Wizard for Farmers using Mobile and Web Application (UZHAVU)

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***Abstract*—The objective of this project is to help farmers to solve their problems in an instant of time within their reach of palm. In the today's world of technologies with lot of people browsing, surfing, chatting on social media Smart Farming App is a tool which will help farmer to seek information to their needs. This app mainly focuses on providing notification of bank loan schemes from the government.**

Besides it also provides information about seasonal cropping, pesticides and fertilizers, seed types, etc. are listed out. Also new emerging technologies related to farming will be provided along with videos if available any. House gardening guidance will be given to the ordinary user who lacks knowledge about farming practices and plants nutritional needs.

All information such as type of plants, their manure and organic fertilizer, etc. related to house gardening will be portrayed in the app as well as in webpage.

I. INTRODUCTION

AGRICULTURE is an essential work, which provides food needed for all human beings. The science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products. Over-fertilization is a serious issue faced by farmers globally. Unplanned use of fertilizers leads to inferior quality of crops, various environmental problems like leaching, water pollution, soil contamination, soil salinity, bio-magnification, contamination of ground water, poor food quality. Also, the present-day soil analysis techniques are time consuming and expensive since they are ex-situ techniques and are carried out in laboratories. It is important to use a method that has a fast response time and a technique which enables real time, on-site soil nutrient analysis. There is a great need to modernize the conventional agricultural practices for the better productivity. The automated fertilization unit increases the profitability of crop production and reduces potentially negative environmental impacts. The present-day technologies do not aid in in-situ soil testing, i.e. the soil samples are taken to laboratories for testing the macronutrient content, which makes it a tedious and time-consuming process. A key in soil testing for formulated fertilization is to determine the amount of soil nutrients. Of the nutrients for crop growth, Nitrogen, Phosphorous and Potassium are the most important elements. Conventional soil NPK testing methods have been generally performed by three steps: soil sampling, sample pre-treatment and chemical analysis. So far, soil nutrient detection commonly uses optical measurement. The optical methods are reliable, but time-consuming, complex and high cost per test. Therefore, alternate methods are being used such as electrochemical sensors which are less expensive as compared to optical method. However, electrochemical sensors did not respond to only one specific ion, but also to other interfering ions present in the analyte. However, ISE and ISFETs are not commercially available and hence it was required to adopt an alternative method which would be cheaper and the components used in that method would be commercially available. There are so many devices available in the market for cultivation processes. This device consists of integration of both hardware and software together and provides a complete assistance for the development of crops in an efficient manner. To produce healthy crops farmers, use various varieties of crops. But by using This product monitors the pH value of the soil to check whether the soil is wealthy or not to grow a crop, also monitors the nitrogen level in the soil to check whether the fertilizers are sufficient for crop growth or not, The machine learning concept is introduced in this product, to predict the crop edible value and monitors the fertility of the soil to cultivate the crops and learn in the daily basis of fertilizer content in the crops to predict the amount of fertilizers is going to use in future. These operations can be monitored by mobile application as well as pc, either by using online or offline (if offline means then operational distance will be limited).

II. RELATED WORKS

• Kwang-il Hwang and his teammates presented a paper on the designing and implementation of wireless sensor gateway for efficient querying and managing through world wide web [1]. Here paper has presented the architecture of the sensor gateway for web-based management and its implementation details.

• Sirisha and her team presented a paper on wireless sensor based remote controlled agriculture monitoring system using zigbee [2]. The system consisted of the soi1 monitoring wireless sensor network and remote data center. The sensor node was developed using JN5121 modu1e and IEEE 802.15.4/ZigBee wire1ess microcontroller.

• Sonali and her team published a paper on monitoring wireless sensor network using android based smart phone Application [3]. The proposed work of this project is to use the technologies of centralized computing and android programming for the development of the application.

• Prof C. H. Chavan and group presented a paper on wireless monitoring of soil moisture, temperature & humidity using zigbee in agriculture [4]. The proposed hardware of this system includes 8 bit AVR, Blue tooth module, Temperature, humidity and soil moisture sensors, LCD. The system is low cost & low power consuming so that anybody can afford it.

• Prabha and her group members published a paper on real-time atomization of agricultural environment for social modernization of Indian agricultural system using Arm 7 [5]. This system uses the integration of the both wired and wireless techniques and ARM controller to have regular monitoring on the environmental conditions of farm and also provides the necessary precautions to be taken for yield to increase for modern agriculture. • Angel C and her teammate Asha S published a research paper on developing a smart environment in agricultural irrigation technique [6]. The paper focuses on a method for developing a smart environment to monitor the irrigational parameter in the entire field. The system also aims on reducing the energy consumption and the cost of communication.

• M.Munnira Sulthana, E.Ramakalaivani and A.V.S. Elavarasi presented a paper on the topic- wireless sensor network for remote monitoring of crop field [7]. This paper presents the design and the implementation of a Wireless Sensor Network that monitors the air temperature, humidity and ambient light intensity in a crop field and from remote places.

III. SYSTEM ARCHITECTURE

The raspberry pi forms the core unit of the setup. The pi is connected to a 5V power supply externally. A keyboard and mouse also connected via the USB ports in the raspberry pi. A soil moisture sensor and a humidity sensor is connected to the setup to extract digital values. The sensor values are initially stored in the raspberry pi itself. They are then transmitted wirelessly using zigbee to another zigbee module connected to a remote computer. The data is then transferred to the remote system using serial communication. The outputs obtained in this process are in the form of 0's and 1's. A zero output indicates that the sensor value is less than the pre defined threshold value after which, the motor and/or fan are to be switched on based on the sensor values. This function can be performed sitting at a remote location within the range of the zigbee network, thereby reducing human effort as also making sure that the plants get an ideal growth environment. The initial step is placing the sensors, like for example in case of a moisture detection sensor, it has to be placed deep inside the soil. The sensor nodes are connected to the zigbee module which is responsible for providing a wireless communication among nodes. The raspberry pi is connected to the zigbee module thus forming a transitive link with sensor network. The processing unit is also linked via zigbee module to a display system. There are relays, valves and motors connected to the system.

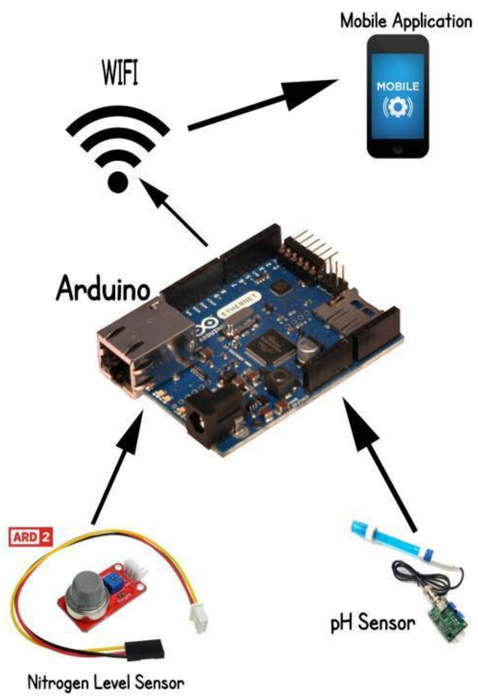

Fig. 1. System Architecture [2]

A. Methodology

By using the pH level measuring sensor, we can be able to predict that which crop is fit for this soil and by observing the pH value of the soil continuously even after the crops are planted, we can predict the development of those crops without any change in the nature of soil, even if soil becomes changed to unfit for the crop, we can be alerted through pH sensor values.

By using the nitrogen level detecting sensor, we can be able to monitor the sufficiency of the fertilizer to the crops, even if the fertilizer level increases more than the sufficiency we can be identified by using nitrogen level detecting sensor. And the whole operations can be accessed and controlled remotely by using mobile application.

This application can be operated by using both online and offline. If it is operated in offline, then the mobile will be connected with this application through WIFI-connection within a limited area. The alternative method adopted was to use pH sensors to detect the macronutrients deficiency in the soil to maintain soil fertility as well as maintain the soil pH through a relation between soil pH and the amount of nutrients present in the soil.

In order to achieve the goals and planned results within the defined schedule, it has been collectively decided to carry out the work in two phases. The major methods include literature survey and the actions to be carried out based on the initial extensive survey. The

"UZHAVU" is expected to bring a new revolution in the agriculture sector with cost and energy efficient, utilizing modern applications in technology.

In first part, a detail investigation has been carried out and resulted in suitable statistics of data on the measure of the PH level in the soil, further use the same knowledge for effective implementation of fertilization unit. pH sensors are cost effective and is simpler to implement. The heart of the automated fertilization unit is the pH sensor and the Arduino board. The pH sensor measures the pH of the soil and the pH measured corresponds to particular percentage of macronutrients present in the soil using the following table. Soil pH measurement is useful because it is a predictor of various chemical activities within the soil and hence can be used as an indicator of nutrients in soil. The output of the analogue pH sensor is a potential which corresponds to a particular pH value. This value is fed into the Arduino board which compares the pH value produced by the soil sample being tested, and the pH value of fertile soil sample.

IV. MOBILE APPLICATION STRUCTURE

This mobile app also consists details about Bank loans, Government Schemes and new Seeds.

By using this app farmers can get all the agriculture related schemes both from central and state Government. One extra feature also be included in this mobile application, that is crop defect identification. Based on the affected crop images detail of the disease and which pest affect that crop are informed to farmer. The pesticides and fertilizers details are also informed to farmers. The data send from the sensors and the hardware devices are to this mobile application. In this mobile application the data processed and based on the data information are display in smartphone then farmers easily can understand the details for agricultural process. This application also be user friendly so any farmers can use and learn how to use this application easily. The main focus is to make this application for farmers and people who like to farm.

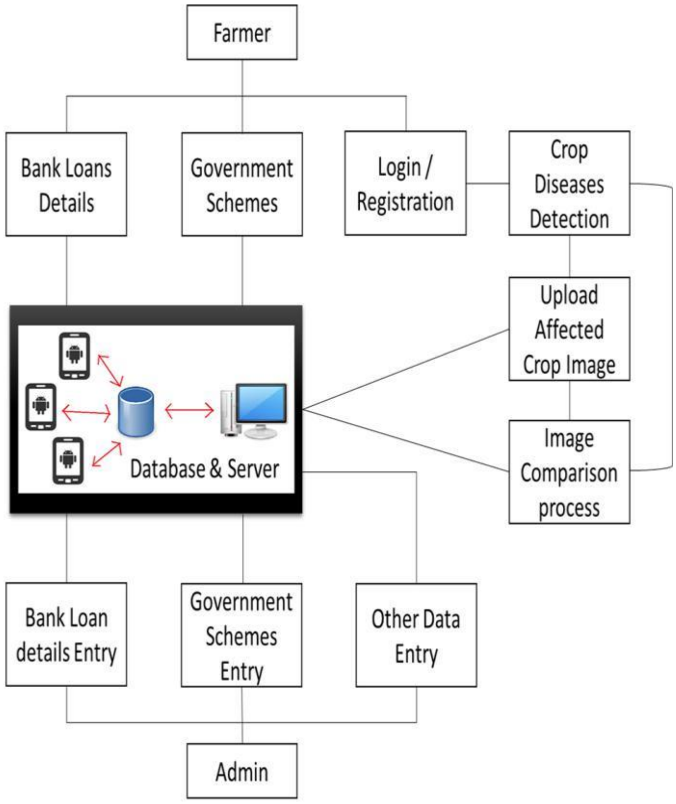

Fig. 1. Mobile Application Structure [5]

A. *Admin module*

An Admin module maintains all the details of the user, authenticates and validates the user login. It also manages other facilities such as seed information, crop disease identification, bank and government schemes, etc. which is stored in database.

B. *Bank Scheme Module*

- Bank Scheme Entry will have the following.
- Name and detail of the bank loan schemes for farmers.
- Its requirements for applying bank loan.
- The Bank scheme entry has the ownership to provide new schemes arrived for farmers. Whoever are eligible for the schemes can visit the respective bank to apply their loan.

C. *Farmer module*

Farmer have to register their username, password, mobile no and aadhaar no. Each login are validated and authenticated to avoid misuse of functionality. If a famer wants to view seed related information along with bank and government schemes, there is no need of login. But for crop disease identification login is must for the farmer. Other such as notification about new schemes, advancement in agricultural technology videos, etc. will be available as public.

D. Government Scheme Module

Government Scheme Entry provides the news and information about the schemes which are launched by our government. Subsidized seeds, pesticides, fertilizers, loans and electricity without any interest are provided to the farmers.

E. Image processing Module

- In this image processing module, farmer can upload their affected crop images in this application.
- After this image upload the image stored into database the that image taken for the processing.

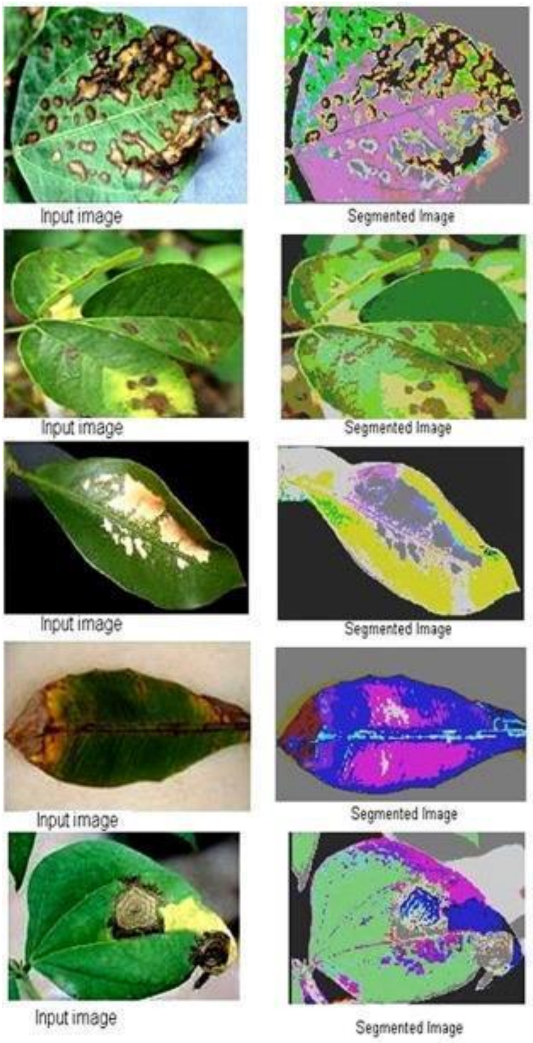

Fig. 1. Image Segmentation [12]

- In image processing the affected crop images are compared with the database images based on the pixel comparison value the disease details are display.

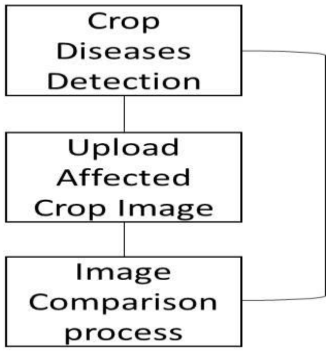

Fig. 1. Image Processing [6]

F. Algorithm

Step1: Get the affected crop images from farmers.
Step2: Compare that image with the images that are already stored in the database or cloud.
Step3: during the image comparison the image processing take place. Images are compared based on their pixels and colors.
Step4:

```
class compareImages{
mimeType($source);
$t = imagecreatetruecolor(8, 8);
createImage($source);
imagefilter($image, IMG_FILTER_GRAYSCALE);
colorMeanValue($image);
```

Step5:Based on the comparison value the disease identified and display.

V. CONCLUSION AND FUTURE WORK

A new way of approach to farming practices are being employed by the farmers. The proposed system solves their problems related to lack of information about the newly found species of pests and diseases. The proposed system is simple, easy to use guide, efficient. A better way to guide farmer to help them to raise both socially as well as economically wise to their betterment of future generations.

Farmers with or without having registration can view the required information to do their agriculture. It offers a new scalable method by developing mobile application along with web application as farmer intends to seek information on any of these application type. The future work is to implement using global positioning system and sensor technology to identify the soil content suitable for growing crops and so on.

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