E-FARMING USING IOT: A SURVEY ON OPPORTUNITIES AND CHALLENGES

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Abstract: Agriculture plays a vital role in India's economy. India is a land of versatile soils and different weather conditions. Due to sudden rain and without accurate weather forecast, Indian farmers often has to faces harsh disappointments due to insufficient knowledge about their soil. Identification of proper soil for proper crop is really a herculean task for farmers. To overcome from these problems, IoT device is used for solving such issues. The solution proposed for this will report any precautionary steps to be taken for farmers using a centralized data server which analysis the data and notifies farmer. The solution also has portable IoT device and hence in any rural areas it can be implemented. But while using IOT there are also some challenges to be faced by farmers. I discuss here both opportunities and challenges.

Index Terms - **E-farming, IOT, Soil Sensor**

I. Introduction

It is how much funny if your plants tell you when they need watered? Or know how saturated the soil in your farm is? Yes this is possible due to IOT.
As we know that our India is a developing country. And India has a very enormous contribution in the world of internet.
IOT is new emerging technology. Many of sectors in India uses IOT.
Agriculture is the core area in the Indian economy. In this field IOT has been used in high scale. By conceptually the system is very useful and good as per the productivity of the crop concerns.
The implementation of IOT using sensor technology is really a useful to farmers.
So I discuss the concept of e farming in this paper which consist of block diagram, Types of soil sensor, opportunities.
But sometimes they should have to face the challenges while using IOT.
I also focus on the challenges face by farmers while using IOT.

II. Woking of E-farm

When the power supply is switched on, the GSM modem gets initialized. The GSM modem communicates with the ARM LPC2148 board using AT commands
The LCD display is connected to the ADC pins of the ARM processor, in order to display the message
Firstly the processor checks for the availability of the solar energy with the help of LDR, the solar panel is interfaced with the stepper motor, which in turn is connected with the stepper river The solar panel rotates both in clockwise and anti-clockwise 180º and stops where the maximum sun intensity is available and stores the in a battery. The humidity sensor checks for the soil moisture content whose maximum threshold is kept at 1000ºc and minimum of 300ºc. When the soil moisture content is less than 300ºc the pump motor will pump the water to the filed .The temperature sensor will measure the surrounding temperature of the farm. The rain sensor will sense the heavy rain and closes the panel to protect the crop. All the above information will be informed to the user using GSM technology. When the power supply is turned on the ARM7 LPC2148 microcontroller and the GSM modem/GPRS is initialized. After the initialization, the system ask the user either to select automatic mode or the manual mode. When the auto mode is selected, firstly the processor checks for the availability of the solar energy with the help of LDR which is used for sensing the sunlight. Solar panel is mounted on stepper motor to expose to light according to sun movement. When no solar energy is available, the system runs on a battery. The block consists of a water level sensor which is used to sense the water level in the tank of the farm field. Relay is connected to the pump which starts pumping water when the moisture sensor senses the land as dry. Moisture sensor is used for sensing the soil moisture of the crop land to feed them water with the help of 3-Phase power unit, whenever the land get dried below the threshold level of moisture of land which is suitable for the growth of crops. The temperature sensor senses the surrounding temperature of the farm. When it starts raining, the pump motor will stop pumping the water to the field and updates the user using GSM/GPRS technique. When there is an unconditional rain the panels provided will be closed automatically to protect the crop. An Alpha numeric LCD is used to display the data. When the manual mode is selected, the information about the farm field will be updated to the user only when he calls to an authenticated number given.

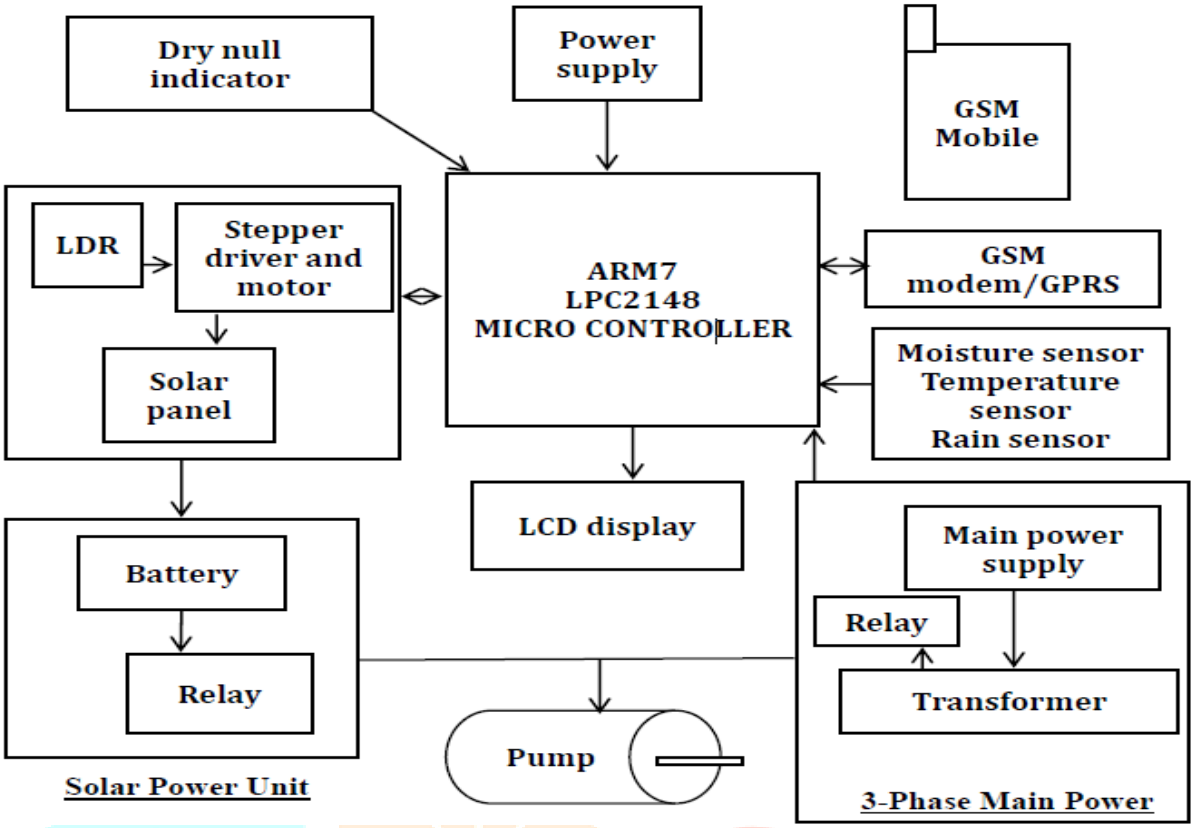

Fig 1: Block diagram of E-farming

III. Types of soil moisture sensor

1. **Integrated soil moisture sensor**
2. **Micro bit moisture sensor**
3. **Moisture Sensing LED Gauge.**
4. **Soil Moisture Monitor with Arduino and a Nokia 5110.**
5. **Soil Moisture Sensor using mcThings.**

Integrated soil moisture sensor

Soil moisture sensor integrated with LWPAN modem installed in the open field able to transmit reading up to 30 km to the nearest base station.

- Real-time monitoring of IoT soil moisture sensors.
- Covering wide-area of the agriculture fields.
- High autonomy from the battery up to 10 years.
- Easy installation to the soil.
- Allows to deploy automatic irrigation control.
- Reduce water usage. Increase yields. Improve crop quality.

Smart soil moisture sensor for irrigation control systems in agriculture. The device provides over-the-web visibility of soil moisture parameters. Integrated NB-Fi radio module ensures the long-range data transmission up to 30 km in rural area.

Fig 2: Integrated soil moisture sensor

Micro bit moisture sensor

This simple soil moisture sensor uses the BBC micro:bit to estimate the amount of moisture content and display it on the LED matrix screen. The sensor works by measuring a voltage related to the conductance of the soil and using it to estimate the amount of moisture in the soil.The kit comes with the code you need to make the BBC micro:bit measure the moisture level, however, you can edit it to suit your own needs, or encourage your students to work out how to programme it themselves from scratch.

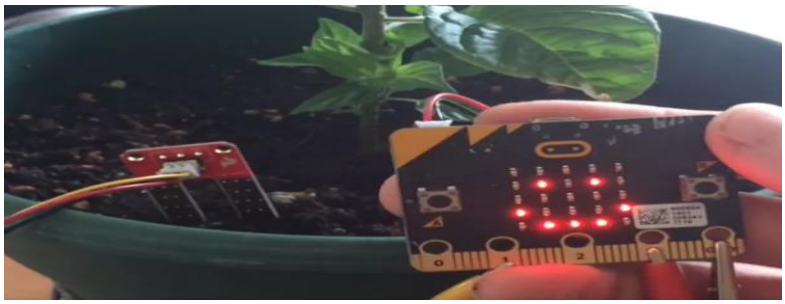

Fig 3: Micro bit moisture sensor

Moisture Sensing LED Gauge

This demo utilizes the moisture sensor with a 4 digit display and LEDs to show the level of moisture of different substances. In this demo we are using the Texas Instruments MSP 432 Launchpad, the sidekick kit for the Launchpad, as well as the Grove starter kit for the Launchpad.

Fig 3.3 Moisture Sensing LED Gauge

Soil Moisture Sensor Using mcThings

The mcThings IoT Platform, we created a little wireless low-power soil moisture sensor. Soil moisture status, battery voltage and temperature (using the built-in temperature sensor) to an MQTT client on Android. Feel free to use the below and send the information to other applications or services as you can send information to the cloud with using IFTTT and MQTT! After working out the soil moisture using the wireless debugging feature in mcStudio, we loaded the code onto the module and put into a planter. We programmed the module to check the soil moisture every 30 seconds as well as the temperature every minute and then send that information via MQTT.

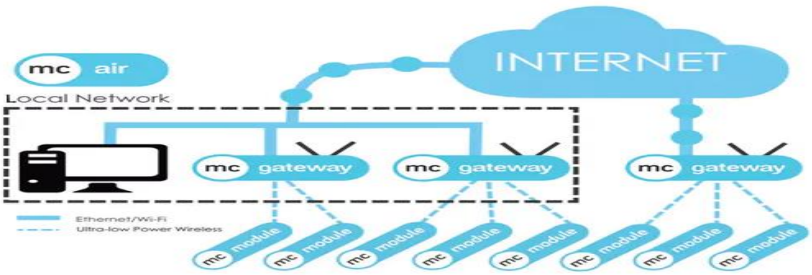

Fig: Soil Moisture Sensor Using mcThings

After the keen work is going on to make our agriculture system more contemporary and smart. Seeing this grateful work, we are expecting to develop accurate relationship between various environmental variables which will give us possible conditions to increase crop production in different situations. So following idealize outcomes will be-

1. Identify the climate conditions for a particular crop
2. Maintain the climate conditions for crops
3. Maximize crop production.
4. Reduce efforts to maintain the farming system

5. Minimize the cost and energy of production.

IV Advantages of soil moisture sensor:

1. Low cost for soil moisture sensors with integrated a large-scale project with wireless connectivity.
2. High scalability. A capacity of one single base station is more than 2 000 000 sensors allows scaling system by simply plugging new end-devices with no-mesh infrastructure costs.
3. Wide area. The range of a base station is 10+ km in urban and 30+ km in the open country allows to a have a deep network reach in the area of fields.
4. Robustness. Star topology with no mesh. Outdoor hardware support.
5. Reliability. NB-Fi protocol specially designed for large-scale projects in wide area with the use of the narrowband approach.
6. User-friendly. IoT cloud platform allows to get and manage data online. Easy integration with company IT-systems with open API.
7. High availability for worldwide deployments with the support of different ISM bands such as 915, 868, 433 MHz and others.
8. Experience. Smart sensors and controllers deployed worldwide.

V. Challenges faced by the Indian Farmers

1. Lack of the knowledge about H/w and S/W

The following software and hardware is used.

Hardware required are Arduino Uno, Soil Moisture Sensor, GSM board, power supply.

Software required are Arduino IDE,Libraries,Embedded C,Osmosis Platform

Most Indian farmers are illiterate they do not know even numbers and letters. So it is big challenges to make them aware about hardware and software.

2. Maintenance charges

When the sensors are being damaged then the farmers do not have sufficient knowledge of repairing it. Due to this they are going towards the experts to repairs that sensor. But in this situation farmers should pay the charges whatever the expert's demands.

3. Network problem/Inadequate infrastructural problem

IOT Sensors need the mobile phone but most of the farming is done on the rural side and there are inadequate infrastructure to provide the network. So sometimes farmers receives the massages from sensors and sometimes not.

4. Adverse conditions of atmosphere

As we know that all electronic devices has its limitations. Sometimes they are not giving the results as we want. The uncertain conditions like storm, heavy rain, lightning may damages the sensors and henceforth farmers are unable to receive any massage form the sensors.

5. Uncontrolled entry of animal.

It is also possibility to demolish the crops due to unwanted entry of the animals into the farm. Due to this it is also possibility to destroy the sensors in the farm.

6. Power failure

In India face the biggest problems and that is the uncertain power supply especially on the rural side. So this is the biggest challenge faced by the farmers.

VI. Conclusion:

An IoT enabled smart soil moisture monitoring system that helps the farmers to information about dry soil areas in the agricultural lands so that the necessary precautionary steps can be taken to make such lands fertile Besides, it is also very much useful that running plant nurseries to automatically turn the pumping motor ON and OFF on sensing the moisture content of the soil. The advantage of using this method is to reduce human intervention and still ensure proper irrigation.

But apart from this When any technology we are going to use it is necessary to know each and everything about that technology or at least the knowledge about how to use that technology .Due to lack of this knowledge users should face some basic challenges. I have discuss that challenges into our paper. If we overcome from that challenges it is definitely become a great technology to farmers and have a good quality of crop.

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