A Framework for Crop Status Monitoring and Subscription System to Obtain Crop Loss Compensation for the Farmers

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ABSTRACT: In the present scenario, the issues faced by many farmers in cultivating and maintaining various crops are increasing and leads to huge loss due to natural disasters, low production, crop unsustainability, over fertilization etc.. sometimes times they are not able to get remedy from the government due to information are not properly given by farmer to get subsidy, crop loss compensation to retain their expenditure spent for crop cultivation. To eliminate the information lagging about crop status by the farmers, it is intended to formulate the innovative approach to help the farmers to get proper compensation by connecting Mobile App, IOT and cloud Environment.

IndexTerms - **crop status, monitoring, agriculture**.

I. INTRODUCTION

The agriculture is in the transition from traditional agriculture to modern agriculture currently. Internet of things (IOT) for agriculture will play greater role for the promotion of agriculture informationize, including the construction of agriculture information network, the development of agricultural information technology and the agricultural use of information resources. The application of intelliSense, identification technology and pervasive computing, ubiquitous network integration applications of IOT will promote the development of smart agriculture and precision agriculture.

Farmers need agricultural information and pertinent knowledge to make knowledgeable decisions and to satisfy informational needs. In agriculture domain through the development of a knowledge management system, enquiries of farmers can be answered with the help of multimedia which is easily accessible. Agricultural system needs to be monitored on a regular basis. The use of the developed framework is to reduce wastage by automating the entire agricultural system.

IOT in environmental monitoring helps to know about the air and water quality, temperature and conditions of the soil, and also monitor the intrusion of animals in to the field. IOT can also play a significant role in precision farming to enhance the productivity of the farm.

II. SENSORS

Sensors are used to monitor different conditions of environment like water level, humidity, temperature etc.Measuring soil moisture is important in agriculture to help farmers manage their irrigation systems more efficiently. Not only are farmers able to generally use less water to grow a crop, they are able to increase yields and the quality of the crop by better management of soil moisture during critical plant growth stages.

Sensor networks allow collecting different types of in-situ information which can be conveniently exploited for controlling crop production or monitoring ecosystems by analysing different variables, such as light, temperature, humidity or climatological and anthropological events, among others.

LIDAR sensors are used to obtain dynamic measurements to estimate fruit-tree leaf area and combined with GPS have been applied for 3D map generation in vine plantations. Laser and hyper spectral data are used for tree classification, including coniferous and deciduous trees. 3-D modeling of tomato canopies is obtained through high-resolution portable scanning LIDAR. Airborne LIDAR data are processed for estimating biomass in alpine forests.

Optoelectronic sensors for weed detection in wide row crops have been analysed in terms of accuracy and feasibility.
pH soil-based sensors allow measurements of variables in the soil oriented toward crop productivity.

III. MONITORING INTERFACE

3.1. Hardware Requirements

TI CC3200 Launchpad and Arduino UNO board with Ethernet Shield is used to implement the monitoring modules. The following sensors and other peripherals are used to collect real time data from the field:

DHT11 Temperature and Humidity Sensor.

Figure 1: Temperature and Humidity Sensor

Soil Moisture Senor (KG003) : Output is high when there is deficit in soil moisture (i.e the field is dry), or output is low. Analog interfacing can be used for accurate output.

Figure 2: Soil Moisture Sensor

Ball float liquid level Sensor: Output is according to liquid level or ball raise.

Magnetic Float Sensor for water level indicator: The float sensor is a device used to detect the level of liquid in the tank. Float sensor is an electromagnetic ON/OFF switch.

BH1750 Module Digital Light intensity Sensor / LDR resistor.

A Four Channel Relay Board (5V) for switching AC/DC is used to trigger a AC motor (220V) to operate the valves. L293D H Bridge (Wide Supply-Voltage Range: 4.5 V to 36 V) which is a typical motor driver that allows DC motor to drive on either direction.

3.2. Software Requirements

Energia MT is an open-source electronics prototyping platform which is a modified version of wiring/Arduino IDE for the Texas Instruments is used to write embedded c code, compile and execute them.

1.6.8, an Arduino programming environment is used for writing code in the Arduino programming language to instruct the Arduino.

Blynk is a Platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where a graphic interface for any project can be built by simply dragging and dropping widgets.

3.3. System Architecture

Modules of Monitoring Interface: The Monitoring phase comprises of application's main abilities and functions. From the knowledge base, the user interface is allowed to use decision making system, knowledge assessment on farming, and other systems.

Reminder: It is used to remind the farmer on the schedules of reaping, fertilizer spraying, pesticides, and on irrigation timings. It notifies the user on daily basis based on the input parameters from the knowledge base through an automated SMS notification.

Monitoring Plant Growth: The stages of growth from the knowledge base is used to calculate the corresponding phase of growth. The height of the plant is found out using the mapping outline image of that plant and this height is used to predict whether the plant is meeting the requirement or not.

Irrigation Planner: It makes a set of plans to irrigate various section of field in a pattern to get profitable yield. It also displays the information from field as dry and irrigated fields as monitoring prospect. Based on the estimation of crop water need, rotational or continuous flow is planned to irrigate the field.

Crop Profit Calculator: It is used to calculate profit for the farmer by giving inputs on year of growth, selling and retention price.

Calamities check: The irrigation plan and the field set is changed according to the weather forecast which is acquired from Yahoo weather API. It is also used to monitor unusual activities in the field like immediate firing, etc.

Problem Identifier: This identifies the problem when there is misdirection in irrigation system, motor problem. It approximately identifies where the problem has occurred. For example, in the case of no power supply, there is no use of giving commands to the peripherals whereas the user should be notified about the power problem.

Calculation of Water need: The amount of water need for meeting water dissipation through evaporation and transpiration is defined the crop water need (Etc.). The crop water need is subjected for a uniform crop, disease free, active having favourable soil

conditions. Shortly, Evapotranspiration estimates the total amount of water plants consume for a quality growth corresponding to the local weather condition and phase of the plant cycle.

Field Dry Check: Similar to the last module it uses soil moisture sensor node, that notifies the user whether the field is dry or not.

IV. PROPOSED FRAMEWORK

4.1 Government Agriculture Department Server

The information pertaining to agriculture lands are maintained for each farmer. The information contains land owner name, survey number, pass book number, land details, land location address.

4.2 CSM Mobile APP (Crop Status Monitoring Mobile APP)

The User Interface that fetches the survey number by selecting the district, mandal

Selecting the corresponding land survey number of farmer, it retrieves the from the Government agriculture Server. Each farmer register themselves with login credentials to maintain privacy of information

After registration, the farmer can open their account with credential and provide the information about the type of crop that they are cultivating every time, start date, approximate overall expenditure that is incurred for cultivating the crop to the cloud server, back to government agriculture department server

Once cultivation process is initiated, the IOT bundled devices are activated by the farmer for their land which is installed in their land to monitor and maintain about the status of crop in all aspects and keep transferring those information to cloud server continuously

In due case, the farmer wants to see the crop status for specific period or current status, they can see the status of crop in all aspects, which help the farmer to take suitable decision, if any thing goes wrong, or to eliminate the unwanted loss.

If the crops are properly grown and harvested by the farmer, then the farmer specify the closing date of the harvested crop in their credential

If the crops are get damaged, due to any reason, in that circumstances, the corresponding data of farmer and crop status of the stipulated period are transferred from cloud serve to government agriculture server based on their survey number for assessing the crop loss

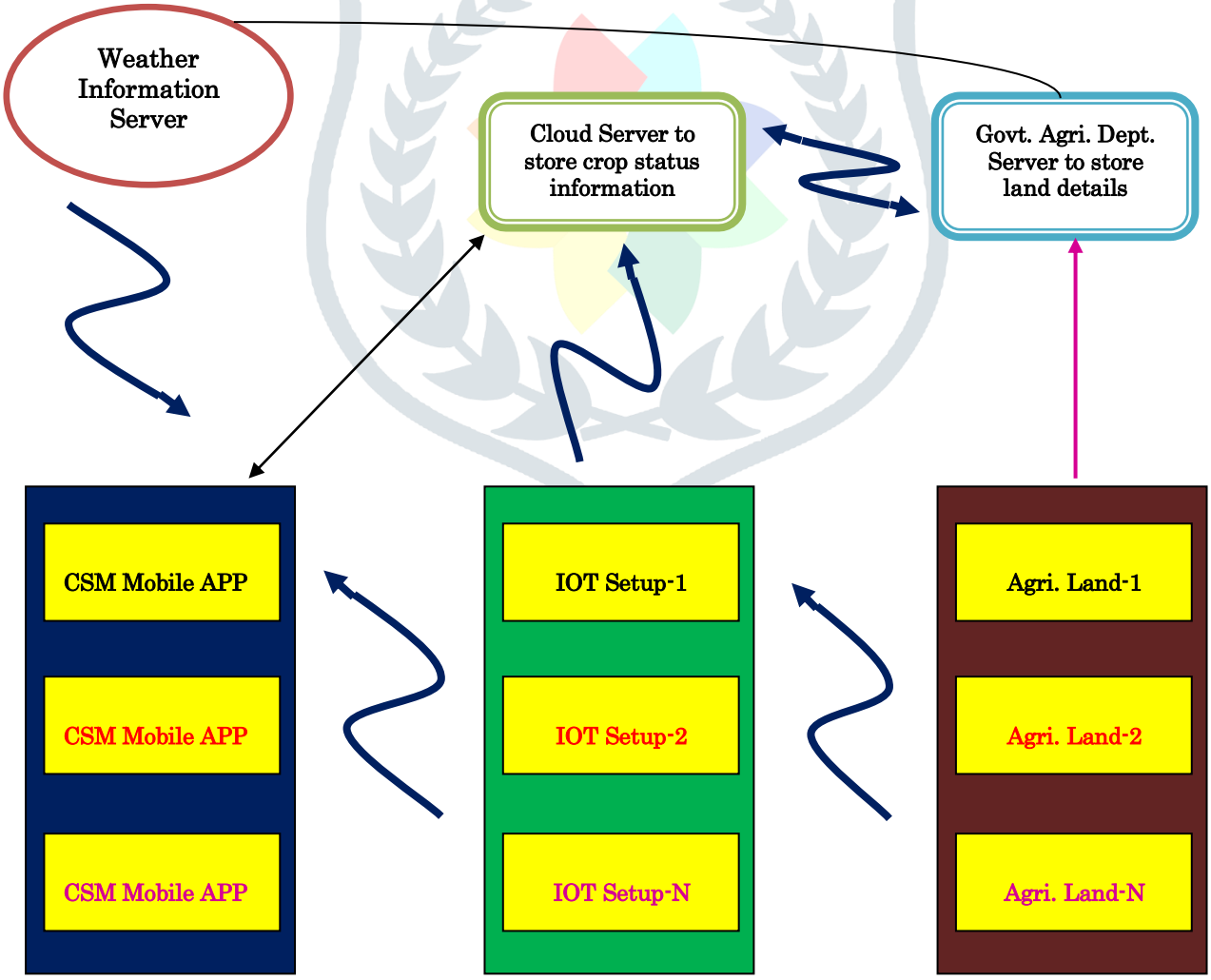

Figure 3: Framework for crop monitoring System

4.3 IOT Setup

Data Collection Unit

This is bundled with different sensors pertaining to environment factors, crop factors are installed in every farmer land and it collects the information from corresponding sensors continuously

Data Processing Unit

Consolidated data are from various sensors installed are collected and processed for every specific period in each day

Data Transfer Unit

Consolidated data DPU is transferred to Cloud server for the corresponding farmer

Advantages

- ✓ Loss Evaluation can be calculated easily for respective farmers
- ✓ There is no chance to misuse the government funds

CONCLUSION

It is believed that, agriculture is backbone of India, but still, many farmers are getting huge loss due to natural disasters and could not get remedy to overcome their difficulties. In order to eliminate this kind of problem, this framework would help both farmer and government agriculture department to support with each other.

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