IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

# Agriculture Monitoring And Prediction Using Internet Of Things (Iot)

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*Abstract:* Agriculture is a rapidly growing sector worldwide due to the increasing population. One of the main challenges in agriculture is improving farming efficiency and quality without constant physical monitoring to meet the rising food demand. Additionally, climate conditions pose significant challenges to the agricultural industry. The aim of this research paper is to propose a smart farming model based on the Internet of Things (IoT) using clustering techniques to address adverse conditions. In this model, various sensors such as soil moisture, temperature, rain detection, and humidity, water level sensors are utilized for different purposes. The collected data will be stored in the cloud and processed automatically. Smart agriculture can be adopted through crop control, data collection, and automated analysis. The purpose of this paper is to demonstrate how IoT can be implemented in monitoring humidity, soil conditions, temperature, water supply levels, and climate conditions. The proposed IoT-based Smart Farming System integrates different sensors and a Wi-Fi module to produce live data feeds that can be accessed online. Agriculture is very important for the growth of any country. However, even in today's technology-driven world, most farmers still use old-fashioned, manual methods of farming. To reduce the need for too much physical work and constant checking, this study introduces an automatic farming system using the Internet of Things (IoT).This system uses sensors and a small computer (like a Raspberry Pi) to monitor and control basic farming tasks such as: Watering plants, Turning lights on or off in greenhouses, Alerting farmers about important issues. The system also sends important information—like water levels, temperature, and humidity—to a central server and directly to farmers. This helps farmers keep track of their farms more easily and can also be useful for further research in agriculture. If many farms use this system, the collected data can help improve farming methods for everyone.

***Keywords* - IoT, Sensors, Cloud, Smart farming.**

## I. INTRODUCTION

Agriculture started on its own in many different places around the world. People in at least eleven different areas began farming without learning it from others. This happened around 12,000 years ago and was a big change in human life. Before farming, people moved from place to place to hunt and gather food. But with agriculture, they could stay in one place, grow their own food, and build permanent homes. "Starting around 3300 BC, during the Bronze Age, farming became more advanced in places like Mesopotamia, Egypt, Sudan, the Indus Valley, China, and Greece. Between 100 BC and 1600 AD, the world's population kept growing, and more land was used for farming. This is shown by the rise in methane from cattle and rice farming".

The Green revolution, also called the Third Agricultural revolution, was a time when new farming technologies led to much higher crop production. It began in rich countries in the early 1900s and spread around the world by the late 1980s.In the 1960s, farmers started using new types of cereal crops like dwarf wheat and rice that produced more food. But these crops needed more fertilizers, pesticides, and water to grow well. Farming also became more mechanized; meaning machines replaced some traditional methods. Modern agriculture using new ideas and technology in farming to grow more food using fewer natural resources like water, land, and energy. It helps farmers work more efficiently to feed the growing world population. Modern farming is also called agribusiness, intensive farming, organic farming, or sustainable agriculture, depending on the methods used.

Agriculture provides food, raw materials, and income for billions of people. For many, farming is not just a job—it's a way of life. Globally, around 2.5 billion people depend directly on agriculture for their livelihoods. The demand for agricultural products is growing because the world's population is increasing and more people have higher incomes. This means we need to produce more food to feed everyone.

For that we have to monitor agriculture effectively, and every time. This may be done by sensors, satellite communication. Gathering information about water content in soil, temperature, humidity, rain detection and other important parameters. Connecting this to Internet and getting information anywhere and anytime.

## II. RESEARCH METHODOLOGY

**Materials**: Components used in agriculture monitoring system are:

Temperature and Humidity Sensor (DHT11)
Liquid Crystal Display (LCD)
Water level sensor (HC-SR04)
Soil moisture sensor
Wi-Fi module (ESP8266)
LM393 Comparator (Rain detection sensor)
Buzzer
Regulator
5V Adaptor
Rain detection module
Arduino Atmega Uno board

**Method:** The system connects all the sensors to microcontroller (AurdinoATmega 328).This connected to wife module ESP8266.
At the USB cable port of AurdinoATmega 328 board we have to connect computer install and set aurdino software. After that write a code in C program language and upload it.
ThingSpeak is a platform providing various services exclusively targeted for building IoT applications. It offers the capabilities of real-time data collection, visualizing the collected data in the form of charts, ability to create plugins and apps for collaborating with web services, social network and other APIs. Here we have to create account by Email and password. Connect that to different sensor channels.
The system consists of five key components: soil moisture sensor, temperature and humidity sensor (DHT11), rain detection sensor, water level sensor, and an ESP8266 Wi-Fi module, all connected to an Arduino UNO microcontroller.
Sensors works based on their working principle and display the environmental changes.

All sensor data is collected by the Arduino UNO, The Arduino UNO acts as the central control unit of the system. It is responsible for collecting data from sensors, processing it, and then communicating the results to a Wi-Fi module (ESP8266), which uploads the data to a cloud platform such as ThingSpeak for remote monitoring and analysis.

**Data Acquisition from Sensors**

The Arduino UNO has 14 digital I/O pins and 6 analog input pins (A0–A5). In the agriculture monitoring system, different sensors are connected to these pins:
Soil Moisture Sensor (Analog): Measures the water content in soil and is connected to analog pin.
DHT11 Sensor (Analog): Measures air temperature and humidity. Its digital output is connected to digital pin.
Rain Detection Sensor (Analog): Detects rainfall and sends signals to digital pin.
Water Level Sensor (Analog): Monitors the level of water in a tank or canal and connects to analog pin.
The Arduino reads the values from these sensors periodically (every few seconds) using its built-in functions.

**Data Processing**

The raw sensor values collected by the Arduino are converted into meaningful readings:
Analog values are mapped to percentages or real-world unit.

**Data Transmission to IoT**

After processing the data: Arduino uses serial communication (UART) to send the data to a Wi-Fi module (ESP8266). It uses commands to instruct the ESP8266 to connect to Wi-Fi and send data to a cloud service like ThingSpeak via HTTP GET requests.

**Uploading to ThingSpeak**

The sensor readings are uploaded to a ThingSpeak channel, where they are: Stored in real time, Displayed as line graphs and charts, Made accessible remotely via browser or mobile. This enables the farmer to monitor crop and field conditions anytime, from anywhere.

| SL.No | Name of the component | Quantity | Amount (Rs) |
|---|---|---|---|
| 1 | Soil moisture sensor | 1 | 100 |
| 2 | Temperature and humidity sensor | 1 | 350 |
| 3 | Water level sensor | 1 | 500 |
| 4 | Rain detection sensor | 1 | 70 |
| 5 | Aurdino UNO board | 1 | 540 |
| 6 | 16×2 LCD display | 1 | 240 |
| 7 | Printed Circuit Board | 1 | 100 |
| 8 | Buzzer | 1 | 140 |
| 9 | 5v-2A DC power adaptor | 1 | 100 |
| 10 | Wi-Fi module | 1 | 1500 |
| 11 | Voltage regulator LM7805 | 3 | 375 |
| 12 | Glue gun | 1 | 50 |
| | **TOTAL** | | 4065 |

Table 1. Budget details **Total cost for this project is 4065Rs**

## III. RESULTS AND DISCUSSION

**IoT Communication Results:** Sensor data was transmitted via ESP8266 Wi-Fi module, Data successfully displayed on a web server ThingSpeak, System responds in real-time with minimal delay.

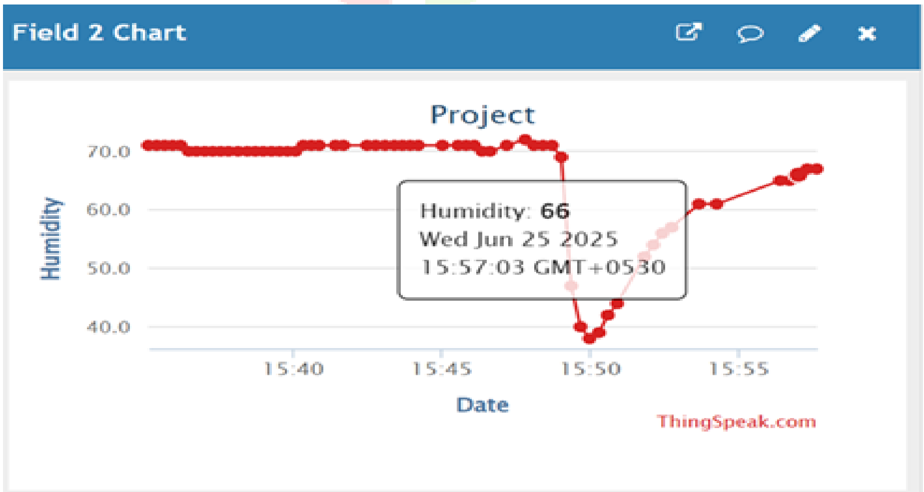
**To know the data fallowing steps to be fallowed:**

Connect the Wi-Fi by setting Wi-Fi name ESP8266 and password.

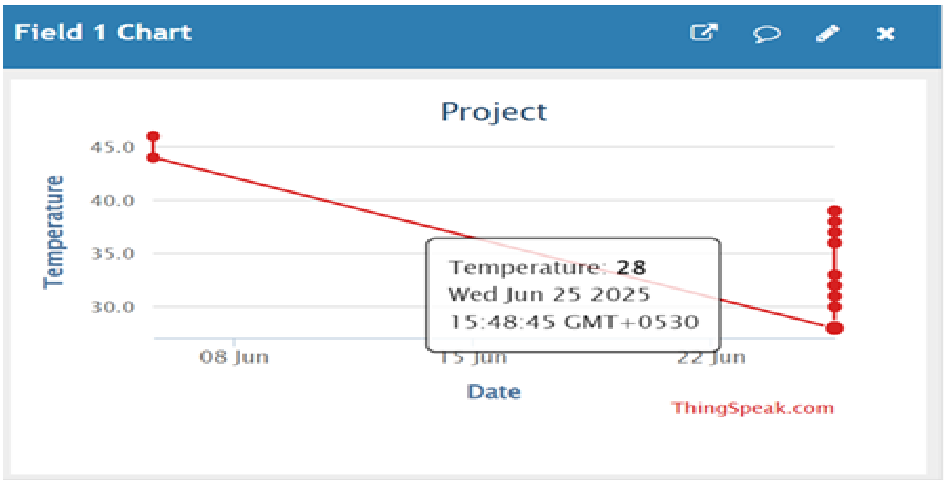
Go to thingspeak and login using Email ID and password. The environmental changes in respective sensors show in the form of graphs (real time plots).

**Graphs**

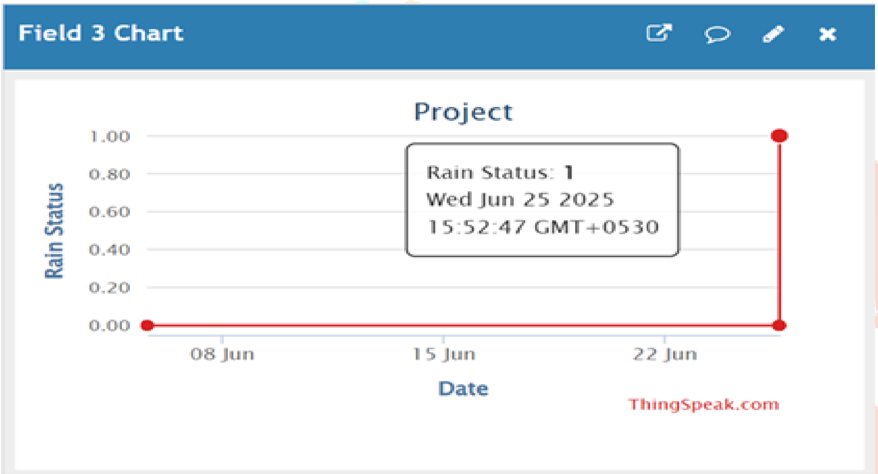
Temperature v/s Time

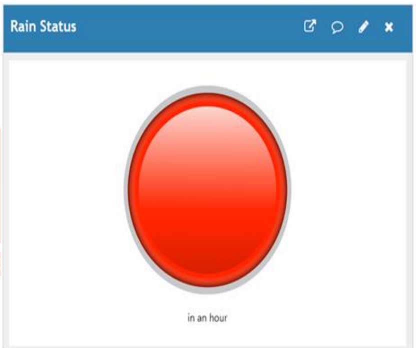


Humidity v/s Time

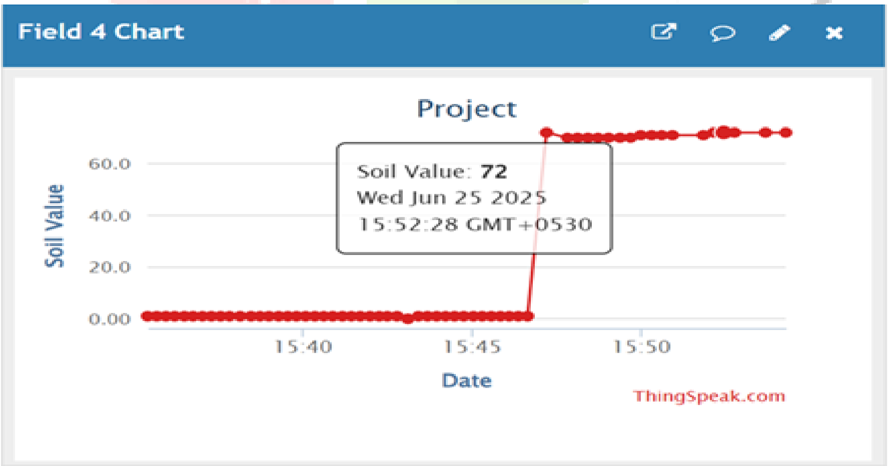



Rain status v/s Time

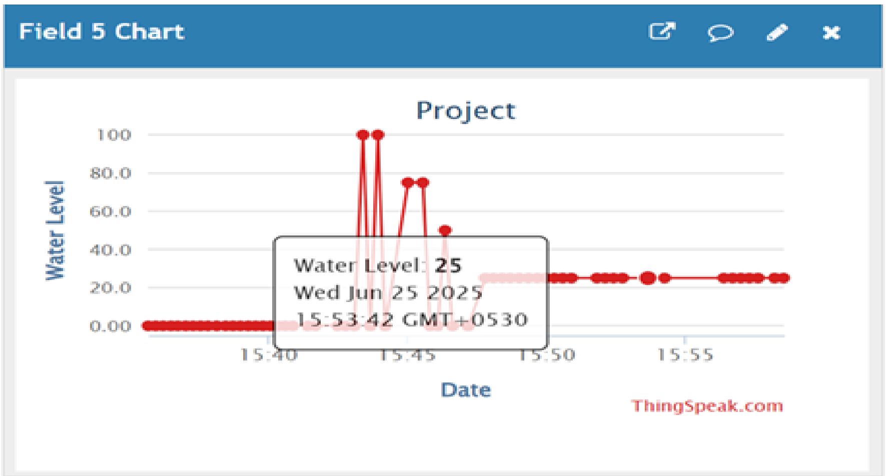



Soil moisture value v/s time



Water level v/s Time




## IV. CONCLUSION

The agriculture monitoring system using IoT with soil moisture sensors, temperature sensors, humidity sensors, water level and rain detection sensors is a powerful tool for modern farming. It helps farmers to: Monitor real-time field conditions. Make smart decisions about watering, fertilizing, and harvesting. Improve crop quality and quantity. Save water, energy, and time. Predict weather and prevent crop damage. In short, this system makes farming smarter, more efficient, and sustainable. It plays a key role in meeting the growing food demand and supports the future of digital and climate-smart agriculture.

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