Asvenna-Technology Growth and Development in Agriculture

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Abstract- Sri Lanka is mostly famous for agriculture and 39% of Sri Lankan people are farmers in the current era. There are different level of cultivations and different types of cultivations. And there are daily new comers in the agricultural field in present. They do not have proper experience in cultivation. Therefore, those different kinds of cultivations face small to large scale of problems because new farmers have insufficient knowledge about agriculture. Because of those problems, famers can be in an uncertain state about their cultivation. Insufficient knowledge about lands and crops can be a main reason. Since they have less idea about their lands, soil conditions, non-fertile, crops, natural disease, sales problems, etc. This article explains an android and a web based system the supports decisions making in agriculture field. So, with this system farmers can get a good profit as they expected. The system uses data mining and gives most accurate solution to agricultural problems. This is created for spices cultivation in Sri Lanka (Ginger, Pepper, Cinnamon andclove).

Index Terms- Agriculture, Land Management, Soil condition, Seeds, Crops, Weather Conditions, Diseases of plants, Economy rate of harvest, Datamining algorithm, Clustering data mining, Image processing, Condiment, Android Application, Web Service

I. INTRODUCTION

Data mining involves collecting, processing, storing and analyzing data in order to discover (and extract) new information. It is an important part of knowledge discovery process that can analyze an enormous set of data and produce useful information.

Mobile communication technology has become the world's most common way of transmitting data, services, and voice, and no technology has ever spread faster. At the end of 2011 there were almost 6 billion cellular telephone subscriptions worldwide, and the number is expected to reach 8 million by 2016. The dynamic growth of mobile communications technology is creating opportunities for economic growth, social empowerment, and grassroots innovation in developing countries. One of the areas with the greatest potential impact is in the contribution that mobile applications can make to agricultural development, by providing access to information, markets, and services to millions of rural and urban inhabitants.

In Sri Lanka, there are different levels and types of cultivations. Therefore, those cultivations face small to large scale of problems. Because of those problems, famers can be in an uncertain state about their cultivation. Insufficient knowledge about lands, crops, soil conditions, non-fertile, crops, natural disease and sales problems can be a main reason for having less harvest. For both agricultural supply and demand, mobile applications and web services that are related to agriculture can reduce waste, make delivery more efficient, and forge closer links between farmers and consumers.

"Asvenna" is developed to solve above problem. Through this research supposed to give most accurate solution to agricultural problems, using an android mobile application and a web site. Since every users doesn't have android systems in their smart mobile phones they can use the web site to have benefits of this system. Users can suggest their problems to the system. System will process given data and display suitable solutions to user through Data Mining technology.

The rest of the paper is organized as follow. Section 2 has provided the background through the Literature Review. Section 3 describes the methodology of this system. Also the discussion of the developed system has described in Section 4. Section 5 contains results of this research. Finally the conclusion is discussed in section 6.

II. BACKGROUND

Agriculture effects on human life cycle directly therefore agriculture is most important for a human. There are lot of researches going on related to agriculture. Every farmer supposed to cultivate in a correct manner and earn good harvest from their cultivation. Due to lack of proper knowledge they failto get profit which they expected. Before cultivate crops, there are few things to consider such as land management, soil condition, diseases and climate changes and identify suitable crops. And there must be a good knowledge about management, economic rate. If farmers have good knowledge about these thing, they can get expected harvest easily.

There are lot of researches about this concept. But referred researches considered only a few sides of above factors.

" Clustering Algorithms Applied in Education Data Mining" authored by Dutta A, AG. S, IS.M, MA.H.[1]. Methodology is Clustering Classification. Advantages in this research they show how data mining techniques apply in education datamining. Helps to know how datamining technology use. Disadvantages in this research consider education fields datamining techniques only. It is hard to get idea how it involves with agriculture side.

"Data Mining and linked opened data – New perspective for data analysis in environment" authored by LAUSCH A., SC A., TH L. [2]. Methodology is Clustering Classification. Advantages in this how data mining techniques apply in environmental datamining. Helps to know how datamining

technology use. Disadvantages of this research consider environmental datamining techniques only. It is hard to get idea how it involves with agriculture side.

"Deploying nEmesis: Preventing Foodborne Illness by Data Mining Social Media" authored by SADILEK A., KA H., DI L., LA B., PO E., TE J., SI V.[3]Methodology is Data mining social media. Advantages in this, how datamining technologies apply in Social media datamining. Helps to know how datamining technology use in Social media mining. Disadvantages of this research, social media mining cannot trusted

"Dynamical Approach for Real-Time Monitoring of Agricultural Crops" authored by GUIJALBA F., MA T., SA M. [4]. Methodology dynamic approaches. Advantages in this research, monitoring good crops to increase the harvest. Disadvantage in this research, they not covers variety in crops. Generally, they have focus on single crop.

"Climate Change and its Impact on Agriculture" authored by Anupama Mahato [5]. Used different mathematical calculations as the methodology. Mainly focus on long-term climate changes and checked how those measurements affected to the quantity and quality of crops in terms of productivity, growth rates, photosynthesis and transpiration rates and moisture availability. Major advantage of this project is cover the huge area of lands.as a disadvantage of this project is they did not focus on short-term climate changes such as daily climate changes.

"Sensitivity of Livestock Production to Climatic Variability under Indian Drylands and Future Perspective" authored by Kumar.S et.al [6]. Used methodology is regression functions analysis. Mainly focused the global climate changes and how it affects some different variables such as droughts, floods and erratic rainfall. Main advantage of this project is different variables to predict the solutions. Limitation of some variables availability is the major disadvantage.

"Applying Naive Bayes Data Mining Technique for Classification of Agricultural Land Soils" authored by P.Bhargavi and Dr.S.Jyothi [7]. Methodology of used is meaningful patterns for the various soils profiles characterized by using different data mining technics. Advantage of this project is output can be high accurate. Disadvantage of this project is used low amount of data do predict the result.

"Drugs Highly Associated with Infusion Reactions Reported using Two Different Data-mining" Methodologies authored by Moore. P. W et.al [8]. Used the methodologies as The Food and Drug Administration Adverse Event Reporting. System(FAERS), Molecular Analysis of Side Effects(MASE), Proportional Reporting Ratios (PRR) using this all tree data mining methods and compare those technics result and then predict the final result. Major advantage of this project is allow to data integration at many levels. Fail to analyses drug availability.

"Location Based Agricultural Yields Rate Prediction by Using Android" authored by Bhargava.R, Pramoda.R and Patil.P [9]. Used Methodologies are android technology and cloud computing. Advantages in this research, farmers can choose the location where they can grow most suitable crops Disadvantage in this research, this research considers only location prediction.

III. METHODOLOGY

The Asvenna project was developed using Iterative Waterfall Model which is a System Development Life Cycle (SDLC) concept.

Selecting this model is beneficial because the team hopes to maintain high quality and minimize problems, errors & difficulties. Therefore many things should be learned to carry out the research and there may be some problems implementing phases. Iterative waterfall model will be very helpful because if any error occurs during implementation the team have the opportunity to go back to the previous phases and resolve the errors at the state they occur.

A. Planning

The first and the most important phase in the SDM is the feasibility study phase. Discussions among group members have been conducted to understand whether the project was financially viable and technically feasible. The team has studied whether the researchcomponent of this project "Asvenna" is feasible to do.

B. Analysis

The group has analyzed the possibility of completing the project successfully considering economic, technological, scheduling and other factors. Rather than looking into the project and wishing for the best, a feasibility study lets the group to get to know the possible negative and positive outcomes of the research project before spending and investing time and money for the project "Asvenna".

Requirement analysis phase answers the questions of what are the requirements to each individual component of the system. To implement the system "Asvenna", to figure out the basic idea of this research problem, team went through similar systems which have been implemented.

C. Design

The design phase represents introduction of operation system and diagrammatic representation on hardware, software data stores, files, User Interfaces(UI).In this phase logical diagrams are converted to physical diagrams and developing and implementing strategies are discussed.

D. Implementation

Here the team Asvenna transformed the design output to actual functions that will work completely. A good implementation reflects how good the design decisions are.

Modules were distributed among team members of Asvenna to be implemented. After the designing and programming was completed, unit testing was carried out and the results were recorded. Mobile application was programmed with aid of android.

E. Testing

This phase will be used to do the testing part of the application. To identify the bugs in the application it should be tested well. By doing this the team will ensure that the "Asvenna" is capable of high performance and reliability. User requirements are mentioned in the document of software requirement specification. So from the testing it will check

whether the application meets that mentioned requirements as well.

After implementing the functions independently unit testing is done for each unit. It will ensure that each function is working correctly in isolation. Integration is done after completing all the functions. Research team used white box testing and black box testing methods. Finally to ensure the whole application performs as one module, the system testing is carried out again. The team should improvise a method to test if "Asvenna" application retrieves predictions as expected.

IV. DISCUSSION

Asvenna contains functioning components such as Select crop, diseases, land, weather, rates through android mobile application and the website. Each component has been tested in isolation. After stabilizing all the modules each of them were integrated together and tested again until the complete system is error free.

The system we started to implement was planned to retrieve agriculture information from database and to give prediction results. Already there are many datamining research, but very less of it in agriculture field. Because of this reason the team decided to complete our research in datamining for agriculture. After having meetings with lecturers who have done higher studies on datamining, the idea of creating both website and android application which goes along with our datamining technology was proposed. The task of creating four different types of websites was not easy as it was since the team could not find and information source regarding how to create websites and androidapplication which will go along with datamining technology. Finally after all the discussions we decided to create a Decision tree algorithm as the data mining model, for the application.

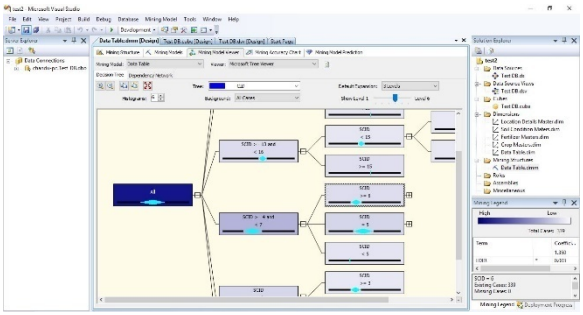

Figure 1:Data mining model

After doing further research on this proposed idea the team managed ourselves to create the schema and retrieve the information from the Agriculture Department. After discussing with Agriculture Department we found hard copies of data sets with relevant to our data mining. Then our team entered that data into MS SQL databases manually. Fortunately, our team found least 5000 of records of dataset. Then we mine that data set with SQL Server Business Intelligence tools. After that found suitable model to do datamining our dataset. Clustering tree is the most suitable method to mine this data set.

The internal application was not supposed to run in the mobile device because of memory requirement is not enough for that kind of operation to take place. The team was to develop a semantic web service to run the internal application. Though the team did many researches on how to implement a web service for this kind of situation, team was unable to find. As for this reason a normal web service was implemented. The mining part runs in this web service. In this web service SQL queries are implemented to retrieve information from the mining which is embedded to the web service. Then those information is passed as string values to the mobile application to display it to the user. Jason is the intermediate language to pass the data. Web site is created by asp.net framework. It also use same method

In order to have full functionality of the system the user must use the application in an android mobile device or device to browse in web (PC, Laptop, etc.) and having internet connection.

V. RESULTS

When user select crops, and enter the land size it gives the prediction results. (suitable rainfall, soil condition, fertilizer and harvest)

Figure 2:Land Results (App):

When user select the location, and enter the land size it gives the suitable crop and other details.

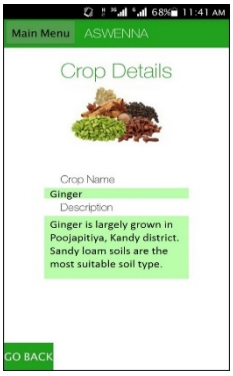

Figure 3:Crop result (App)

This gives details about crops

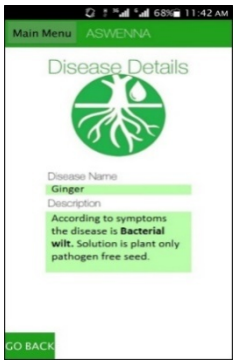

Figure 4:Diseases result(App)

This interface about selectsuitable crops in land.

Figure 5:Select the crop (web)

This interface is about result in crops

Figure 6:Crops Results (Web)

This interface about results in lands.

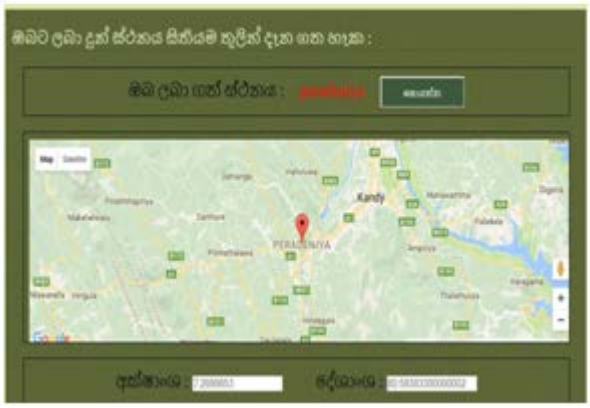

Figure 7:Land Results (Web)

This interface about select answers for the questions to determine diseases.

Figure 8:Diseases (web)

VI. CONCLUTIONS

A. Goals

"Asvenna" project is mainly targeted people who do cultivations, even though this app can be used by any user. Beside the team performed questioners with ordinary people in order to be more specific when meeting customer satisfaction.

The objective behind the project is to implement an android and a web application which can predict the most accurate agricultural information using Data mining. The final application will provide the user a reliable, efficient and user friendly experience. The objectives of this project can be summarized as follows.

1) Reduce the time wastage: The application will directly retrieve information to user.
2) Increase efficiency and accuracy: Since the information are retrieved from websites the users can get the up to-date information. This causes in increased efficiency and accuracy.
3) Increase reliability and availability: The application will be developed to achieve 100% accuracy and be

Figure 2:Land Results (Web)

available for use 24X7. “Asvenna” will be able to be installed on any android mobile device.

4) All the agricultural information in one place: The application will retrieve all the information and display them to the user in one place. Information such as Land management, Soil condition, Seeds, Crops, Weather conditions, Diseases of plants, Economic rate of harvest.

B. zLimitation

Even though team Asvenna went through a good process in the research project, the team had to deal with so many difficulties when completing the system. Most of problems were taken care by the team to complete, though some still exists. This kind of difficulties occurred due to the lack of learning resources regarding datamining and about its mining structures. Some of the difficulties are listed down as followed,

1) Lack of resources and less knowledge on datamining.
2) Limited knowledge in connecting the android app to the web service.
3) Lack of data.

C. Contributions

With the imperial studies done towards the functioning of the system the research project mainly focuses on the field of constructing an agricultural information system with using Data mining, which the system is able to retrieve relevant information. And the criteria that have been added on to the system may give out an efficient and accurate experience to the users of Asvenna application. With the research that is being done may have a noticeable effect on the farmers, increasing its user base and reliability factor.

D. Future Research

Asvenna system can be developed in several ways since the concept is applicable to this kind of situation. Adding more functionality to the data mining models would be a better idea so that the information prediction can be done with any kind of website. As data mining is still in developing level and when the technology of data mining gets evolved this idea could be resourceful in the future ahead. The same technology and the concept can be adapted to a different type of a system in the future.

This system we implemented to Kandy district only. By adding more other districts in next versions and develop value of this system and helpful for farmers to know how to cultivate and take care of plants properly. As well as for people who would like to have a good crop. As a research mainly focus in four crops (cinnamon, clove, pepper and ginger). As a future work insert more crops and develop the range of the system by adding more features such as vegetables and fruits.

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