

Coalescing e-Agriculture and Marketing for a Sustainable Food Supply System: Mobile Application Approach

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Abstract - In Bangladesh, a large portion of the population is reliant on cultivating endurance. Numerous farmers don't know about the rest of the world and the specialized headway about cultivating. The majority of the farmers don't have any thought regarding the market price of the harvests and their items and they trade their items at a random expense. The farmer doesn't get real-time updates or news about the closest market that is available in their area. So, because of that, they don't find out about the current news about the cultivating plans. During this pandemic, farmers cultivated harvests that could not be sold. As a result, both farmers and other citizens suffered food as well as an economic crisis arose. So, for the farmers who have smartphones, we have developed a mobile application-based solution for them to utilize smartphones where they can get updates spontaneously about the rice, vegetables, organic product prices of each market in Bangladesh what's more, they can sell their items at the accurate price with the delivery system implemented with a GPS tracker simplification algorithm. Our application includes where all the cultivating-related notification from the public authority will be included and farmers will get legitimate data about various plans and pesticides. Contingent on certain economic situations, we are able to predict the rates of the harvests and natural products. Stakeholders can buy harvests with a GPS tracking delivery system from this app. So, in any circumstances, the food supply remains sustainable.

Keywords - Android, GPS, Smartphone, Pandemic, Market Rates

I. INTRODUCTION

Bangladesh is renowned for its population growth. Yet, its accomplishments in farming stay incomplete notwithstanding being vital to lessening neediness since 2000. Horticulture has assumed a vital part in diminishing Bangladesh's neediness from 48.9% in 2000 to 31.5% by 2010 with more than 87% of rustic individuals part of their pay from rural exercises [1]. The turn of events of horticulture affects the monetary government assistance of our country. Presently our nation is independent in food grains. In the forthcoming years, agribusiness will face vital diversity. By far most of the Bangladeshi farmers that incorporate limited scope makers are frequently unfit to get to the data and mechanical assets that could increment the cultivation and result in improved costs for their harvests. The data regarding development are open from various sources like printed media, sound, and visual aids, paper, TV, web, flexible, etc. anyway the associations and developments of data are special. In this way, it's difficult for the farmers to get the information and to fathom the distinctive information which is spread from various sources. Eventually, various manual advances are required while getting ready data for changing data beginning with one arrangement then onto the following. In Bangladesh, many farmers don't know about the outside world and the specialized progression of the cultivating. The majority of the farmers don't know about the paces of the harvests and their items and they sell their items at any expense. In this day and age, farmers get news through paper and TV. However, only one out of every odd farmer can understand paper or they don't sit in front of the TV as they don't have such a lot of time to sit before the TV for quite a while. So, in light of that they don't find out about the current values about the cultivating plans toward the end they need to sell their items easily.

As android is the latest thing in the present world, every single area has android-based applications. Android Smart Phone is getting more famous because of low cost and free applications [10]. The advanced cell makes every one of our undertakings quick, productive, and precise. Android market permits android advanced cell clients to download applications openly. Due to these android highlights, we are building up the farmer assistant application for farmers to use the most extreme advantage. This android application for farmers who are utilizing cell phones where they can get continuous updates about the vegetables, natural product paces of each market in Bangladesh, and they will want to sell their items at the appropriate rates.[11] Our application will be giving the element where all the cultivating-related notification from the public authority will be added and farmers will get legitimate data about various plans. Besides, due to buying and selling availability, the food supply system will remain constant even during the pandemic.

We have organized this paper in the following manner. The motivation behind this work is depicted in section-II, related research is described in section-III, the whole methodology is discussed in section-IV, performance analysis and evaluation is added in section-V and conclusion and future work is discussed in section-VI.



II. MOTIVATION

During this pandemic, the farmers continued to cultivate the harvests. But the lockdown situation did not let them market and deliver their harvests to the cities. Immeasurable harvests were wasted were at the same time, the citizens of the city required those food facing a food crisis. The farmers also faced an economic crisis for not being able to sell the harvests. People needed more food to fight the virus but unfortunately, we could not receive those foods as we lack a proper food delivery management system from farmers to stakeholders. If few farmers of an area collaborate to sell their harvests to the specific stakeholder and fixed delivery system, it would be easier to sanitize and maintain safety than a distributed system.

Also, a centralized system where the required pesticides will be available to buy, the information of different harvests including their required monsoon, soil pH, cultivating procedure, different symptoms, market price, and selling opportunity of the harvest is a need of time for our agriculture-dependent country.

III. LITERATURE REVIEW

The authors [2] have discussed an android-based application that is fundamentally for the economic advancement of farmers. Ordinarily farmers are confused making choices in regards to the determination of manure, compost, pesticide furthermore, an ideal opportunity to do specific cultivating activities. So, to keep away from this issue this application is helpful. A compost plant of each type of yield can get enrolled. In light of the planting date of yield, the farmer will get updates about the use of compost, herbicide according to plan, pesticide for sicknesses furthermore, climate alarms if specific yield surpasses its good temperature range. Yield ideas are given upheld soil kind, topographical area. Consistent public level yield rates will be provided to the farmer to get more advantage. This framework joins elegant net and portable correspondence frameworks with GPS for affordable and smooth cultivating. This review paper presents the presentation, hypotheses, and investigation of DBMS, utilization of smartphones in farming. This paper was created on a brief investigation of some normal issues looked at by the farmers across the nation.

Alzarliani *et al.* have built AgriCom [5], which is an android based application, and gives data to farmers in regards to various yields and cultivating rehearses and other horticultural items. It is dynamic and intelligent to take in the survey and other contributions from the end-clients and can direct individuals with the various methodology that should be embraced. This undertaking shows a recreation of a live climate that mulls over various angles like market interest, inventory network, creation estimate, compost inclinations, and so forth.

This authors [3] centers around online vegetables pricing system to oversee and refresh the value subtleties of the vegetables on the web. This undertaking robotizes the current manual framework with the assistance of mechanized hardware and programming. Vegetables worth information might be move inside the data. The data recovering and overseeing gets simpler with this application. Every day, the vegetable value data is refreshed intermittently.

This authors [6] have proposed the advancement of the sensor hub ready to quantify every one of the boundaries and make the activation signal for the actuators. Other than that, sensor hubs are additionally fit for sending this information to the cloud. An Android application is likewise evolved to get to every one of the agrarian boundaries. This paper proposes the utilization of cloud-based IoT in the agriculture zone. Precision cultivating is in a general sense a thought which requests to give an ideal proportion of resources at and for a cautious term of time. These resources can be numerous things like water, light, pesticides, etc. to execute exact cultivation the benefits of IoT have been utilized in the proposed paper. The vital idea is to recognize every one of the important limits from the cultivating field and take the normal decision to control the actuator. These agribusiness limits are Soil Moisture, Temperature and Relative Humidity around the plant, Light power. Considering the examining distinguished by the sensor sensible move is made for instance water framework valve is enacted reliant on soil moisture readings, valve for fogger (for sprinkling water dot) is incited subject to the Relative mugginess (RH) readings, etc.

IV. METHODOLOGY

A. User module:

Our mobile application working principles are shown in Fig. 1. This can be divided in the buyer and seller interfaces and the user module is used to complete the registration in the application. If the user is authorized, the available information is showed to the user as per requirement. The user information which was collected from the registration page will be stored in the database securely. This information can be accessed by the admin. Authorized stakeholders can also view some of the required information of the user while marketing the product. Also, while buying and selling harvests the buyer and seller will need to provide their required information for the approval, database, and invoice.



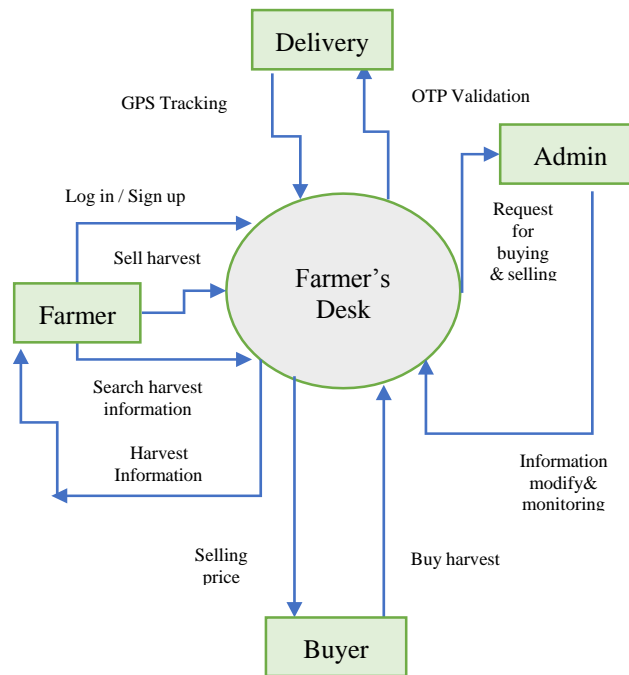


Fig. 1. The system architecture of farmer's desk application.

B. Home Screen:

The splash screen is the starting page of this application. The home screen shows two categories to the user. By choosing a specific category the user can access the information and interact there. The two categories are discussed below. The whole process is shown in Fig. 2.

1) *Harvest Information*: This page does not require any login system or authorized user. Any user can view this page. It contains several categories of harvests. Category-wise crops are added in the next user interface. Then a specific crop can be selected and the product description, required pesticides, required fertilizer, and the market price are provided in different user interfaces. The crop description includes soil pH, areas where this can be cultivated easily, and their maintenance instruction. The fertilizer portion includes different symptoms of the plant. The pesticide includes different type of possible insects and their solution pesticides. And the market price provides the recent market price of the harvests. Depending upon the specific economic situations of the current week and past couple of weeks, our framework will foresee future rates. So, it would be helpful for farmersto sell their products at a specific time in a market

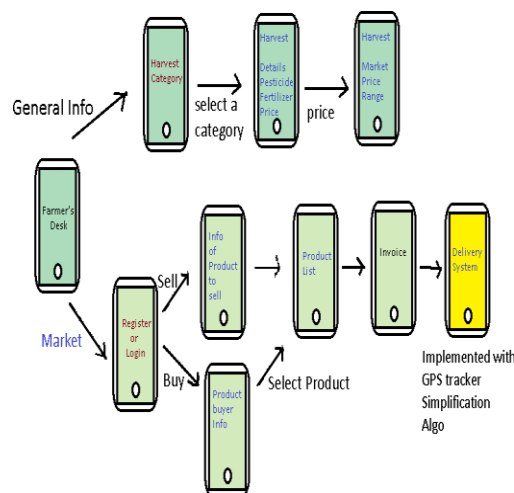


Fig. 2. Workflow of the overall system

2) *Marketing Harvest*: This is one of the main features of this app. As we needed a quick platform for marketing the products from farmer's platform. Here, there are three different user interfaces. After login, the authorized users can see the other harvests and their price to sell. The next user interface is for the sellers. They will provide the harvest information, their unit-wise selling price, delivery system (if possible), and price with a delivery system (optional). The buying portion is like the "add to cart" page. The user will confirm here required information to buy harvest with the payment system and invoice. As per requirement delivery system will be available. So, during pandemic situations, the harvests will not be wasted and the economic crisis will also not arise hopefully. The stakeholders also won't need to waste time bargaining or buying products with their expectable rate. The delivery system is the exclusive part of this system. Like uber eats, food panda, the additional delivery module is added here. So that if buyer or seller don't have any delivery person or transport available, the delivery system can help as it has a tracking system available with firebase real-time database. The buyer and seller both can track the delivery using the app. The delivery man will do the OTP verification with his valid information before accepting the task for safer delivery.

V. IMPLEMENTATION AND EVALUATION

A. Implementation:

The app includes several modules implemented with unit testing and performance testing for acceptance checking. The modules are general information of harvests, buying module, selling the module, and delivery module with GPS track simplification algorithm [11] shown in Fig. 3. After the delivery man confirms his valid information with OTP verification before delivery, the delivery can be tracked with GPS and both buyer and seller can monitor the delivery. So, during a pandemic or any situation, the products will reach the stakeholders. The marketing portion is accessible to only the registered users and the delivery system requires OTP confirmation, so the system ensures complete security of data and other operations. Buying, selling is first confirmed then placed to avoid fake users or fake actions.

B. Evaluation:

The app works like a one-stop service for a farmer. All the required information according to the requirement about harvests is available here. They can see the market price. The seller can sell their harvest at market price. The product list is decorated according to that. The buyer can also get the harvest without bargaining or time-consuming methods. A delivery system with a tracking facility and permission is also available.

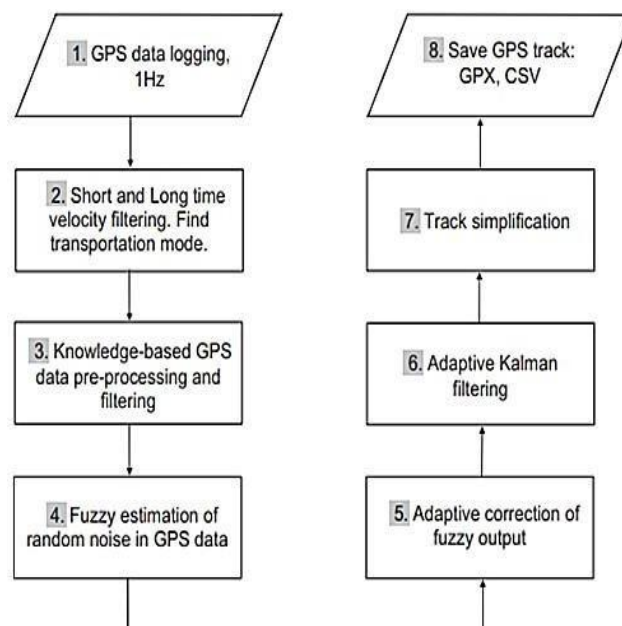


Fig. 3. GPS tracking simplification algorithm

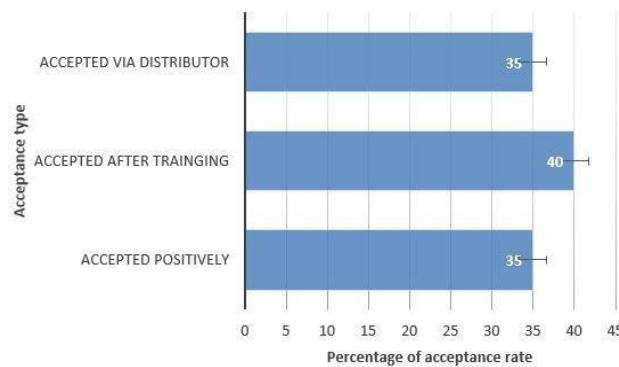


Fig. 4. Survey result of farmers' acceptance of this system.

The main challenge of this app was the practicality. The farmers are not used to the app and many of the farmers don't have a smartphone. After a quick survey, we got to know that 35% of the farmers accepted the app positively, 40% of the farmers started to accept the app with proper training, and 35% of the farmers mentioned distributors or collaborators for their operation as they don't have a smart phone that are shown in Fig. 4. The stakeholder was glad to accept the system as they can get the fresh product at a lower price than the market. In the delivery system, the people or drivers with available transport are also benefited because of the fixed price less time-consuming process. So, it can be said that the acceptance is high and if it is made available for all the users will be benefited practically.

VI. CONCLUSION

The farmers will infer a more noteworthy advantage when they can settle on better choices about where to sell their yield in the wake of getting market costs for an assortment of the neighborhood and far off markets [8]. With the utilization of such applications, cultivators could set aside time and cash since they don't have to make a trip to sell their items. Farmers and other invested individuals in horticulture could acquire by utilizing cell phones as a working device [10]. This app will help the farmers, stakeholders as well as users. The farmers might need help to interface with the app but once they understand it, they will surely be benefited. In the future, during a pandemic or any situation, it will help to cope up. And in the future, many more dimensions can be added with this app as per the requirement to make it more dynamic.

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