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SMS Information Gateway for Santa Rosa Laguna Farmers

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Abstract: Rice farmers are facing certain challenges such as climate change, shrinking farmlands that put greater pressures to produce more rice for lower revenues and the increasing number of high intensity typhoons. Information and Communication Technology (ICT) is suggested as one of the appropriate and best method when it comes to the gap of information that needs to be connected for rural farmers having information that is also related to innovative practice, the technology, and other information that may be relevant. SMS, Short Message Service, is one of the most widely used types of text messaging service. For a developing country, this is the most convenient mode of communication to use since not all has access to a smartphone. One of reason why farmers have losses is rooted on the farmers having no access to up-to-date weather information. For City Agriculture Office (CAO), data collection has been a problem due to lack of tools or medium to gather the data they need from the farmers that leads to delay in generating needed reports. This led the researchers to develop an SMS Information Gateway for the Santa Rosa Laguna for CAO and the farmers. The methodology used in this study is the Rapid Application Methodology. Based on the testing done, all test results were a pass. Modules are functioning correctly but the researchers believe that there are a few aspects that can still be polished. The researchers recommend that further use of the system would entail a more updated source of weather data, preferably access to the nearest weather station from Santa Rosa Laguna like IRRI in UP Los Banos.

Key Words: rice farmers; SMS; DSSAT; weather updates; information and communication technology (ICT)

1. INTRODUCTION

Agriculture is the backbone of the Philippine's economy. To be able to have a significant contribution to the economy, farmers will need to gain access to information regarding agriculture and knowledge composed in a timely, complete, and quality manner. The traditional practice for delivering agricultural information in the Philippines is mainly through farmer-to-farmer visits, farmers' own experience and extension officers. In the article written by Guzman (2018), he said that agriculture continues to play an important role in the country's economy but still the percentage of GDP (value added) continues to decrease from 31.06% in 1974 to a 21.36% last 2016 (Guzman, 2018).

In his 2019 article, Tallada said that the challenges rice farmers are facing are climate change, shrinking farmlands that put greater pressures to produce more rice at even lower farm gate prices and

the increasing number of high intensity typhoons. (Tallada, 2019). He also said that ICT can greatly improve production and economic efficiencies such as improving decision making in crop care and getting better marketing arrangements. Some of the technologies include Philippine Rice Information System (PRISM) that monitors the intensity and scale of rice production and Rice Crop Management (RCM) that provides rice crop recommendation such as fertilizer, crop health and water management. There are also mobile applications like AgriDoc and eWeeds but nothing was mentioned about providing weather updates.

According to an IRRI specialist, "ICT can provide rice farmers access to accurate, relevant, and timely information that can help improve their productivity" (n.a., 2015). In his 2012 study, Adegbidi et al. said that traders behave as opportunists due to lack of or no access to information on the quantity and quality of produce being traded (Adegbidi, 2015). Kiplang in Das (2016) noted the importance of relevant information reaching the farming communities at the right time. It can help the farmers make decisions on the market and the effective adoption of agricultural inputs (Das, 2016).

The emergence of technology in agricultural organization has received legal recognition all throughout Asia. ICT is suggested as one of the appropriate and best method when it comes to the gap of information that needs to be connected for rural farmers having information that is also related to innovative practice, the technology, and other information that may be relevant. This technology has provided new opportunities for rural farmers to obtain knowledge and information about agricultural issues, problems and its usage for the development of agriculture. The use of ICTs when it comes to services provided by agricultural services especially the ones that mobile phones broadcast into the agricultural sector are filled with information regarding the markets, the state of weather, mode of transport and the agricultural techniques to be contacted with concern with agencies and department (Aker, 2011). In his research, Sangbuapuan (2012) said that questions asked by farmers (including questions on how to increase yields, access markets, and adapt to weather conditions) can now be answered faster, with greater ease, and increased accuracy through ICT (Sangbuapuan, 2012). In his 2013 study, Chhachhar et. al. said that more farmers are using mobile phones and has led them in getting access to marketing, weather and business information. It may now be possible for farmers to directly contact market brokers to sell their product. This would also include an avenue for farmers to search and focus on useful and up-to-date market information from social and business networks. Mobile phones can now be a powerful tool in providing basic information about agriculture. The importance of accessible, accurate and timely information would greatly benefit and enhance the livelihood of the farmer (Chhachhar et. al, 2013).

Mobile technology has been a big asset to farmers in making decisions which is easier than before. The Santa Rosa farmers are not exempted for their phone are only used for and can only handle SMS. Due to this, the need to find an effective way with regards to time-based agricultural information and knowledge is a must.

The researchers were able to find out that the farmers have no access to up-to-date weather information. In the perspective of the CAO, there are also problems on how they gather the data they need from the farmers and how it delays their report generation. There is reason to believe that this is happening because there is no medium for them to gather and store the data they need from the farmers. The objective of the study is to develop an SMS Information Gateway for the for the Samahan ng Magsasaka ng Santa Rosa (Farmers Group of Santa Rosa) and the City Agricultural Office of Santa Rosa City so that the farmers can minimize, if not eliminate, huge amount of losses. The scope of the system will include gathering of data (date of planting, type of seed, kilos of fertilizer used, crop damages, weather inquiries, crop inquiries, crop harvested) from the farmers through an SMS gateway that would allow the CAO representatives to generate calamity and harvest reports. It will also allow farmers to get relevant information by sending an SMS message.

The SMS information gateway would provide

advisories about the weather. The farmers would send inquiries about their daily farming needs e.g. prices and cost of goods sold, weather and crop simulation, and send calamity information via SMS. They can inquire about the weather regarding a certain date, or they can send the date or details for a crop simulation in order to provide them with the crop growth, best probable irrigation dates and expected yield of harvest. The prices and goods sold by the farmer in the market will also be accessible via SMS inquiry, and the system will reply with the necessary information.

The system is to be integrated with the Web Portal project by another group, but the researchers included a simple web application to demonstrate sharing of information between farmers and CAO and storing of information. Crop simulation will be using Decision Support System for Agrotechnology Transfer (DSSAT).

2. METHODOLOGY

The methodology used in this study is the Rapid Application Methodology (Figure 1). According to (Lucidchart, n.d.), Rapid Application Development (RAD), is an "agile project management strategy" which is normally used as a software development methodology. This was chosen for its fast-paced environment, due to its focus on minimizing the planning stage and maximizing prototype development. By minimizing the planning stage and maximizing prototype development, it lets the group members accurately measure progress, milestones, and be inconstant communication on evolving issues or changes (Lucidchart, n.d.). It has four (4) phases which are the following: requirements planning, user design, rapid construction, and cutover.

The main purpose of the requirements planning is to be able to scope the size and requirements of the project. The group and end-users were able to determine the goals and expectations for the project. This phase was broken down into 3 steps. First step was to conduct research through interview and group discussion about the problem of the organization and its members. Second, the group defined the requirements of the project. Lastly, the group finalized each requirement with the approval of the main stakeholders of the system. The output for this phase comprised the final project proposal, which contains the general plan of the group for the capstone project, the related concepts, the organizational profile, and the problem areas. During the user design phase, the group worked hand-in-hand with the different system users such as the farmers, farmer heads and the CAO representative in the several iterations to get their comments, suggestions and approval. They used the open source SMS gateway called iTexmo during this phase. During the construction phase, they used Kannel, which is an open source Short Messaging Service (SMS), Wireless Access Point (WAP) gateway and DarkSkyApi for the weather information. During the cutover phase, unit testing of all the components is done as the components were developed. The test cases were performed using different types of accounts in the system and different mobile numbers for the SMS. The application was first deployed to Hostinger web server before testing the system. A user's manual was also developed to serve as guide for the users.

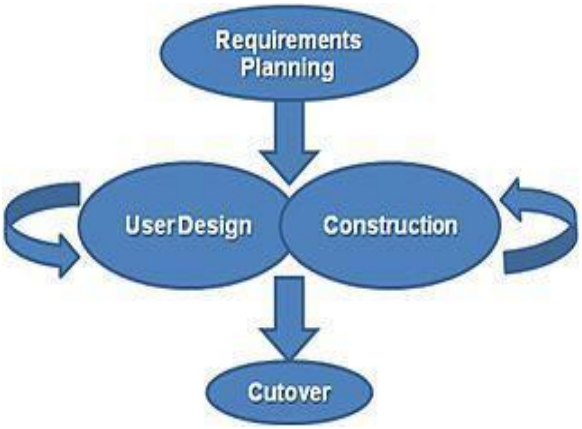

Figure 1: Rapid Application Development (RAD)

3. RESULTS AND DISCUSSION

Based on the data gathered and interviews conducted, the main reason why farmers have losses

is rooted on the farmers having no access to up-to-date weather information. For CAO, data collection has been a problem due to lack of tools or medium to gather the data they need from the farmers that leads to delay in generating needed reports.

The proposed solution has four modules, namely: the weather services module, farmers services module, tracking services module and the external DSSAT simulation module. Please refer to Figure 2 for the Conceptual Framework showing the sub-modules, problems and tools and techniques that were used in developing the system and Figure 3 for the Design Architecture.

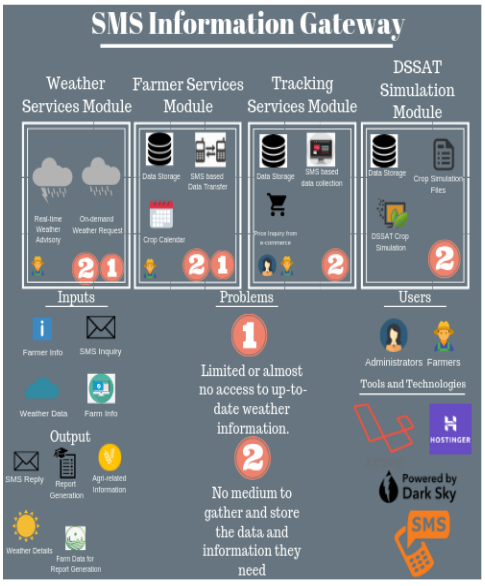

Figure 2: Conceptual Framework

The weather services module mainly focuses on solving the problem of the farmers having limited or almost no access to up-to-date weather information. This module gives relevant weather information through external weather sources (DarkSky API). It provides weather information such as temperature

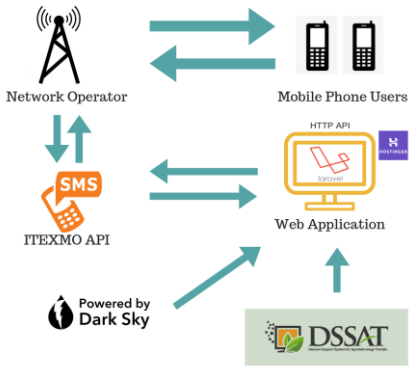

Figure 3: Design Architecture

(C°), rainfall -if any (mm), wind(kt),and wind gusts(kt) which would be very helpful for the farmers to know on demand. The farmer will send an SMS code for a particular day, e.g. PANAHON November 11, to help him make decisions depending on the weather information. See Figure 4 for the SMS screenshot.

Figure 4: SMS Code PANAHON

Likewise, the module also has the weather advisories feature in order to help farmers know about incoming weather. This information will be sent automatically to the farmers as text blast using the SMS information

gateway. Refer to Figure 5a for the SMS received by the farmers and Figure 5b for the web application's weather blast.

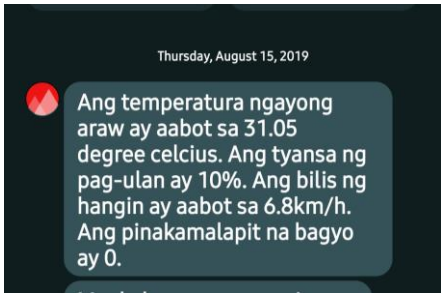

Figure 5a: SMS Blast of Weather Update

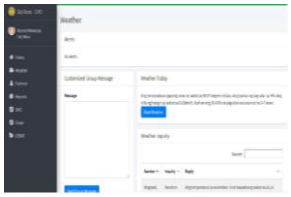

Figure 5b: Web Application for sending the Weather Blast

The tracking services module allows the CAO representatives to track information they need from farmers such as the number of planted crops, number of harvested crops and farmer details. They can now generate reports based on the planting dates, harvest dates that were simulated and given by the farmers and the estimated yields and crop damage report. For example, if the farmer sends an SMS Code TANIM, he gets the information about the date of the different stages of rice farming, such vegetative, reproductive and harvest (Ani). Refer to Figure 6 for the screenshot. At the same time, the CAO representative gets the same information which can now be used in generating the reports.

The Farmer Services Module allows farmers to get information related to their day-to-day farming operations by sending an SMS code. The SMS would be the avenue for farmers to access the said information through an affordable medium due to lack of internet connection. For example, the farmer would like to know when is the best day of a particular month to plant rice. He will send the SMS code CROPSIM to get the information such as yield per hectare based on the DSSAT Crop Simulation file. The yield per hectare will also be used in the reports. Refer to Figure 7 for the screenshot.

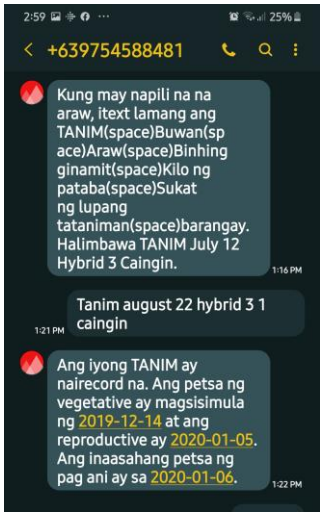

Figure 6: TANIM

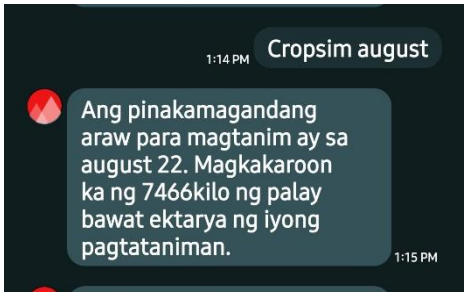

Figure 7: CROPSIM

The DSSAT simulations module is an external module that extracts file from DSSAT based on the desired date. The extracted crop simulation

files from DSSAT will be uploaded to the system. The simulations could be done yearly by simulating a whole year, day-to-day simulations. The outputs are needed to be updated yearly because of the changes in the weather files that will be retrieved from NASA. Refer to Figure 8 for the screenshot.

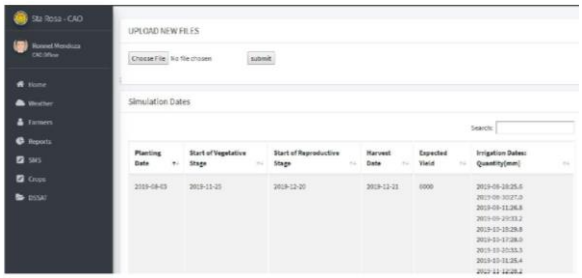

Figure 8: Upload Extracted Crop Simulation from DSSAT

The test cases were performed using different types of accounts in the system and different mobile numbers for the SMS. The web application was first deployed to Hostinger, web server before testing the system. Based on the test case results that was conducted all test results were a pass. After this, a user acceptance testing was conducted. Improvements based on user feedback include the fixing of the SMS messages so that it will be easier for the farmers to use the different codes and understand the messages they receive and removing some of the weather information that they do not need for rice farming. For the CAO representative who will be the admin of the system, a detailed instruction on how to run/upload the DSSAT will be provided in the system.

4. CONCLUSIONS

The SMS Information Gateway for Santa Rosa Laguna Farmers will help the farmers get weather updates and relevant information in a timely manner thus it can prevent huge losses because they can make decisions fast. Using SMS as communication tool is less costly since there is no need to connect to the internet and cost of messaging is minimal. CAO representatives need not go out to get the information from the farmers. The role of the government agency, in this case, CAO, is very critical to the success of the project since the office will act as the administrator of the system and they can probably request a budget for this. For future studies, the researchers suggest that there is a need to use a more updated source of weather data, preferably access to the nearest weather station from Santa Rosa Laguna. The nearest weather station would be located at the University of the Philippines - Los Banos (UPLB) branch of IRRI. Also, there is a need to generate and use predictive weather forecasts to further improve the accuracy of the crop simulation.

5. ACKNOWLEDGMENTS

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