IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

Fabracation Of Smart Agriculture Monitoring System By Using Iot Technology

[1]M.S.N.Satya Prasad , [2]P.Gopi , [3]CH.Naga Sai Santhosh Manikanta
[UG1,2,3]Students in Mechanical Engineering Dept., NRI Institute of Technology, Vijayawada, Andhra Pradesh, India – 521212.
[1]Dr. Emani Siva Krishna , Assistant Professor in Mechanical Engineering Dept., NRI Institute of Technology, Vijayawada Andhra Pradesh, India – 521212.

ABSTRACT: Manual irrigation is still widely used in agricultural field using traditional drip and can watering. However, traditional irrigation systems are in efficient and in exact, leading to either insufficient or excessive watering, human error and is potentially risky for rural areas. The scientific and technical improvement in this modern era has led to advancement in sensors and cloud computing technology. An attempt is being made to make use of them in irrigation field. Internet of Thighs (IoT) is one of such emerging technology which can be used in Agriculture. This paper focuses on the implementation of loT technology in agriculture to help farmers increase their productivity and reduce the cost of production. This system can be used to monitor irrigation, soil moisture, the humidity of the environment, soil nutrients and process data to study further.

KEYWORDS: IOT(Internet of things), DH11 Sensor, Soil moisture sensor, Microcontroller

1. INTRODUCTION

The agricultural sector is undergoing significant transformation with the advent of Internet of Things (IoT) technology. The increasing demand for food production, coupled with the need to reduce waste, conserve resources, and mitigate the impact of climate change, has necessitated the development of innovative solutions. This is where Smart Agriculture Monitoring Systems come into play.

2. LITERATURE REVIEW

Ritika Srivastava.et.al.(1): In this paper Uses sensors, microcontrollers, and mobile apps to monitor and manage agricultural fields. Sensors collect data on soil moisture, temperature, and humidity Microcontroller processes data and sends it to the cloud. Mobile app provides real-time access to data, enabling farmers to monitoring.

Sweta patel.et.al.,(2): In this paper system is a combination of hardware and Software and using the BLYNK app to control the system .By soil moisture sensor, DHT11 sensor, nodemcu8266 the farmer can control the system by using data of sensors to improve crop growth and hence demand for the future

D.Betteenasheryl Fernando.et.al.,(3): In this paper the advance technology like sensors, remote sensing, GPS for increasing the quantity & quality of the crop. information about environmental factors such as temperature, moisture, humidity by this sensors finding the field and live data of environment on various devices like smartphones. All these values are sent to the mobile phone using Wi-Fi technology.By the moblie app on and off of the syetem .Due to the usage of this system, water is pumped to crops .

Swapna peravali.et.al.,(4): In this paper Wireless Sensor network in the process of development in smart agriculture can be used to monitor the changes in environmental conditions such as climate,humidity, Temperature.By the iot technology we can upgrade the agriculturing wireless sensor networks are used to identify the Data of environment. So, farmers can monitor their crop on Smartphone or on computers. these systems help to increase the crops like Rice, wheat and other agricultural production in India.

Jaya Kumar.et.al.,(5): In this paper the system offers a practical and effective solution for farmers to monitor and optimize the growth of their crops. By collecting and analyzing data on various environmental factors such as temperature, humidity, soil moisture. By this sensors the finding the real time data of environment and by the mobile app like BLYNK farmers can Operation the system by phone . The farmers able to control the watering in the field by this System increases of agriculture crops.

Rodrigo Filev Maia.et.al.,(6): In this paper the smart management of freshwater for precision irrigation in agriculture is essential for increasing crop yield and decreasing costs, while contributing to environmental sustainability. The intense use of technologies offers a means for providing the exact amount of water needed by plants. The Internet of Things (IoT) is the 5 natural choice for smart water management applications, even though the integration of different technologies required for making it work seamlessly in practice is still not fully accomplished. The SWAMP project develops an IoT-based smart water management platform.

Jaime Lloret Published.et.al.,(7): In this system the water management is paramount in countries with water scarcity. This also affects agriculture, as a large amount of water is dedicated to this use. The rising concerns about global warming have led to the consideration of creating water management measures to ensure the availability of water for food production and consumption. Thus, the researches on water usage reduction for irrigation have increased over the years. In this paper, we have provided an overview of the actual state of the art regarding IoT irrigation systems for agriculture. We have identified the most monitored parameters to characterize water quality for irrigation, soil and weather conditions. We have also identified the most utilized nodes to implement IoT and WSN systems for the irrigation of crops and the most popular wireless technologies. Furthermore, the current trends in the implementation of IoT systems for crop management and irrigation have been discussed as well. We have provided a 4-layer architecture proposal as well for the management of crop irrigation.

Silvia Liberata Ullo Published.et.al.,(8): In this paper has presented an extensive and critical review of research studies on various environment monitoring systems used for different purposes. The analysis and discussion of the review suggested major recommendations. The need of extensive research on deep learning, handling big data and noisy data issues, and a framework of robust classification approaches has been realized. We have focused mainly on water quality, and air quality monitoring as smart agriculture systems that can deal with environmental challenges. The major challenges in implementation of smart sensors, Al and WSN need to be addressed for sustainable growth through SEM. The participation of environmental organizations, regulator bodies and general awareness would strengthen SEM efforts. The poor quality of sensory data can be preprocessed using appropriate filters and signal processing methods to make the data more suitable for all subsequent tasks associated in SEM. The future scope of the work aims at studying other factors of environment such as sound pollution and disasters etc.

Mohamed Riduan Abid.et.al.,(9): In this paprer it is an open access article under the CC BY-NC-ND license this study enabled the development and evaluation of an intelligent real-time irrigation system incorporating cutting-edge technologies such as embedded systems, IoT, HTTP, SSE, HTML, and CSS. The main objective was to optimize the management of agricultural irrigation through the use of real-time data, thereby aiming to maximize the 6 efficiency of water resource use while minimizing environmental impact. The results obtained confirmed that our approach enables precise monitoring of climatic conditions and the specific needs of crops, thereby facilitating better-informed decision-making. Using the ESP32 microcontroller and specialist sensors such as the DHT22, as well as soil moisture and water level sensors, our system enables continuous and reliable data collection, essential for adjusting irrigation in real-time. The integration of the SSE protocol ensures that data is updated automatically and regularly via an intuitive user interface, increasing operational efficiency and reducing the costs associated with manual irrigation

Vijendra Kumar.et.al.,(10): The application of IoT technology in agriculture pre-sents numerous opportunities to revolutionize farming practices. Through smart irrigation, precision farming, crop and soil monitoring, smart greenhouses, supply chain management, livestock monitoring, agricultural drones, and pest and disease management, farmers can enhance efficiency, productivity, and sustainability. Key findings from this review highlight the transformative potential of IoT technology in agriculture. By enabling informed decision-making and optimizing resource usage, IoT facilitates precision agriculture, allowing for tailored adjustments to maximize crop yield while minimizing inputs. Moreover, cost savings are achieved through efficient resource utiliza-tion and predictive maintenance practices. Enhanced sustainability is promoted through reduced environmental impact and the conservation of resources. Furthermore, improved livestock management, facilitated by IoT, leads to better health monitoring and productivity.

3.METHODOLOGY

The basic building blocks of anloT System are Sensors, Processors and applications. So the block diagram below is the proposed model of our project which shows the interconnection of these blocks. The sensors are interfaced with Microcontroller, data from the sensor is displayed on the mobile app of the user. Mobile app provides an access to the continuous data from sensors and accordingly helps farmer to take action to fulfil the requirements of the soil.

3.1 BLOCK DIAGRAM

shows the basic blocks of the proposed system for IoT based agriculture monitoring. The sensors for identification of various parameters affecting the crop are shown affecting the crop are shown in the figure. The

Water level sensor mainly detects the rainfall related information and its effect on the crop can be studied. Temperature and moisture sensors are used for real time monitoring of the parameters. The water pump is controlled through ATMEGA 2560 microcontroller. Wi-Fi module enables the storage of real time parameters on cloud. The parameters can also be displayed on the LCD on real time basis. The feedback signal is useful to control the operation of the pump there by controlling the flow of water. The system is found suitable to11 control the water flow depending upon the need of the cultivation. The programming enables the operations in different environments and various soil types to control the water flow. The moisture of the soil is checked through the sensor and the flow of water can be controlled through the circuit.

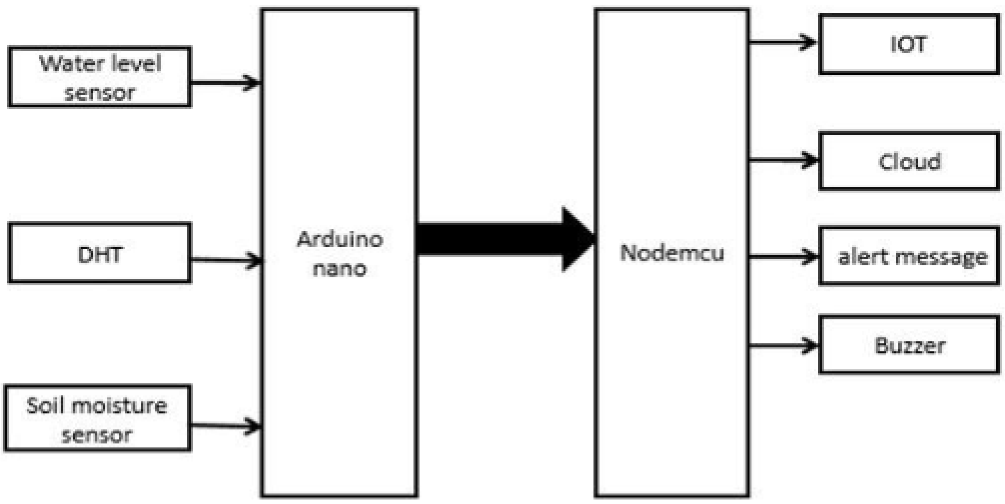

Fig-3.1 - Block Diagram

3.2 HARDWARE REQUIREMENTS

• Arduino UNO Microcontroller
• Node MCU module.
• Power Supply unit
• Water level
• DHT
• Soil Moisture sensor

3.3 SOFTWARE REQUIREMENTS

• Arduino IDE

3.4 CODE DEVELOPED:

```
#include <ESP8266WiFi.h>
#include <SPI.h>
#include <Wire.h>h
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>
#include <DHT.h> // Including library for dht
#define SCREEN_WIDTH 128 // OLED display width, in pixels
#define SCREEN_HEIGHT 64 // OLED display height, in pixels
#define OLED_RESET -1 // Reset pin # (or -1 if sharing Arduino reset pin)
#define DHTPIN D4 //pin where the dht11 is connected
DHT dht(DHTPIN, DHT11);
```

```
String apiKey = "C25ICK6FHOR7PST4"; // Enter your Write API key from ThingSpeak
const char *ssid = "MySmartHome"; // replace with your wifissid and wpa2 key
const char *pass = "nRF52840";
const char* server = "api.thingspeak.com";
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, OLED_RESET);
const int AirValue = 790; //you need to replace this value with Value_1
const int WaterValue = 390; //you need to replace this value with Value_2
const int SensorPin = A0;
int soilMoistureValue = 0;

int soilmoisturepercent=0;
int relaypin = D5;
WiFiClientclient;
void setup() {
Serial.begin(115200); // open serial port, set the baud rate to 9600 bps
display.begin(SSD1306_SWITCHCAPVCC, 0x3C); //initialize with the I2C addr 0x3C (128x64)
display.clearDisplay();
pinMode(relaypin, OUTPUT);
dht.begin();
WiFi.begin(ssid, pass);
while (WiFi.status() != WL_CONNECTED)
{
delay(500);
Serial.print(".");
}
Serial.println("");
Serial.println("WiFi connected");
delay(4000);
}
void loop()
{
{
float h = dht.readHumidity();
float t = dht.readTemperature();
Serial.print("Humidity: ");
Serial.println(h);
Serial.print("Temperature: ");
Serial.println(t);
soilMoistureValue = analogRead(SensorPin); //put Sensor insert into soil
Serial.println(soilMoistureValue);
soilmoisturepercent = map(soilMoistureValue, AirValue, WaterValue, 0, 100);
if(soilmoisturepercent> 100)
Serial.println("100 %");
display.setCursor(0,0); //oled display
display.setTextSize(2);
display.setTextColor(WHITE);
display.print("Soil RH:");
display.setTextSize(1);
display.print("100");
display.println(" %");
display.setCursor(0,20); //oled display
display.setTextSize(2);
display.print("Air RH:");
display.setTextSize(1);
display.print(h);
display.println(" %");
display.setCursor(0,40); //oled display
```

```
display.setTextSize(2);
display.print("Temp:");
display.setTextSize(1);
display.print(t);
display.println(" C");
display.display()
delay(250);
display.clearDisplay();
}
else if(soilmoisturepercent<0)

{
Serial.println("0 %");
display.setCursor(0,0); //oled display
display.setTextSize(2);
display.setTextColor(WHITE);
display.print("Soil RH:");
display.setTextSize(1);
display.print("0");
display.println(" %");
display.setCursor(0,20); //oled display
display.setTextSize(2);
display.print("Air RH:");
display.setTextSize(1);
display.print(h);
display.println(" %");
display.setCursor(0,40); //oled display
display.setTextSize(2);
display.print("Temp:");
display.setTextSize(1);
display.print(t);
display.println(" C");
display.display();
delay(250);
display.clearDisplay();
}
else if(soilmoisturepercent>=0 &&soilmoisturepercent<= 100)
{
Serial.print(soilmoisturepercent);
Serial.println("%");
display.setCursor(0,0); //oled display
display.setTextSize(2);
display.setTextColor(WHITE);
display.print("Soil RH:");
display.setTextSize(1);
display.print(soilmoisturepercent);
display.println(" %");
display.setCursor(0,20); //oled display
display.setTextSize(2);
display.print("Air RH:");
display.setTextSize(1);
display.print(h);
display.println(" %");
display.setCursor((0,40); //oled display
display.setTextSize(2);
display.print("Temp:");
display.setTextSize(1);
```

```
display.print(t);
display.println(" C");
display.display();
delay(250);
display.clearDisplay();
}
if(soilmoisturepercent>=0 &&soilmoisturepercent<= 30)
{
digitalWrite(relaypin, HIGH);

Serial.println("Motor is ON");
}
else if (soilmoisturepercent>30 &&soilmoisturepercent<= 100)
{
digitalWrite(relaypin, LOW);
Serial.println("Motor is OFF");
}
}
if (client.connect(server, 80)) // "184.106.153.149" or api.thingspeak.com
{
String postStr = apiKey;
postStr += "&field1=";
postStr += String(soilmoisturepercent);
postStr += "&field2=";
postStr += String(h);
postStr += "&field3=";
postStr += String(t);
postStr += "&field4=";
postStr += String(relaypin);
postStr += "\r\n\r\n\r\n\r\n";
client.print("POST /update HTTP/1.1\n");
client.print("Host: api.thingspeak.com\n");
client.print("Connection: close\n");
client.print("X-THINGSPEAKAPIKEY: " + apiKey + "\n");
client.print("Content-Type: application/x-www-form-urlencoded\n");
client.print("Content-Length: ");
client.print(postStr.length());
client.print("\n\n");
client.print(postStr);
}
client.stop();
```

4. FABRICATION

This chapter we are discussing about the required components to the system like microcontroller,DH11 sensor,Arduino and frabrication.

4.1 ARDIUNO BOARD

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources. This guide covers the Arduino Uno board (Spark)fun DEV-09950, $29.95), a good choice for students and educators. With the Arduino board, you can write programs and create interface circuits to read switches and other sensors, and to control motors and lights with very little effort. Many of the pictures and drawings in this guide were taken from the documentation on the This is what the Arduino board looks like.

Fig-4.1- Arduino

4.2 ARDUINO SOFTWARE

This Arduino Software is done by the following steps give below which includes 5 steps to process the code.
1. Open Arduino IDE as shown below Open Arduino IDE.
2. Select the COM Port from tool Select the COM Port.
3. Select the required Arduino board from Tools as shown below Select the required arduino broad
4. Write the sketch in Arduino IDE Sketch in Arduino DE.
5. Compile and upload the Sketch to Arduino board upload the Sketch to Arduino board

4.3 COMPONENTS USED

4.3.1 DHT11 SENSOR
4.3.2 OLED DISPLAY
4.3.3 RELAY MODULE
4.3.4 SOIL MOISTURE SENSOR
4.3.5 MOTOR
4.3.6 MICRO-CONTROLLER ESP8266
4.3.7 BOARD

4.3.1 DHT11 SENSOR

This DHT11 sensor can be used in smart irrigation agriculture with IoT as it measures temperature and humidity essential for monitoring environmental conditions.

Fig-4.3.1 - DHT11 SENSOR

4.3.2. DISPLAY

This display which can used to display the Real-time data such as temperature , humidity ,light and soil moisture.

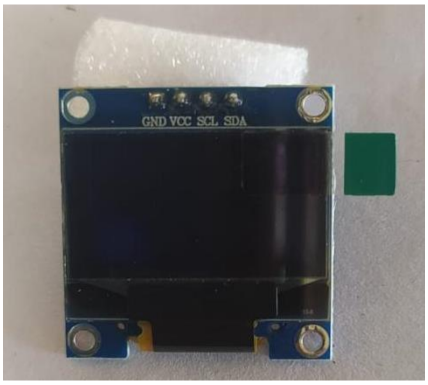

Fig-4.3.2 - Display

4.3.3 Relay module

This is a relay module is an electric Component that acts as a switch to Control voltage device like motor

Fig-4.3.3 Rely Module

4.3.4. Soil moisture sensor

A soil moisture sensor measures the moisture levels in the soil. It directly kept in the soil, and it measures the content in soil.

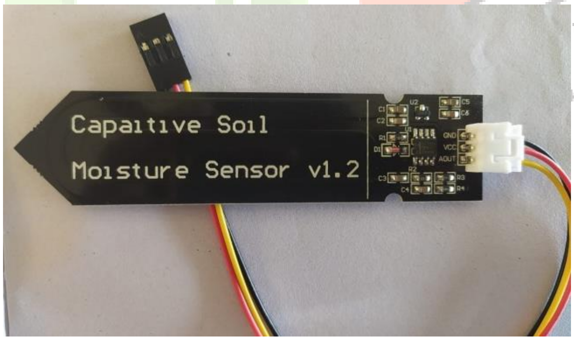

Fig-4.3.4 Soil Moisture Sensor

4.3.5. MOTOR

A motor a device that converts electrical energy into mechanical energy. motor can be used to control irrigation system.

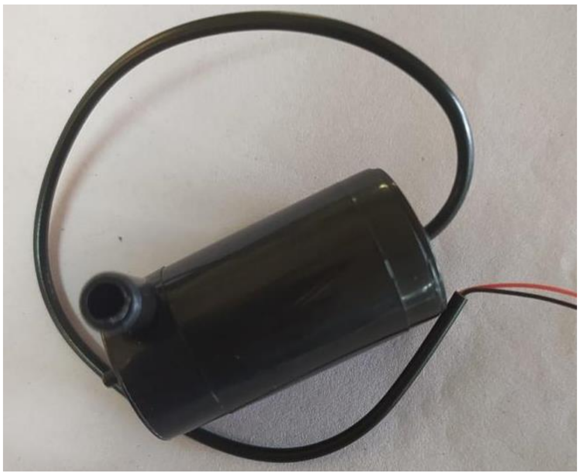

Fig-4.3.5 – Motor

4.3.6 MICRO-CONTROLLER ESP8266

A microcontroller is a small computer that controls external devices. Microcontrollers can be used to read sensor data, and it is to control and communicate with other devices.

Fig-4.3.6 – Micro Cotroller ESP8266

4.3.7 BOARD

This breadboard can be used in a smart agriculture IoT project for prototyping circuits to connect sensors, microcontrollers, and other components without soldering.

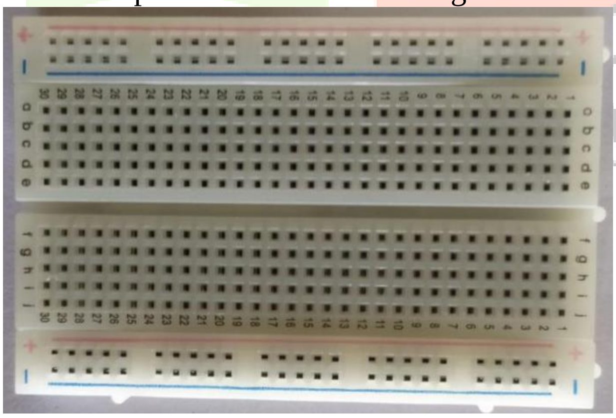

Fig-4.3.7 – Board

5. TESTING:

The fabricated smart agriculture monitoring system successfully integrates IoT technology to enhance real-time monitoring and automation in agricultural practices. The system consists of various sensors, including temperature, humidity, soil moisture, and pH sensors, which effectively collect environmental data and transmit it to a cloud-based platform. The data is then processed and visualized through a user-friendly interface, allowing farmers to make informed decisions regarding irrigation, fertilization, and other critical farming operations.

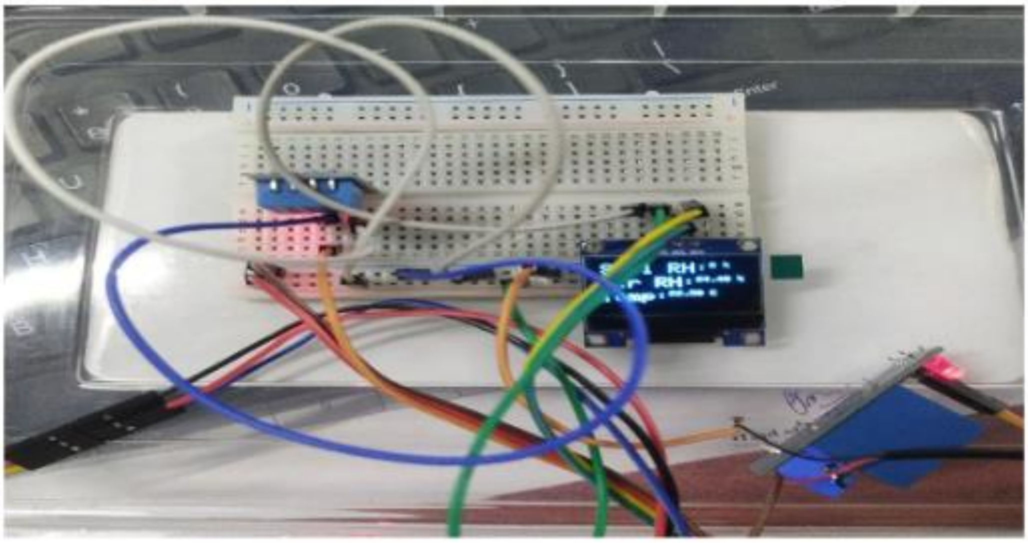

Fig-5.1 - Testing of Components

Fig-5.2 - Testing on Plant

During the testing phase, the system demonstrated efficient data acquisition and transmission with minimal latency. The real-time monitoring capabilities ensured that anomalies in environmental conditions were promptly detected, reducing potential risks to crops. The automated irrigation system, based on predefined thresholds, optimized water usage, leading to resource conservation and improved crop yield.

Additionally, remote accessibility through a mobile application or web-based dashboard provided convenience to farmers, allowing them to monitor and control agricultural activities from any location. The integration of predictive analytics further enhanced the decision-making process, providing insights into weather patterns and soil health conditions.Overall, the results indicate that the fabricated smart agriculture monitoring system significantly improves efficiency, resource management, and productivity in agricultural practices.

6.RESULT AND DISCUSSION

In this chapter we are discussing about the result and the discussion of the system. The fabricated smart agriculture monitoring system successfully integrates IoT technology to enhance real-time monitoring and automation in agricultural practices. The system consists of various sensors, including temperature, humidity, soil moisture, and pH sensors, which effectively collect environmental data and transmit it to a cloud-based platform. The data is then processed and visualized through a user-friendly interface, allowing farmers to make informed decisions regarding irrigation, fertilization, and other critical farming operations.

During the testing phase, the system demonstrated efficient data acquisition and transmission with minimal latency. The real-time monitoring capabilities ensured that anomalies in environmental conditions were

promptly detected, reducing potential risks to crops. The automated irrigation system, based on predefined thresholds, optimized water usage, leading to resource conservation and improved crop yield.

Additionally, remote accessibility through a mobile application or web-based dashboard provided convenience to farmers, allowing them to monitor and control agricultural activities from any location. The integration of predictive analytics further enhanced the decision-making process, providing insights into weather patterns and soil health conditions.

Overall, the results indicate that the fabricated smart agriculture monitoring system significantly improves efficiency, resource management, and productivity in agricultural practices. The system's scalability and adaptability make it suitable for various agricultural environments, demonstrating its potential for widespread implementation in smart farming applications.

6.1 THING SPEAK

Thing Speak is an IoT analytics platform that lets you collect, store, visualize, and analyze data from devices connected to the internet. It's often used for prototyping and testing IoT systems.

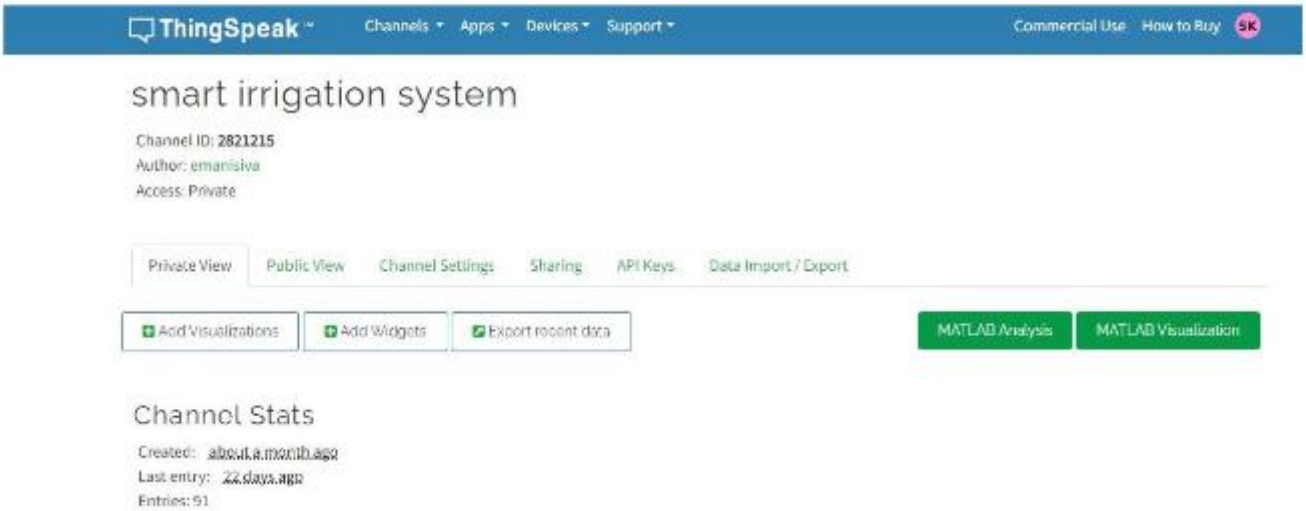

Fig-6.1 - Think Speak

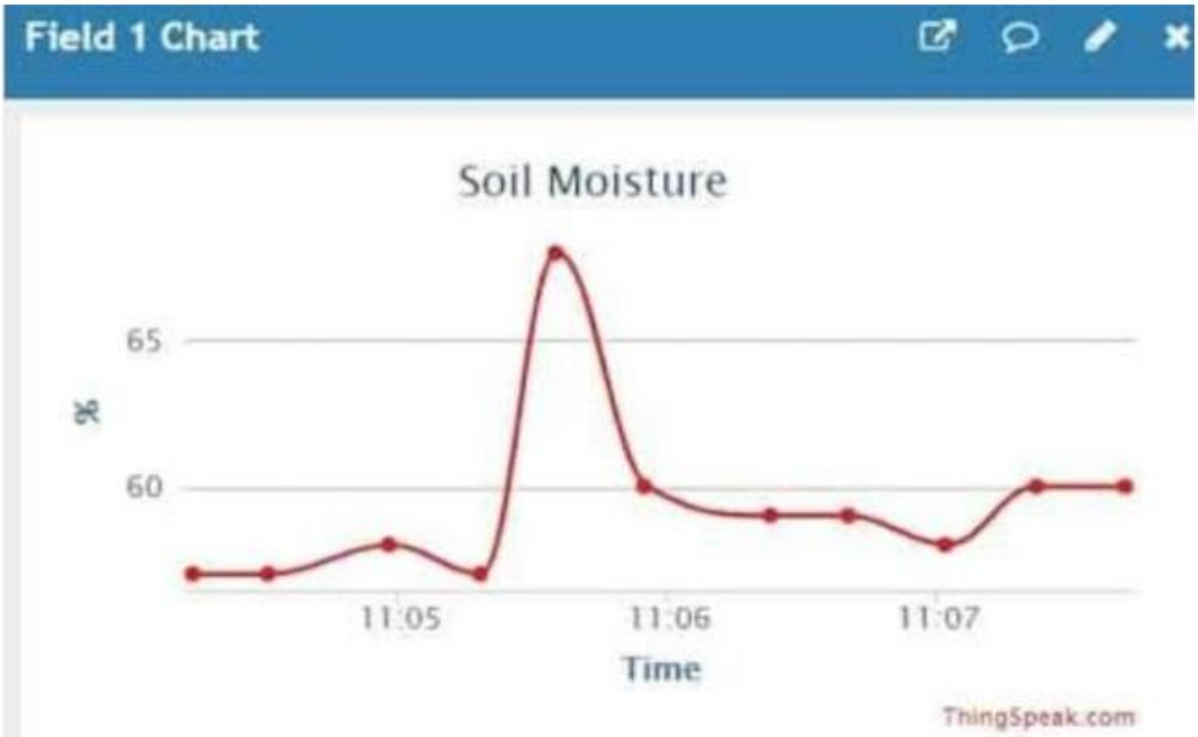

Fig-6.2 - Graph of Soil Moisture

Fig-6.3 - Graph of air quality

Fig-6.4 - Graph of temperature

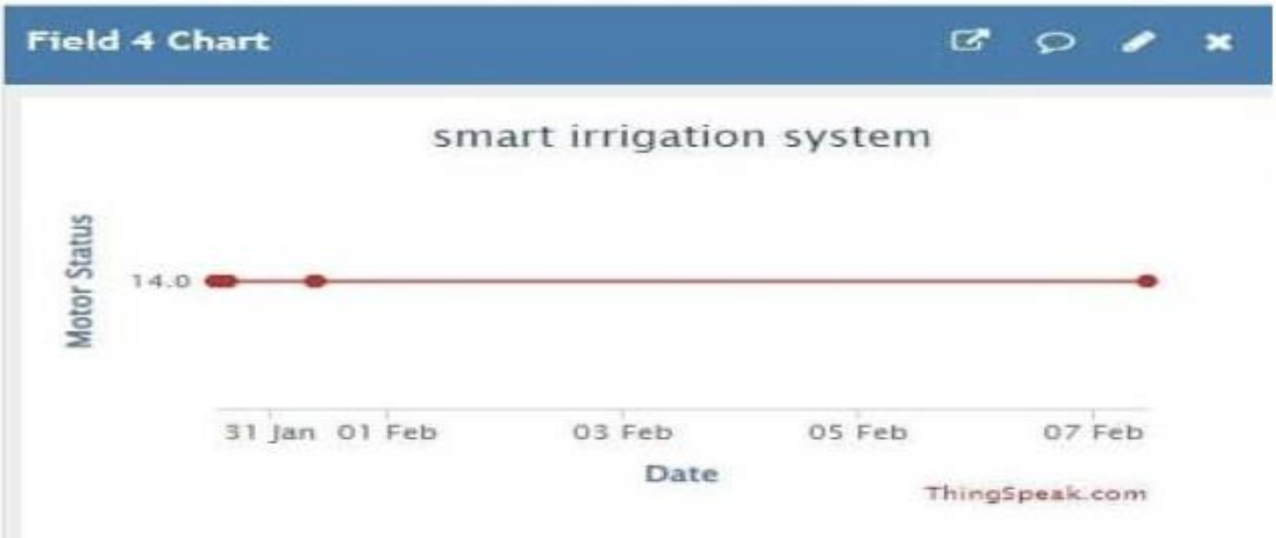

Fig-6.5 - Graph of Motor Status

Showing the variation of soil moisture, motor, humidity and temperature respectively with time. These graphs depict the real time data acquired on thing speak.

7. CONCLUSION

In conclusion, a Smart Agriculture Monitoring System using IoT (Internet of Things) has the potential to revolutionize modern farming practices. By integrating various IoT devices such as sensors, drones, and GPS systems, farmers can monitor critical factors like soil moisture, temperature, humidity, and crop health in real time. This not only improves crop yields by ensuring optimal growing conditions but also reduces the use of water, fertilizers, and pesticides, leading to more sustainable farming practices. The system enhances operational efficiency through automated processes, reducing the need for manual laber and minimizing human error. It also provides valuable data analytics that help farmers make informed decisions regarding crop management, irrigation scheduling, and pest control, which can ultimately increase profitability.

IoT-based agriculture systems contribute to the broader goal of global food security by optimizing resource use, reducing waste, and ensuring that food production meets the increasing demand of a growing population. As the technology continues to evolve, smart agriculture powered by IoT is poised to be a key driver in the future of farming, promoting environmental sustainability and economic growth.

8. REFERENCES

1.Ritika Srivastava, VandanaSharma, VishalJaiswal, Sumit Raj, “Smart agriculture using IoT”, International research Journal of Engineering and technology, ISSN-2395-0056, Volume 7, Issue 7, Page no:2708-2710, Year:july 2022.

2.Sweta patel, Hiraldesai , karuna soni,swami, “Iot based smart agriculture monitoring system“, International journal of scientific research in computer science, engineering and information technology, ISSN:2456-3307, volume 10, issue 4, Page no:18-22, Year:july-aug-2024.

3.D.Betteena Sheryl Fernando, M.Sabarishwaran, R.Ramyapriya, S.Santhoshini, “Smart agriculture monitoring system using iot”, International journal of scientific research &engineering trends, ISSN:2395-566X, volume 6, Issue 4, Page no:2212-2216, Year:july-aug-2020.

4.Swapnaperavali, Adithyavadapalli, Venkataraodadi, “Smart agriculture system using iot technology”, International journal of advance research in science and engineering, ISSN:2319-8354, volume 9, issue 9, Page no:9-18, Year:sep-2020.

5.Jayakumar, Neveenperumal, Methini, Karthikeyan, “Smart agriculture using iot”, Journal of emerging technologies and innovative research, ISSN:2349-5162, Volume 6, Issue 6, Page no:92-98, Year:june 2019.

6.Carloskamienski, Juha-pekkasoininen, markustaul, Ramidedantas, Attiliotoscano, Tilliosalmon cinotti, Rodrigofeilevmaia, Andre torreneto, “smart water management platform:IOT based precision irrigation for agriculture”, Sensors , doi:10.3390/s19020276, Volume 19, Issue 23, Page no:1-20, Year:2019.

7.Laura Garcia, Lorenaparra, JoseM.Jimenez, Jaimelioret and Pascal Lorenz, “IoT based smart irrigation system: An overview on the recent trends on sensors and IoT systems for irrigation in precision agiculture“, Sensors, Volume20, Issue10, doi:10.3390/s20041042, Page no:1-8, Year:2020.

8.Silvia liberate ullo, G.R.Sinha, “Advance in smart environment monitoring systems using IoT and sensors”, Sensors, Volume-20, Issue-3, doi:10.3390/s20113113, Page no:1-8, Year:2020.

9.Abdennabi morchid, Bouali Et-taibi, Zahraoughannou, Rachid El Alami, El-Mahjoub boufounas, Mohamedridunabid, "IoT-enabled smart agriculture for improving water management: A smart irrigation control using embedded systems and server sent events", Science African, Volume 27, Issue 27, ISSN-2527-2726, Page no:1-7, Year:2025.

10.Vijendra Kumar, Kul Vaibhav Sharma, NareshKedam, AnantPatel, Tanny Ram Kate, Upaka Rathnayake, "A comprehensive review on smart and sustainable agriculture using IoT technologies", ELSEVIER,Smart agriculture technology, Volume 8, Issue 8, ISSN:4087-4134, Page no: 1-23, Year-2024.