Modernization in Indian agriculture- An IoT approach

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ABSTRACT

The main aim of the project is to provide overall support to the farmers and increase their margin of profit. In spite of agriculture being a non-recession occupation, many farmers are not able to reach the expected margin of profit. Reasons for that can be many. Having no prior knowledge about inflation in the market, farmers might end up growing the same crop in ample quantities in the market. Hence they reduce the margin of profit and sell the crop. The second reason being the traditional method followed in agriculture. Error due to human intervention cannot be ignored. Last reason being the role of intermediates. Farmers having inadequate knowledge about the price in the market, agree on a deal with intermediates. In order to reduce the risk, a farmer obtains a system has been proposed. The proposed system provides aids in multiple stages. In order to avoid inflation of crops, data about the quantity of all crops are aggregated and stored in a central database. This value acts as a threshold and warns before inflation. Change from traditional method to modern techniques in agriculture can be introduced with the concept of sensors. Multiple sensors are deployed in the farm field which gives timely and accurate readings to the farmer. Being in a remote location farmer is able to control his field. Farmers are being cheated by the intermediates due to lack of information about the price of crops. The system proposes a solution to this problem. Market price stores in the database are made available to the farmers. As a result, they are prevented from cheating.

Keywords— *IoT, Android, Pre-production, Production, Sales support*

1. INTRODUCTION

India is called the land of agriculture. Agriculture is one of the major occupations in India. Famers are said to be the backbone of India. The major economy of India is through agriculture. About 61.5% of the Indian population is dependent on agriculture. It plays a vital role in the development of the country. Agriculture is said to be profitable only if it yields well. This is dependent on a number of factors. It is dependent on water. The right amount of water will help in proper yielding of the crops. Apart from this crop must be protected from rodents. Rodents play a vital role in the destruction of the crops. Natural calamities like fire will also destroy the crops. Water has to be provided in sufficient quantity. Irrigation is one of the ways by which farmers are dependent on. Over-irrigation will destroy the crops. Whereas under irrigation will result in drying of crops.

There is a huge amount of risk for the farmers in getting proper yield. India is a land of agriculture no, much support is provided to agriculture. In many cases we find that farmer incur huge amount of loss. Reasons for this can be many. One of the reasons is inflation. Inflation is a condition where there is an excess quantity of crops. Due to lack of knowledge about the demand and supply statistics in the market, farmers are unaware of the type of crop to be grown. Having insufficient knowledge about this, farmers might end up growing the same crop which is already in excess. When this product is brought to the market, farmers having no choice have to sell their crops with a decreased margin of profit. Another reason that is affecting the yield is traditional method followed in agriculture. Human work cannot be cent per cent accurate. It would be difficult for a farmer to keep a watch on the farm field all the time. There might be intruder detected such as rodents which play a major role in destroying the crops. Natural calamities such as fire can also be the reason. Detecting fire at an early stage will help reduce the impact of the loss. Irrigation plays a vital role. Farmer should be cautious about the amount of water supplied to the field. If water is not provided in sufficient quantity then crops dry out. On the other hand, if crops are over-irrigated, this also results in damage to the crops. Means should be introduced to reduce human intervention. Even after overcoming these problems, a major obstacle that the farmer has to face is the black market. The problem of middle man in the market. Even after yielding good crops, it is not possible for farmers to get the desired amount of profit. Between consumers and farmers there is a huge role played by a middle man. Farmers will not be aware of the actual price in the market. Middle men take advantage of this and shall purchase products from the framer at a very low price. Hence the farmer will be cheated from the amount of profit he deserves.

With the evolving technologies such as IOT and big data, a loss that farmer incurs can be reduced. Human intervention can be reduced and accuracy can be increased with the help of sensors. Paper [1] deals with multiple case histories for implementing smart agriculture. It gives a brief study of the ways by which technology can be introduced in agriculture.

Paper [5] proposes the concept of an irrigation system which uses valves to turn irrigation ON and OFF. These valves may be easily automated by using controllers. In this project, an attempt has been made to automate farm that allows farmers to apply the right amount of water at the right time, regardless of the availability of labour to turn valves on and off.

Monitoring environmental conditions are the major factor to improve the yield of efficient crops. [5] includes development of a system which can monitor temperature, humidity, moisture and even the movement of animals which may destroy the crops in agricultural field through sensors using Arduino board and in case of any discrepancy send a SMS notification as well as a notification on the application developed for the same to the farmer's smartphone using Wi-Fi/3G/4G.Knowledge about how connected systems are developed can be done through [5] references. It provides insights about how humidity sensor, temperature sensor, intruder work.

2. PROPOSED SYSTEM
In order to reduce the loss, the farmer incurs a system has been developed. Man aim is to increase the accuracy and margin of profit. The system contains an android application for notifying the farmer. Hardware setup to demonstrate the prototype. Figure 1 shows the block diagram of the complete system.
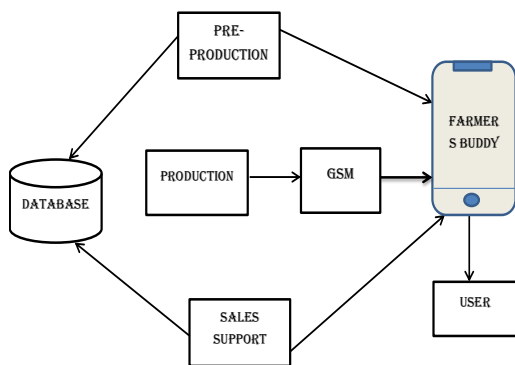
Fig. 1: System block diagram

The system is connected to the cloud which maintains the data. The pre-production phase of the system aims at reducing the loss incurred by the farmer due to inflation. Production phase helps increase the accuracy with the concept of sensors. Post-production phase prevents the farmer from being cheated by the middle man.

Each phase is designed to perform a designated task. Cloud maintains all the data of the system. Cloud in the system acts as a server for storing the details. Pre-production and production are the android application for the user interface. Data from this application is stored in the cloud and is used for later processing.

3. METHODOLOGY
The system has been divided into 3 phases and each phase performs a particular task. The first phase is the pre-production phase. Second is the production phase. And finally the sales support. Each phase is designated to reduce the risk that the

farmer incurs at every stage. And hence the margin of profit can be increased.

First is the pre-production phase. This phase is mainly designated to reduce the loss that can be incurred due to inflation. It aims at aggregating the data and storing it in a central database. Based on the requirement of each crop threshold is fixed. Hence the problem of inflation is addressed from the root level. If the excess crop is not cultivated then there is no concept of product wastage. Figure 2 shows the block diagram of the pre-production phase. The threshold for all the crops is fixed. This threshold is based on the survey from previous statistics. Previous data must be analyzed in order to fix the prize of the crops. But for the prototype purpose, the price for the crops here is fixed manually.
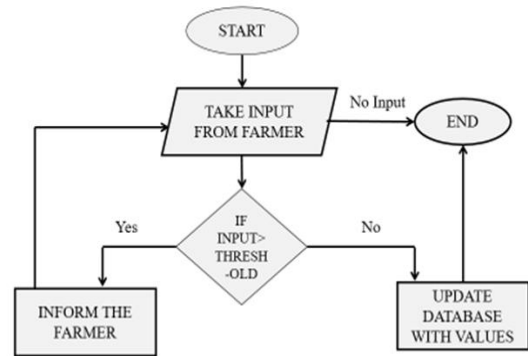
Fig. 2: Pre-production block diagram

The next is the production phase. In the production phase, farmers can be provided with a system that reduces human errors and intervention. With the introduction of sensors in agriculture, the precision of agriculture can be increased. Sensors for monitoring the water level in the soil, for intruder detection, for fire detection. All these sensors help in increasing the accuracy of agriculture. Figure 3 shows the block diagram of sensors connected to a microcontroller.
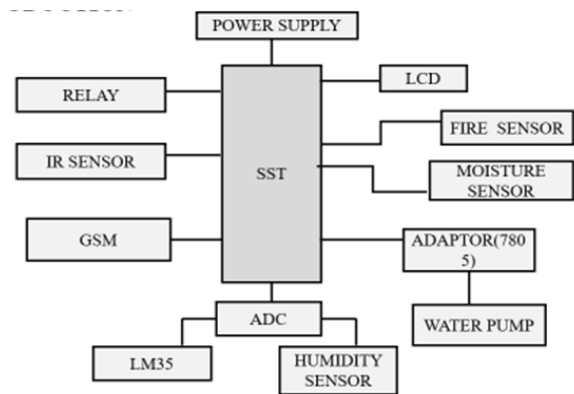
Fig. 3: Hardware block diagram

And finally, in the sales support, farmers are avoided from being cheated by the middle man. The rate of each crop is fixed and is made available to the farmer. This can act as an acknowledgement to the farmers and prevent them from being cheated with a price.

4. IMPLEMENTATION
Pre-production is implemented as an android app. The application consists of multiple fields using which user needs to register himself. This process is done before the farmer starts growing his crop. Farmer is expected to register the crop name and the quantity of crop to be grown. If the particular crop has

reached a threshold then an alert message is obtained warning that the threshold has reached. Figure 4 shows the snapshot of the application for registration.

Fig. 4: Registration snapshot

In order to demonstrate the working of production, a prototype has been developed. 8051 Microcontroller family P89V51RD3 is used. A microcontroller can be treated as the heart of the Setup. All the sensors that collect data send it to the microcontroller for further processing. Based on the processing of the microcontroller actions are taken like turning the motor on and off. LCD is used to display the result on the LCD screen.
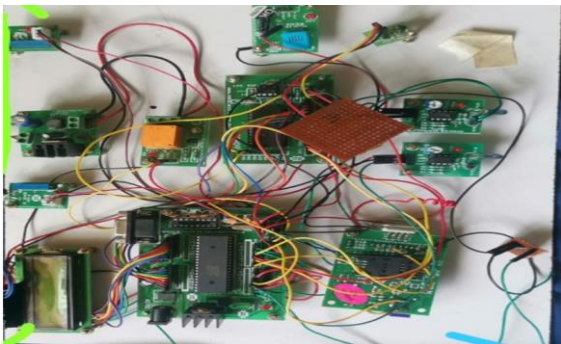

Fig. 5: Hardware setup

And finally, in the sales phase, the amount that is fixed for crops is made available directly to farmers. The application contains a list of crops and its price for the day. This can be used as a reference by the farmers and can help them from being cheated by the middle man. To make it more convenient for the farmers, pictorial representation is used.

Fig. 6: Sales support

5. FUTURE SCOPE
Large spreadsheets of data are required in order to fix the price of crops. Collecting the huge amount of data is a tedious job. Good data analytics tools are required in order to analyze the data. Variations in the prices are done by the administrator analyzing the data generated. With the evolving technologies such as AI and ML, the process of price updation can be automated. A model that predicts the price based on the variation in demand-supply will increase the accuracy and reduce human load.

6. REFERENCES
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