Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

# Innovative Product Development Report

***on***

# Smart Agriculture Monitoring System using IOT

SUBMITTED BY


| Name | SAP ID |
|---|---|
| Diksha Patel | 60002210070 |
| Suvasi Sheth | 60002220244 |
| Trupti Gami | 60002220311 |

*Under the guidance of*

Ranjushree Pal

**DEPARTMENT OF**

**ELECTRONICS AND TELECOMMUNICATION ENGINEERING**

**Academic Year: 2023-2024**

**Shri Vile Parle Kelavani Mandal's**

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# Department of Electronics and Telecommunication Engineering

This is to certify that

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Students of **Electronics and Telecommunication Engineering** have successfully completed their Innovative Product Development-IV required for the fulfillment of **SEM VI** during the first half of the year 2024. The project report has been assessed and found to be satisfactory.

**Internal Guide** **External Guide**

**Head of Department** **Principal**

**Internal Examiner** **External Examiner**

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# ABSTRACT

**Agriculture can become smart agriculture (IoT) with the use of advanced wireless networks and the Internet of Things. Crop demand rises in tandem with the growth of the human population. Food security will be increased by a smart agriculture system's understanding of environmental temperature, humidity, and soil moisture measurement through real-time monitoring. Furthermore, crop output, water waste, and productivity can all be increased through smart agriculture. This study suggests smart agriculture as a solution, which makes use of real-time, sensor-based monitoring devoid of human intervention. All sensor data is captured and monitored continuously, from any location within the internet's coverage area, and users have direct access to real-time data. This study quantifies the effects of temperature, humidity, and soil moisture on agricultural yield. We can gather data from wireless sensor networks by using an Internet of Things (IoT)-based farm monitoring system. The data is transmitted via wireless protocol. The three sensors will provide data to the system upon implementation, which will then be transmitted to the ThingSpeak interface for display of temperature, humidity, and soil moisture content data. A temperature is frequently a set point that is supported by the type of crops that are grown. The farmers can utilize smart gadgets to access the information.**

***Keywords- Internet of things, Cloud, Wi-Fi, wireless sensor network, ESP32.***

# INTRODUCTION

Every country's cornerstone is its agriculture, which also contributes to the country's GDP. In order to increase crop productivity, it is crucial to fortify the agricultural sector by improving technology and system efficiency. Stated differently, the nation's growth and the impact it has on the average citizen's level of living are both facilitated by the modern agriculture sector. One major difficulty facing this industry is providing people's food demands while increasing crop output, quality, and quantity without the need for manual monitoring. The Internet of Things is a crucial part of a smart system. The idea of the internet of things (IoT) allows a device to communicate data via a network without the need for human interaction. The sensors that are affixed to the chosen object produce the data. Furthermore, real-time crop monitoring is made possible by embedded systems, like those found in smart agricultural systems, which leads to more productive crop growth. A farmer using smart agriculture can maximize yield and maintain the availability of food. Increasing food security can also be achieved through the use of precision agriculture in intelligent agriculture. This is because the crop's quality and yield will increase due to the high accuracy and real-time control. Additionally, because of the movement control order, food security is a crucial component of the COVID-19 pandemic. Furthermore, physical parameters like temperature, relative humidity, and soil moisture must be measured in agriculture. This is due to the fact that these factors both favorable and unfavorable impact crop growth. It is perhaps advisable to take into account additional factors like the pH of the soil and the quantity of fertilizer. However, for this project, these parameters are not measured. In order to boost agricultural yields and enhance crop management, smart agriculture, also known as smart farming, is utilizing a variety of tools and technologies, including the internet, cloud computing, and Internet of Things (IoT) devices. Through wireless data exchange, the Internet of Things seeks to close the gap between the real and virtual worlds. IoT also makes precision agriculture more effective because it can increase crop quality, productivity, and yields. The monitoring system is made up of multiple sensors that are able to interface with other devices in order to monitor physical parameters such as soil moisture, temperature, and humidity. Precision agriculture, often known as smart agriculture, is a technique that maximizes crop productivity by using fertilizers and water efficiently. A technique for modifying agricultural inputs to the current environmental circumstances is called precision agriculture. It is controlled by a set of regulations and uses sensors to acquire data about the crops, including soil temperature and humidity, so that the data may be used to make decisions. Because the relay is precisely engaged and deactivated based on data acquired by the sensor, this method uses less water. Farmers can also water crops according to their needs with the help of smart agriculture, provided they receive quick notifications. Thus, the goal of this research is to create an algorithm that will enable user participation while maintaining the ideal level of soil moisture using a real-time monitoring system. This method can help save water usage and boost agricultural productivity. Furthermore, a significant amount of research has been conducted in order to enable better outcomes in terms of both number and quality.

# LITERATURE REVIEW

This paper proposes smart farming using the IOT which provides more benefits when compare to current technology. This system also proposes the optimize the inputs and uses low water and it is more efficient. In this paper the author have developed an low cost based intelligent system which helps in smart irrigation. This system uses the IOT and allow the user to talk and connect by their self for remote data monitoring and neural based decision This neural network will gives information about the irrigation schedule for efficient irrigation. This project gives the alert messages about the surrounding temperatures and rate of humidity level of soil and also tells the current status about the power supply. For getting the output motor status and input parameters such as temperature, humidity level and moisture level. The proposed method provides that the sand soil moisture sensor detects the value of dry condition soil only so it tells the water will serve automatically to the land and this paper used soil moisture sensor using multiple climate based drought indices. In this paper the author have developed that to optimize the resources and make the plant to maintain a certain growth level. This project will be discussed on the basis of hardware tools and their testing and compared to other modules in the market and it will measure the temperature and Humidity of the soil by remotely sensed with internet of things. This paper proposes that by using remote controlling we will measure and control the all the sensor values and it will helpful to the crop growth for agriculture. This paper mainly to use the low-cost soil moisture sensor. An algorithm is created to provide water timely and checks this moisture level. Thus, this system helps in saving water and reduces the labor work.

# THEORY

## i) Working Principle

The objective of an IoT based smart agriculture monitoring system project can include several aspects such as hardware and software development, system design, testing, and validation, among others. The specific scope of the project may depend on the objectives, requirements, and resources available.

Some potential areas of scope for an IoT Based Smart Agriculture Monitoring System project could include:

• With the help of sensors, the labor need will decrease.

• The sensor allows precise measurement of the moisture level of soil.

• The temperature sensor detects the temperature level precisely and accurately than the manual process.

• This may involve using statistical methods and other analytical tools to process the data collected by the system and generate useful insights.

• This may involve creating a user-friendly interface that allows farmers to easily access and interpret the data collected by the system.

The proposed design for the Smart Agriculture Soil Monitoring System (SASMS) leveraging IoT technology encompasses several key components. Firstly, the system will deploy sensor nodes equipped with various sensors to monitor crucial soil parameters such as moisture level, temperature, and humidity. These sensor nodes will be strategically placed across agricultural fields, ensuring comprehensive coverage. After sensing the data from the sensor nodes it is sent to Thingspeak, a cloud platform, enabling real-time monitoring and analysis. The cloud platform will serve as the hub for data aggregation, storage, and processing, leveraging robust security measures to protect sensitive agricultural data.

In this project we plan to build a Smart Agriculture monitoring system using IoT. The Soil sensor is used to detect the moisture level in the soil, it will detect the moisture in the soil and thus take the reading and presenting them on the mobile screen as well as to the microcontroller in real time. Once the sensor senses the moisture and the humidity level of the plant it is transmitted for cloud computing via wireless connection and compared to the threshold levels given to the microcontroller. If it is observed that the moisture of the soil is less than the threshold value it will display low moisture level on the application and turn on the DC motor which in turn starts the water supply using the water pump. This process of measuring and supplying continues until the moisture level of the soil is greater than or equal to the given threshold value. The water pump dispenses the required amount of water and balances the moisture level of the soil.

All the processes going on in the system will be alerted to the operator with help of notifications through the web services. We plan on implementing the web service using the ThingSpeak software suite. A simple user interface will be programmed for a hassle-free operation of the entire system. All the systems and sensors are controlled and maintained in sequence with each other so as to get the maximum efficient output with the help of the microcontroller. A microcontroller can easily read the input signal and can also translate it into an output signal.

## ii) Flowchart and Block Diagram

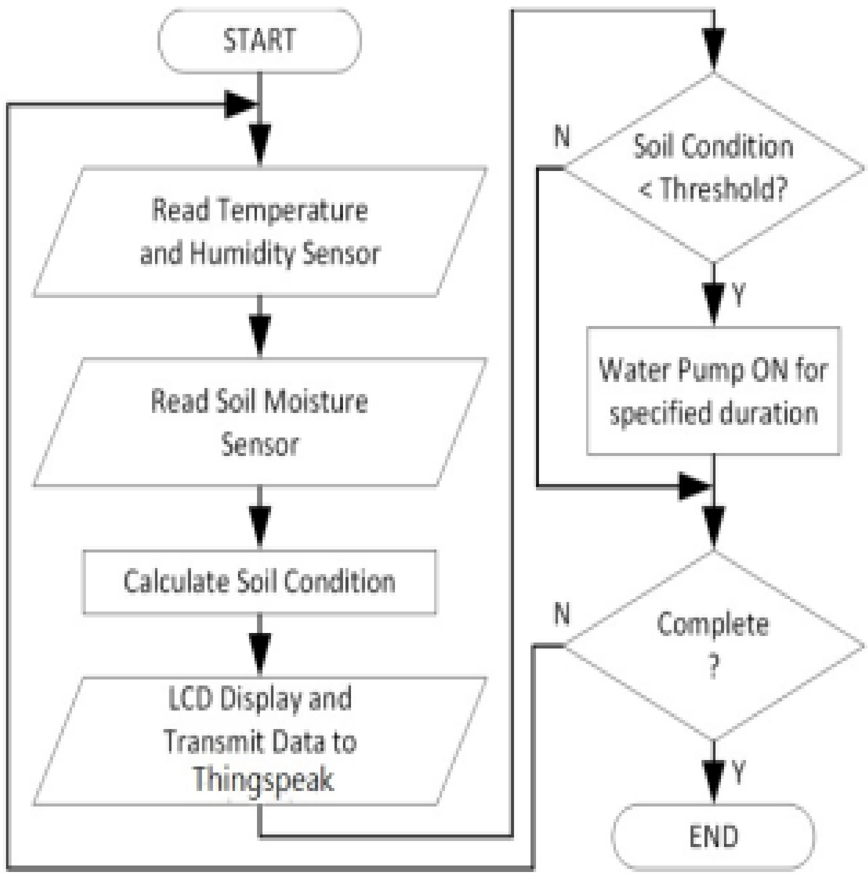



Fig. 1. Flowchart

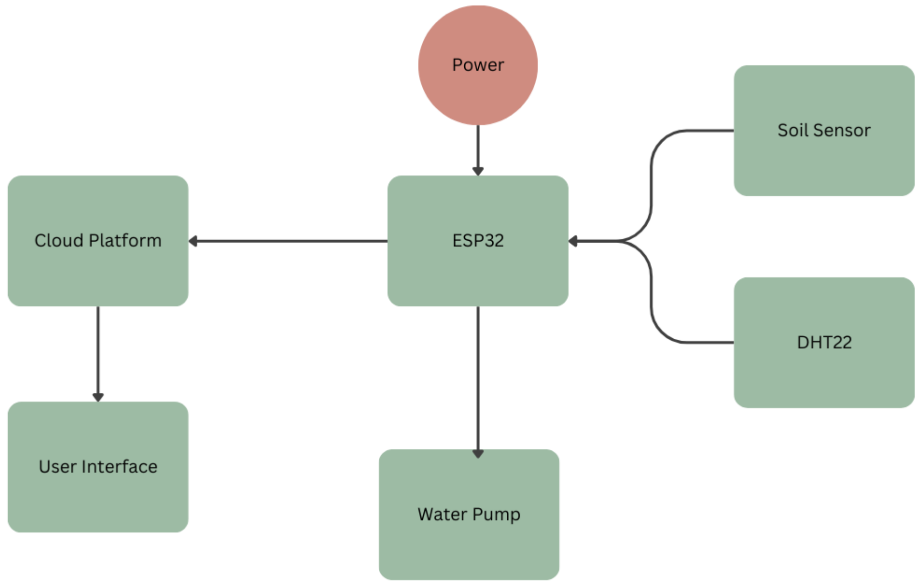



Fig. 2. Block Diagram

## SOFTWARE SPECIFICATION

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. With the ability to execute MATLAB code in ThingSpeak you can perform online analysis and processing of the data as it comes in. ThingSpeak is often used for prototyping and proof of concept IoT systems that require analytics.

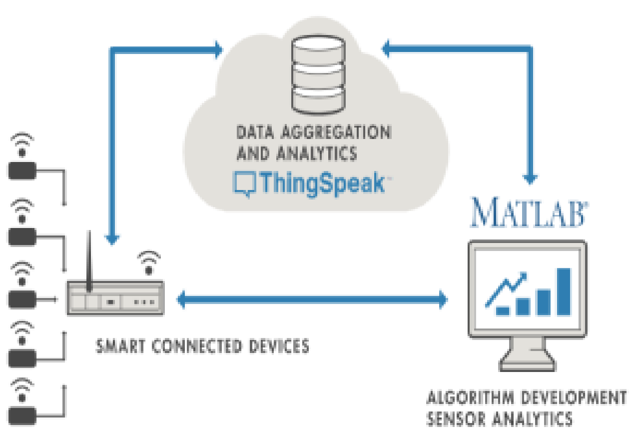
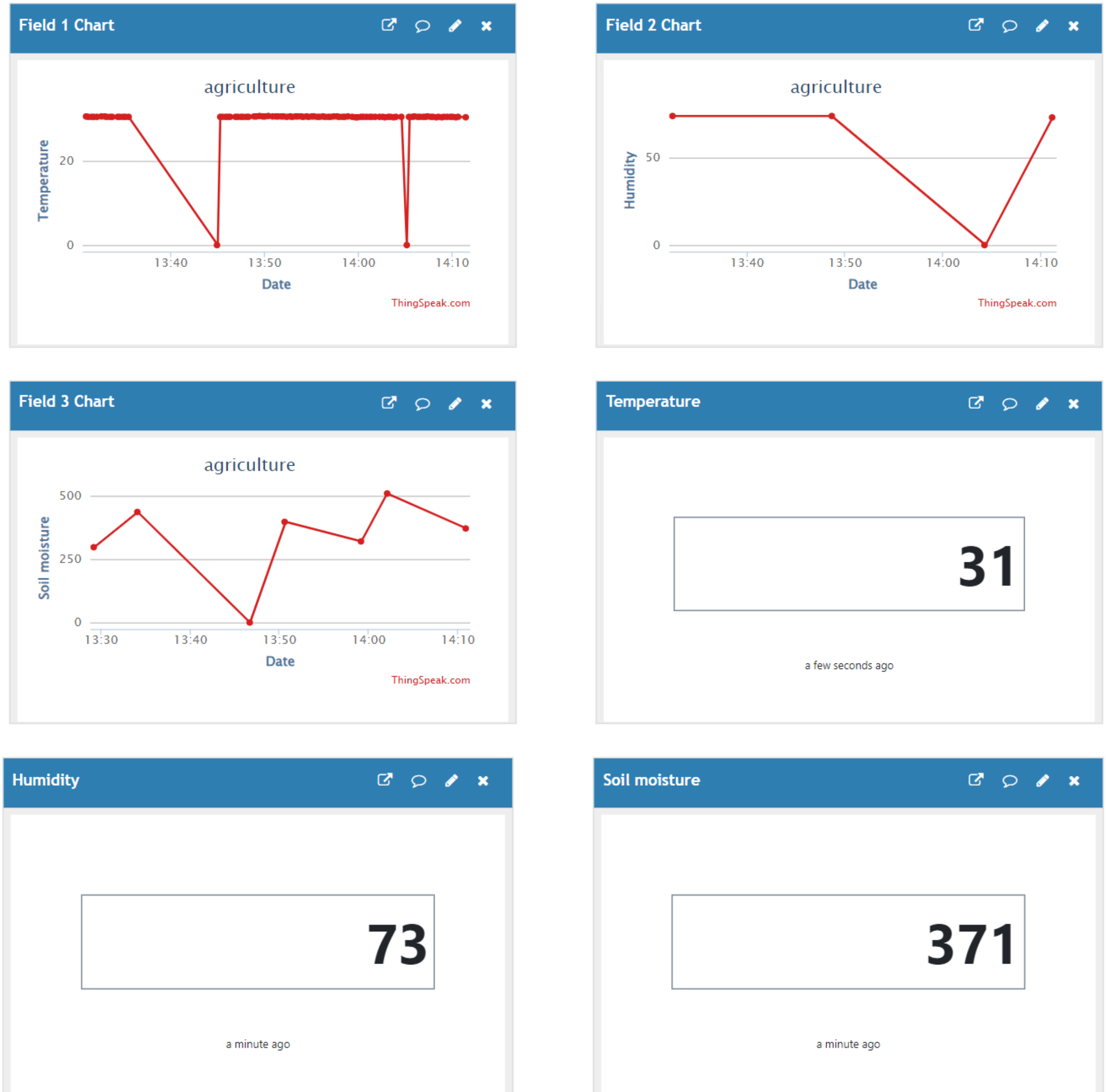



Fig. 3. ThingSpeak Diagram

# RESULT

The integration of the Smart Agriculture Soil Monitoring System (SASMS) utilizing IoT technology promises significant benefits for agricultural practices. Through real-time monitoring of soil parameters and insights that are data-driven, farmers can make informed decisions to optimize crop yields while conserving resources. The ability of system to accurately assess soil moisture, temperature, humidity, and nutrient concentrations enables precision agriculture techniques, reducing water usage, minimizing chemical inputs, and mitigating environmental impact. By leveraging machine learning algorithms, the SASMS provides predictive models for irrigation scheduling, fertilizer application, and pest management, enhancing productivity and efficiency. The user-friendly visualization interface empowers farmers to remotely monitor soil conditions and crop health, facilitating proactive management strategies. Moreover, the scalability, modularity, and integration with existing farm management systems ensure seamless adoption and compatibility with diverse agricultural settings. Overall, the Smart Agriculture Soil Monitoring System represents a transformative approach to soil management, offering a sustainable solution to meet the evolving challenges of modern agriculture while promoting environmental stewardship and economic prosperity.


Field 1 Chart
agriculture
Temperature
20
0
13:40
13:50
14:00
14:10
Date
ThingSpeak.com
Field 2 Chart
agriculture
Humidity
50
0
13:40
13:50
14:00
14:10
Date
ThingSpeak.com
Field 3 Chart
agriculture
Soil moisture
500
250
0
13:30
13:40
13:50
14:00
14:10
Date
ThingSpeak.com
Temperature
31
a few seconds ago
Humidity
73
a minute ago
Soil moisture
371
a minute ago

# FUTURE SCOPE

A smart agricultural monitoring system project utilizing the Internet of Things might involve multiple areas, such as both software and hardware development, system design, validation, and testing, to name a few. The exact extent of the project will rely on objectives, specifications, and resources on hand. An Internet of Things (IoT)-Based Smart Agriculture Monitoring System has several possible uses, including:

• Sensors will help to reduce the requirement for labor.
• The sensor makes it possible to monitor the soil's moisture content precisely.
• The temperature sensor is more accurate and precise at detecting the temperature than a manual method.
• To process the data gathered by the system and produce insightful analysis, this may entail utilizing statistical techniques and additional analytical instruments.

# BUDGET SHEET

| Sr. No. | Component | Cost |
|---|---|---|
| 1. | Microcontroller (ESP32) | 600/- |
| 2. | Moisture sensor | 600/- |
| 3. | Temperature & Humidity sensor | 400/- |
| 4. | Water Pump | 230/- |
| 5. | Battery management system | 250/- |
| 6. | Breadboard | 300/- |
| 7. | Cables and Connectors | 100/- |
| **Total:** | | **2480/-** |

# APPLICATIONS

**1. Irrigation Management:** Soil moisture sensors play a critical role in optimizing irrigation practices. By providing real-time data on soil moisture levels, farmers can determine when and how much water to apply, preventing overwatering or underwatering. This helps conserve water resources and promotes efficient water use.

**2. Precision Agriculture:** Soil moisture sensors are an essential component of precision agriculture systems. They enable farmers to monitor and manage soil moisture variability within fields, allowing for targeted irrigation, fertilizer application, and crop management practices. This leads to improved crop yield and resource efficiency.

**3. Water Resource Management:** Soil moisture sensors contribute to effective water resource management strategies. By monitoring soil moisture content, water managers can make informed decisions regarding water allocation, reservoir management, and sustainable water use policies.

# REFERENCES

[1] T. S. GUNAWAN, I. R. H. YALDI, M. KARTIWI, AND H. MANSOR, "PERFORMANCE EVALUATION OF SMART HOME SYSTEM USING INTERNET OF THINGS," INTERNATIONAL JOURNAL OF ELECTRICAL AND COMPUTER ENGINEERING, VOL. 8, NO. 1, P. 400, 2018.

[2] F. TONGKE, "SMART AGRICULTURE BASED ON CLOUD COMPUTING AND IOT," JOURNAL OF CONVERGENCE INFORMATION TECHNOLOGY, VOL. 8, NO. 2, PP. 210-216, 2013.

[3]VIVEK RAMAKANT PATHMUDI: NARENDRA KHATRI; AJAY KUMAR VYAS,A SYSTEMATIC REVIEW OD IoT THECHNOLOGIES AND THEIR CONSTITUENTS FOR SMART AND SUSTAINABLE AGRICULTURE APPLICATIONS, SCIENTIFIC AFRICAN(2023).

[4] MD.A. MODAL AND Z. REHANA, “IOT BASED INTELLIGENT AGRICULTURE FIELD MONITORING SYSTEM”, 8TH INTERNATIONAL CONFERENCE ON CLOUD COMPUTING, DATA SCIENCE & ENGINEERING (CONFLUENCE),2018.