Agriculture Automation

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Abstract- *India is mainly an agricultural country. Agriculture is the most important occupation for the most of the Indian families. It plays vital role in the development of agricultural country. Smart farming is a concept quickly catching on in the agribusiness. Offering automated farming techniques are clearly many advantages a networked farmer has to offer. Water act as back bone in agriculture infrastructure and its availability is totally depends on rains and water storage. Estimating correct amount of water needed to plant plays an important in its growth.*

The Internet of things (IoT) is the network of physical devices, mechanism, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect and exchange data. There is also growing opportunity in the agriculture sector that stands to improve lives, make India a true leader in agricultural IoT & revolutionize the way farmer's plant, fertilizers, & harvest in the nextdecade.

Smart irrigation systems are specifically suited for arid & semi-arid regions, smart irrigation technology can ensure efficient use of water resources based on the humidity of the soil, the needs of the crop & weather patterns which when integrated with the right type of sensors & connectivity will result in optimal usage of scare resources with the help of IoT & cloud we can build a system which monitor and informed about the status of irrigation to the farmer. System uses the machine learning algorithm to take the decision related to the irrigation on the data received from sensor. The goal of this study are to discover the excellent automation technique for smart irrigation system automatically controlled through software in a way that allows the user to monitor all information and control the device immediately from mobile.

Keywords- Agriculture Automation, Smart Farming, Home Farming, Green House Water Irrigation, Automatic Plant Irrigation, Microcontroller, Monitoring Moisture Level, Motor Pump, Solenoid Valve(SV), ESP8266-NODE MCU, Relay, Sensors.

I. INTRODUCTION

Food is the basic need of human beings that means humans cannot live without foods! Human get the food from farms so as to fulfill the need of food, farming is necessity in every corner of the world.

Agriculture is the branch of science or farming practices which includes cultivation of farm to grow various crops. In India, agriculture began by 9000 BC as a result of early cultivation of various types of plants. Agriculture plays most crucial role in India's economy. 58 percent of the rural population is depend on agriculture as there source of income and livelihood. Agriculture along with fisheries and forestry is contributing major role in Gross Domestic Product (GDP).

India comes in largest countries which produces, consumes and exports spices and spice products. India is second largest fruit producer country in the world. India is largest producer of milk; it contributes over 22 percent of total world production. It is second largest exporter of sugar and contributes over 14 percent of global exports.

To give the importance to agriculture sector, the government of India, planned many steps in its Budget 2021.It proposed good deal to enhance agriculture and farmer's welfare. Over 2 million hectare land will be brought under drip and sprinkler irrigation and improve the efficiency of irrigation, said companies with the budget announcement of doubling irrigation fund created with National Bank for Agriculture and ruler Development (NABARD) to Rupees 10,000 crore in 2021-22. Government has taken steps regarding important factors soil and water to improve soil fertility to support farming scheme.

Due to the increment in the investments in agricultural infrastructure such as irrigation facilities, warehousing and cold storage in India is expected to generate grate momentum in next few years. Parameters such as reduced transaction costs and time, improved port gate management, enhanced fiscal incentives will contribute to sector's economic growth. Increment in genetically modified crops will improve the yield for farmers.

In Agriculture, There a lot of farmers who have to wake up early in the morning to start the water supply to the farm and farmers take the decision based on random guess.

If they think water supply is enough then they switch off the button. And these things are so time consuming and not good for farm to give sufficient yield.

There are some parameters to determine irrigation of crops. Evapotranspiration (ET) is a technique in which of moisture from the earth is transferred to the atmosphere by evaporation of water and transpiration from plants. It depends on climatic changes.ET controllers can be used to schedule irrigation. It has been proved that using ET method the water savings is up to 47%. Soil moisture and temperature of the field are the most essential parameters.

The basic functionality of the system is to automate the sprinklers, drips network deployed in the farm as per need of the plants. This way water will be saved for other usage.

A hardware unit will be deployed in farm to sense soil moisturevalues. This data will be sending to server periodically.Server application will fetch these values.

Server will decide how much water needed to plant and when using decision tree algorithm (machine learning). Accordingly server will inform field hardware unit to start/stop the solenoid valve for irrigation. Then Farmer receive the data of moisture level. Controlling field from mobile application and irrigation control are work very well. The water usage is 90% more efficient than any other traditional and other modern irrigation methods.

II. LITERATURE REVIEW

This section provides a survey on the domain and gives more brief idea about the smart irrigation system which automates the irrigation using IoT approach.

In [1], Irrigation management using soil moisture sensors, gives information about various type of moisture sensor and working of moisture sensor in various condition of soil. Soil moisture sensors having probes use to pass the current through soil and measure the resistance of soil and accordingly give the moisture level present in soil.

In [2], smart irrigation using soil moisture sensor, solenoid valve and ESP8266 wifi module, Smart irrigation system is proposed which uses sensor to sense moisture, and water requirement. These data send to web server where data compare with standard values and allow controlling the water irrigation from any place which is reduce the water wastage and increase the crop yield.

In [3], smart irrigation and monitoring system, IoT is use for the bi-directional communication among various devices. Machine learning algorithm is used to train the data received from sensor network deployed on farm. It takes the decision whether irrigation needs to be done or not. Farmer receive data through mobile application and accordingly farmer can ON/OFF the water pump and solenoid valve.

In [4], IOT Based crop-field Monitoring and irrigation Automation, IoT technique is use to irrigate the crop-field. Various sensors are use to monitor the field, sense data store on Firebase. It also uses the moisture sensor which measures the moisture level that indicates how much water require for irrigate the field. Accordingly it irrigates the field.

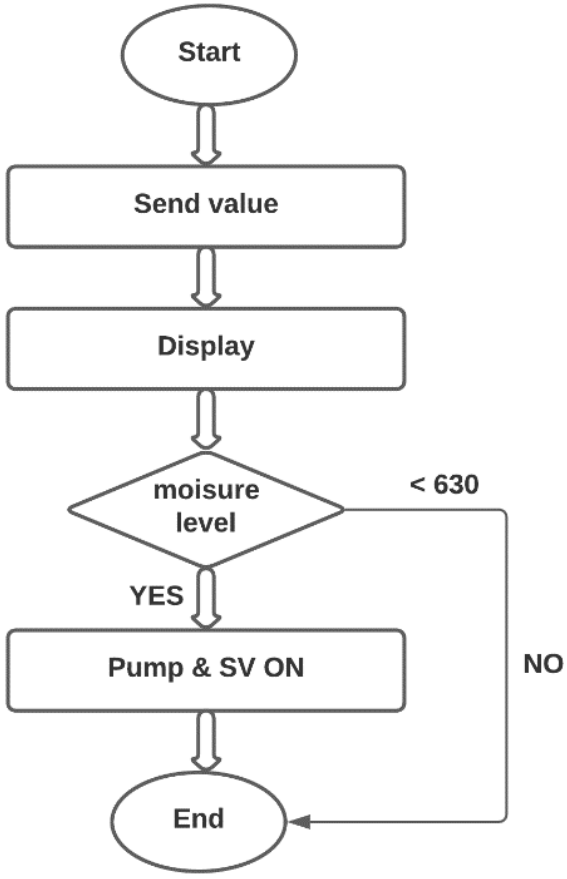

Fig 1: Flow diagram of soil moisture sensor

III. SYSTEM DESIGN

Diagram (Fig.2) gives the circuit diagram of whole system:

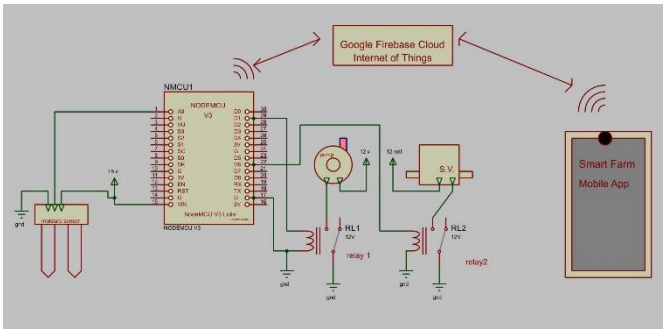

Fig 2: Circuit Diagram

System contains three components:

1. Field Hardware unit
2. Central Server Application
3. Android application

1. Field hardware unit

The hardware unit contain Sensor,ESP8266, motor pump, solenoid valve(SV), i.e.

Microcontroller which has in-build Wi-Fi support to connect to internet. Hardware unit having sensor and component.

ESP8266: The ESP8266 is a very user friendly and low cost device to provide internet connectivity to your projects. The module can work both as a Access point (can create hotspot) and as a station (can connect to Wi-Fi), hence it can easily fetch data and upload it to the internet making Internet of Things as easy as possible. It can also fetch data from internet using API's hence your project could access any information that is available in the internet, thus making it smarter. Another exciting feature of this module is that it can be programmed using the Arduino IDE which makes it a lot more user friendly.

Fig 3: ESP 8266

Capacitive soil moisture sensor: It's measures soil moisture levels by capacitive sensing rather than resistive sensing like other sensors on the market. It is made of corrosion resistant material which gives it an excellent service life. Insert it in to the soil around your plants and impress your friends with real-time soil moisture data! This module includes an on-board voltage regulator which gives it an operating voltage range of 3.3 ~ 5.5V. It is perfect for low-voltage MCUs, both 3.3V and 5V. This soil moisture sensor is compatible with our 3-pin "Gravity" interface, which can be directly connected to the Gravity I/O expansion shield.

Fig 4: Capacitive soil moisture sensor

Solenoid valve: The valve works with the solenoid coil which operates electronically with DC 12 volt supply. As it is a normally closed assembly, it opens the flow of fluids as soon as it is powered ON and stops/blocks the flow when the supply voltage removed.

Fig 5: Solenoid valve(SV)

DC pump: Smaller electric water pumps, such as the kinds used in homes, usually have small DC motors. The DC motor is contained in a sealed case attached to the impeller and powers it through a simple gear drive. In the center of the motor is a rotor with coils around it. Around those coils are magnets, which create a permanent magnetic field that flows through the rotor. When the motor turns on, electricity runs through the coils, producing a magnetic field that repels the magnets around the rotor, causing the rotor to spin around 180 degrees. When the rotor spins, the direction of the electricity in the coils flips, pushing the rotor again and causing it to spin the rest of the way around. Through a series of pushes, the rotor continues to spin, driving the impeller and powering the pump.

Fig 6: DC pump(12V)

2. Central Server Application

The Firebase component that is provided by App Inventor is super useful, especially when you need to update any number of apps with fresh data. In addition to using Firebase as a datastore, you can also leverage its website authentication in your apps to take care of your user management needs. This means, sign-up, email verification, and login. What is more, all the user information is stored and maintained on Firebases servers, so the most difficult problems of user authentication are solved for you.

Firebase is the bridge between ESP8266 and user application.

3. Android Application:

Farmer receives data which gives real-time sensor on the android application. Application support pump and solenoid valve ON/OFF control. And also show the level of moisture to farmer. Farmer also can operate solenoid valve and motor pump auto or manually.

Fig 7: login page

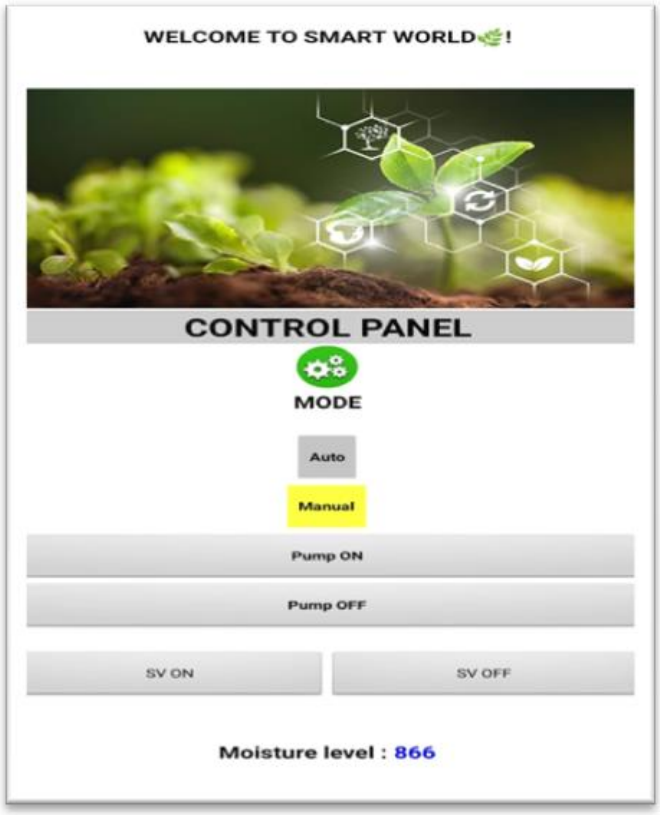

Fig 8: control panel

IV. CONCLUSTION

The application of agriculture networking technology is need of the modern agricultural development, but also an important symbol of the future level of agricultural development; it will be the future direction of agricultural development. After building the agricultural water irrigation system hardware and analyzing and researching the network hierarchy features, functionality and the corresponding software architecture of precision agriculture water irrigation systems, actually applying the internet of things to the highly effective and safe agricultural production has a significant impact on ensuring the efficient use of water resources as well as ensuring the efficiency and stability of the agricultural production. With more advancement in the field of IoT expected in the coming years, these systems can be more efficient, much faster and less costlier. In the Future, this system can be made as an intelligent system, where in the system predicts user actions, rainfall pattern, time to harvest, animal intruder in the field and communicating the information through advanced technology like IoMT can be implemented so that agricultural system can be made independent of human operation and in turn quality and huge quantity yield can be obtained.

V. ACKNOWLEDGMENT

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