By increasing the efficiency of the system modifications will need to be done in the future.

V. DISCUSSIONS

Implementing this proposed system which provides the user major facilities for the cultivation and life quality. This system provides the user some facilities which have not been provided

by the other similar android mobile applications or websites. Predicting the price of their cultivated products issue by pattern analyzing of the past data will provide the application some reliability and trust ability. The application is to be designed in a user friendly and easy handle way so that rural people who are not used of using these kinds of facilities will get easy to learn how to handle the system. Significance of the project is implementing some special feature which gives convenience through, implementing a system where it detects location, recommendations for the crop, gives predicate prices etc.

VI. CONCLUSION AND FUTURE WORK

Smart Cultivation Partner Mobile apps Service to help the farmers working with the motive of greater profitability by direct communication between farmer-to- Merchant, farmer-to-farmer and also farmers can know the contact details of the relevant agriculture and agrarian department .This service is also provide the new technology features news to introduce to the cultivations, new fertilizer, new crops details to the farmers. This service boosts business communication and brings transparency in the system. An effective Graphical User Interface (GUI) so that rural people may easily use the service, this app can be used in 3 languages (Tamil, English, Sinhala). Predicate the price of the vegetables using the previous data predicative mining. This App is to use for Vegetables, Fruits and Coconut Cultivation farmers. System is tracking the GPS of the current location of the farmer and it connects to the most suitable merchants. Thus Smart Cultivation Partner System plays an important role in improvement of traditional cultivation sales system in Sri Lanka. Limitations

Deployment of Smart Cultivation Partner System carries some limitation constraints which should be taken into consideration.

The limitations are as follows,

- ❖ Disable people will not be able to use the system at all
- ❖ Need to get the actual user location.
- ❖ Application will be connect with the system via internet and user need internet connection to use this application

Recommendations

- ❖ User should have a mobile phone with a screen size of minimum 4.0 inches to get a proper view on the mobile and have a fast internet connection for communication.
- ❖ Placing the Collection point in a fixed location

Future work

Smart Cultivation Partner covers a very large scope with an ultimate goal of revolution in cultivation. Till the Goal is met numerous number of research paths will be open to researchers. This research area will stay fresh with the rise modern technologies. Project team has identified following as immediate set of future works which may interest researchers in this area.

- ✓ Connect the farmers through mobile with the Agriculture departments
- ✓ Establish System in every Agriculture department
- ✓ Expanding the system targeting Cultivation management system of entire nation
- ✓ Identify the defects in the plants using image processing system
- ✓ Add Instant online payment system

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