SMART WEATHER BASED AGRICULTURAL SYSTEM POWERED BY IOT

Aditya Vikram[1]

[1]Student, School of Electronics and Communication Engineering, Vellore Institute of Technology. Vellore, Tamil Nadu, India

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Abstract - *In present days, in the field of agriculture farmers are facing serious issues in watering their yields. It's because they don't have proper idea about the availability of the power. Even if it is available, they need to pump water and wait until the field is properly watered, which compels them to stop doing other activities – which are more significant for them, and in this way they lose their valuable time and efforss. But, there is a solution to this problem– an automatic plant water system that helps farmers as well as others for watering their nurseries also. This automatic agricultural system detects the dampness level of the soil and automatically switches the irrigation system when the water content in farm is low. An appropriate utilization of water system is needed because of shortage of water in of absence of downpour adequate utilization of water is happen when there is impromptu utilization of water and so water doesn't go to waste. Therefore, we use this automatic plant watering system, and this system is exceptionally helpful in all climatic condition. Plus, system lets farmers view physical conditions of field sitting at comfort of his home.*

Key Words: **Internet of things, automatic watering system, cloud computing, Soil moisture sensor, Water level sensor, Humidity sensor, Temperature sensor**

1. INTRODUCTION

During the early days, farmers used to calculate the ripeness of soil and doubted if it would yield crops in good quantities. They didn't consider the humidity, level of water and particularly atmosphere condition which horrible a rancher progressively The Internet of things (IOT) is rebuilding the agriculture engaging the agriculturists through the broad scope of strategies, for instance, as well as practical farming to manage difficulties in the field. IOT modernization helps in gathering data on conditions like climate, dampness, temperature and productivity of soil. Crop online assessment enables discovery of weeds, level of water, bug area, animal break in to the field, trim turn of events, cultivation. IOT enables farmers to get connected with his home from any place and at whatever point. Remote sensor frameworks are used for watching the field conditions and smaller scope controllers are used to control and automate the agricultural processes. IOT advancement can reduce the expense and update the profitability of standard creating this type of system. To improve the productivity and thereby supporting both farmer and nation we used the development of system which evaluates

the nature of reap and also take necessary action on its own. The Internet of things (IOT) is patching up the agriculture by drawing in the farmers by the expansive collection of procedures, for example, accuracy and cultivation yeilds to go up against challenges in the field. IOT headway helps in party data on conditions like air, temperature and efficiency of soil, reap web watching engages area of weed, level of water, bug acknowledgment, animal interference in to the field, alter improvement, cultivation. IOT utilize farmers to get connected with the system from his residence from wherever and at whatever point. Remote sensor frameworks are used for checking the farm conditions and little scale controllers are used to control and actions the various actions of farming like automatic irrigation pump etc.

1.1 Related works

Kajal N. Dhawale, Dr. Narendra Bawan (2019) [1] proposed a paper in which the humidity and soil moisture sensors are placed in the root zone of the plant. Based on the sensed values the microcontroller is used to control the supply of water to the field. This system doesn't intimate the farmer about the field status.

Sonali D.Gainwar and Dinesh V. Rojatkar proposed a paper [2] in which soil parameters such as pH, humidity, moisture and temperature are measured for getting high yield from soil. This system is fully automated which turns the motor pump ON/OFF as per the level of moisture in the soil. The current field status is not intimated to the farmer.

V. R. Balaji and M. Sudha proposed a paper [3] in which the system derives power from sunlight though photo-voltaic cells .This system doesn't depend on electricity. The soil moisture sensor has been used and based on the sensed values PIC microcontroller is used to ON/OFF the motor pump. Weather forecasting is not included in this system.

R.Subalakshmi proposed a paper [4] to make irrigation system simpler, the complexities involved in irrigation is tackled with automation system using microcontroller and GSM. Based on the sensed values from soil moisture, temperature and humidity sensors, the GSM sends message to the farmer when these parameters exceed the threshold value set in the program. The nutrient content in the soil is not determined by this system.

Karan kansara proposed in [5] an automated irrigation system where the humidity and temperature sensors are used to sense the soil conditions and based on that microcontroller will control the water flow. Farmer will

be intimated through GSM. This system doesn't monitor the nutrient content in the soil .

C.H.Chavan and P.V.Karnade in [6] a smart wireless sensor network for monitoring environmental parameters using Zigbee. These nodes send data wirelessly to a central server, which collects data, stores it and allows it to be analyzed then displayed as needed and also be sent to the client mobile. Weather forecasting and nutrient content is not determined in this system.

G.Parameswaran and K.Sivaprasath in [7] proposed a smart drip irrigation system using IOT in which humidity, temperature and pH sensors are used. Irrigation status is updated to the server or local host using personal computer. The farmer can't access about the field condition without internet.

S.Reshma and B.A.Sarath in [8] proposed an IOT based automatic irrigation system using wireless sensor networks in which various sensors are used to measure the soil parameters. This system provides a web interface to the user to monitor and control the system remotely. Weather monitoring is not done in this system.

Joaquin Gutierrez in [9] proposed a gateway unit which handles sensor information, triggers actuators, and transmits data to web application. It is powered by photovoltaic panels and has duplex communication link based on cellular internet interface that allows for data inspection and irrigation scheduling to be programmed through web page.

2. Design Approach and Details

The Smart irrigation System has wide extension to robotize the total irrigation system. Here we are building an IoT based Irrigation System utilizing ESP8266 NodeMCU Module and DHT11 Sensor. It won't just consequently inundate the water dependent on the moisture level in the soil yet in addition send the Data to ThingSpeak Server to monitor the land condition. The System will comprise a water pump which will be utilized to sprinkle water on the land contingent on the land natural condition, for example, Moisture, Temperature and Humidity.
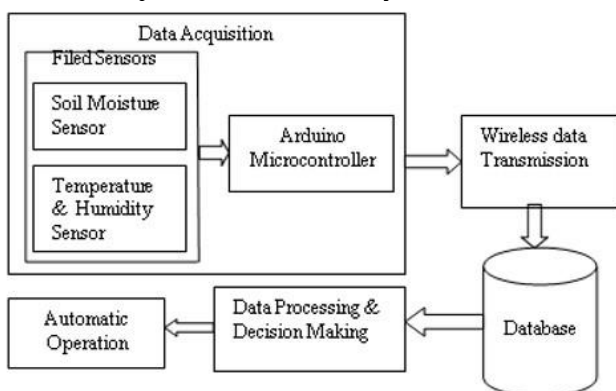

Fig -1: Block diagram of setup

Note that the various yields require diverse Soil Moisture, Temperature and Humidity Condition. So in this undertaking we are utilizing such a harvest which will require a soil moisture of around 30-35%. So when the soil loses its moisture to under 30% at that point Motor pump will turn on consequently to sprinkle the water and it will keep on sprinkling the water until the moisture goes upto 35% and after that the pump will be killed. The sensor information will be sent to ThingSpeak Server in characterized time frame with the goal that it very well may be checked from anyplace on the planet.
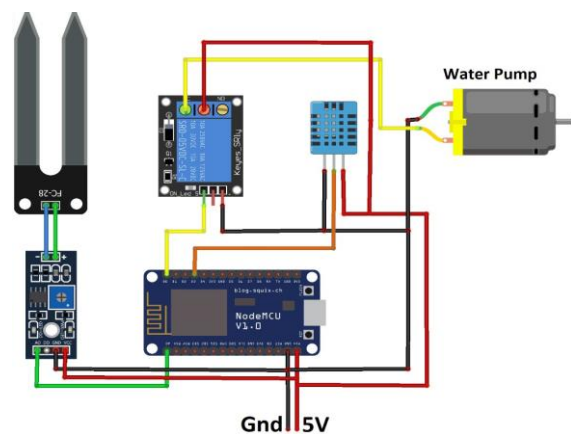

Fig -2: Circuit diagram

First the data about the agricultural field that is Temperature, Humidity and the Soil Moisture is sensed through two sensors deployed in the field that is DHT11 and the Soil Moisture Sensor and is send to the microcontroller that is NodeMCU. From there the data is send to the ThingSpeak cloud server by packing the data in suitable format and using API key generated, it is sent to the channel created there in cloud. There the data is processed and the control signal for the pump is send back to the NodeMCU to actuate the pump. Also the data is visualized in form of graphs at the thingspeak cloud using graphs. Now if the moisture content of the soil becomes less than 30% the pump is automatically switched on.

ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize and analyze live data streams in the cloud. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. ThingSpeak is often used for prototyping and proof of concept IoT systems that require analytics. We can create channels based on thee type of data. We can create as many required fields in each channel to visualise the data we need. After creating our channel there will be an API key with which we can share the data by encryption. The API key acts as an doorway to our channel for the data. We include this API key is given in the code for the NODEMCU to connect to the cloud. When the NODMECU connects to our channel it sends the data it takes in to the cloud. There are some predefined functions in this cloud such as visualising the data and creation of widgets. Here three widgets were created one for temperature,

humidity and pressure each where its real time data can be visualized.

3. RESULTS

The hardware was working as per the plans. The sensors connected to the NodeMCU is sensing the data such as humidity, temperature and the soil moisture that is placed in a remote agricultural field. The sensed data is then successfully sent to the microcontroller NodeMCU which then sends it to the ThingSpeak cloud server. There in the ThingSpeak cloud server the channel created is used to projected the data in form of Graphs which is used to analyse and visualize the data and also acts as a trigger to the pups attached to the NodeMCU as when the soil moisture content goes below 30%, the cloud sends a control signal to the NodeMCU to the pump switch on. When the moisture content of the soil goes above 35% the pump is automatically switched off It is important to notice here that the whole system is completely automated. Now the farmer has no need to repeatedly check the soil moisture content again and again and put the irrigation pumps on when the soil moisture content pros below a certain limits.

Now the system will automatically sense drop in soil moisture content and pumps the pump on automatically. The farmer can now analyze the data sitting at his/her home though the graph projections on ThingSpeak cloud and take the necessary decisions.
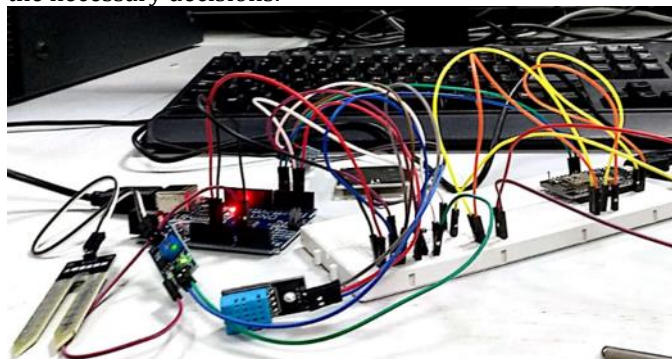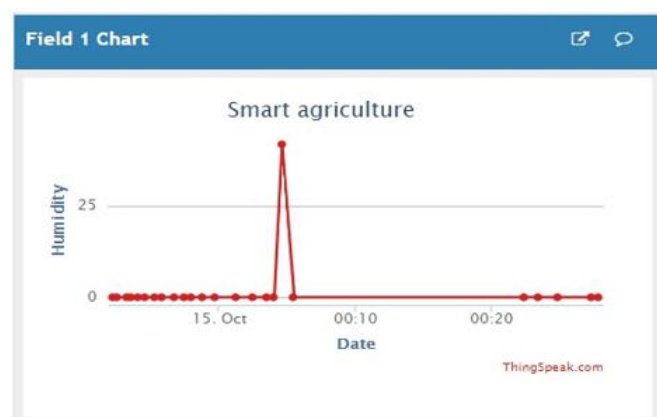

Fig -3: Hardware setup

Fig -4: Projection of humidity of soil on the ThingSpeak Cloud
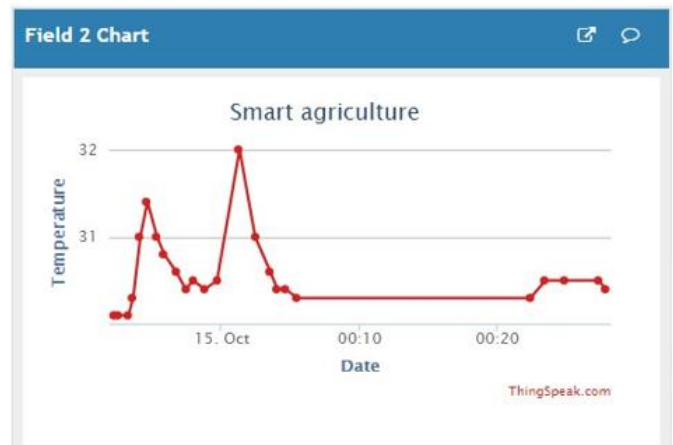

Fig -5: Projection of temperature of field on the ThingSpeak Cloud

Fig -6: Projection of moisture content of soil on the ThingSpeak Cloud

4. CONCLUSIONS

In this paper a smart agriculture system is made which is powered by internet of things. The system can be used in a modern-day farm. This system had made the process of farming fully automated. It senses the physical conditions of the farm like temperature, humidity and moisture content of the soil and sends that data to the cloud which can be viewed by the farmer sitting at the comfort of his home. The system automatically switches on the irrigation system whenever the water content of the soil becomes low.

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