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# SECURE SMART AGRICULTURE MONITORING SYSTEM USING MQTT

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**Abstract-** This study focuses on a secure smart agriculture monitoring system using IoT technology. The main aim of this system is to help farmers by monitoring environmental conditions such as soil moisture, temperature, and humidity in real time. Sensors are used to collect data from the field, which is transmitted through the MQTT protocol for fast and reliable communication. The system also ensure data security so that the information is protected from unauthorized access. With the help of this system, farmers can take better decision rerated to irrigation and crop management. It reduces manual effort and improve overall productivity.

**Keywords:-** MQTT, IOT, ESP8266, Wi-Fi, Sensors, Solar panel, Smart Agriculture, Real-time Monitoring.

## I. INTRODUCTION

Agriculture is one of the most important sectors for human survival, but traditional farming methods often face challenges such as inefficient water usage, lack of real time information, and high manual effort. With the advancement of technology, smart solutions are being development to improve farming practices and increase productivity. This project presents a smart agriculture monitoring system that uses IoT technology to collect and transmit data from the field. Different sensors are used to measure environmental conditions like soil moisture, temperature, and humidity. The collected data is sent through the MQTT protocol using a WI-FI module such as ESP8266, enabling real time monitoring. The system also focuses on energy efficiency by using a solar panel as a power source, making it suitable for remote areas. By providing accurate and timely information, this system helps farmers make better decision, reduce wastage of resources and improve crop fertility.

## II. METHODOLOGY

This system is developed to monitor agricultural conditions using IoT technology. It gathers data from different sensors and transmits it to the user through wireless communication. The system provide efficient secure transfer of data.



Figure 1. Internal Circuit Setup of the Proposed System

In this system, sensors are installed in the agriculture field to continuously monitor parameters such as soil moisture, temperature, and humidity. These sensors collect real-time data, which is then sent to the ESP8266 microcontroller for processing. The processed data is transmitted using the MQTT protocol through a WI-FI network, allowing the user to access the information remotely. Farmers can easily check the field conditions on their mobile devices and take necessary actions like irrigation at the right time. The system is powered by a solar panel, which makes it cost-effective and suitable for use in rural and remote areas.

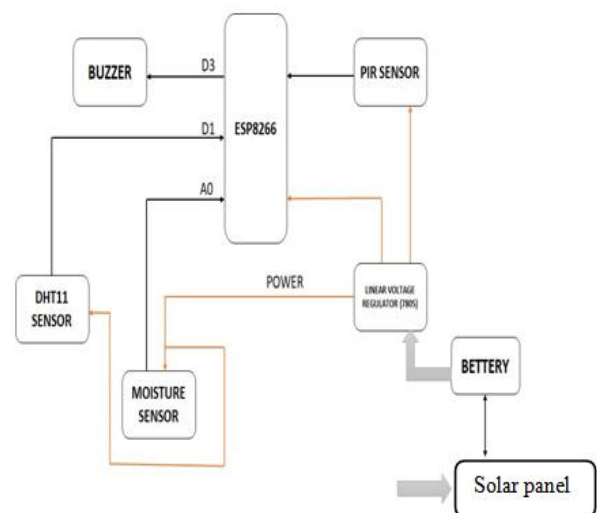


Figure 2: Block Diagram of Smart Agriculture System

The above diagram shows the flow of data from sensors to the user through ESP8266 and MQTT protocol. It also represents the use of a solar panel as a power source for the system.

Solar panel

### III. RESULT AND DISCUSSION

The developed system was tested under different environment conditions to observe its performance and accuracy. The sensors successfully collected real-time data such as soil moisture, temperature, and humidity from the agriculture field. The ESP8266 microcontroller processed the data efficiently and transmitted it using the MQTT protocol over a Wi-Fi network. The data received on the user interface was found to be stable and timely, allowing continuous monitoring of field conditions. The system responded properly to change in environment parameters, which make it useful for decision-making in irrigation and crop management. The use of a solar panel as a power source ensured uninterrupted operation of the system, especially in areas where electricity supply is limited. This makes the system reliable and cost-effective for rural applications. However, slight variations in sensor readings were observed due to environment factors, which can be improved due to environmental factors, which can be improved by using high-precision sensors in the future. Overall, the system demonstrated good performance and proved to be an effective solution for smart agriculture monitoring.



Figure 3. prototype of secure smart agriculture monitoring system

### IV. CONCLUSION

The developed smart agriculture monitoring system offers a useful solution for monitoring environmental conditions in real time. By using IoT technology, sensors, and the MQTT protocol, the system ensures efficient data collection and communication. The integration of a solar panel makes the system energy efficient and suitable for remote areas. This system helps farmers in making better decisions related to irrigation and crop management, which can improve productivity and reduce resource wastage. Overall, the project demonstrates a practical and reliable approach towards modern and smart farming.

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