

## **IOT based Green House Monitoring and Controlling System**

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### **ABSTRACT**

*An IoT based greenhouse monitoring and controlling system is designed to improve agricultural productivity by continuously monitoring environmental conditions inside a greenhouse. The system uses various sensors to measure temperature, humidity, soil moisture, light intensity, and carbon dioxide levels. These sensor values are transmitted to a cloud platform using IoT technology. Farmers can monitor real-time data remotely through a web or mobile application. Automated control actions such as switching irrigation systems, ventilation fans, heaters, and artificial lighting are performed based on predefined threshold values. This reduces human intervention and operational errors. The system ensures optimal growing conditions for plants throughout the cultivation period.*

*Efficient resource utilization helps reduce water and energy consumption. Data logging and analysis help in predicting crop behaviour. The proposed system enhances crop yield, quality, and sustainability. It is cost-effective and scalable for small and large farms. The use of IoT provides real-time decision making. The system minimizes crop loss due to environmental variations. Automation improves farming efficiency. Remote monitoring increases farmer convenience. The solution supports precision agriculture. The system improves greenhouse management practices. It is suitable for modern smart farming applications. Overall, the IoT based greenhouse system provides an intelligent agricultural solution.*

## INTRODUCTION

Greenhouse farming is an advanced agricultural technique that allows crops to be grown in a controlled environment. Traditional greenhouse systems require manual monitoring and control of environmental parameters, which is time-consuming and inefficient. Environmental factors such as temperature, humidity, soil moisture, and light intensity play a vital role in plant growth. Improper control of these factors can reduce crop yield and quality. With the rapid advancement of Internet of Things technology, smart greenhouse systems have become more feasible. IoT enables real-time data collection and remote monitoring. Sensors and actuators are integrated with microcontrollers to automate greenhouse operations. Wireless communication improves system flexibility. Cloud platforms allow data storage and analysis. Farmers can access information from anywhere. Automation reduces labor cost and human error. Smart alerts help prevent crop damage. IoT-based systems support sustainable agriculture. Precision farming improves resource utilization. Greenhouse automation ensures consistent environmental conditions. The system improves productivity and profitability. It helps in climate-independent farming. IoT enables smart decision making. The introduction of smart

greenhouse technology marks a significant advancement in agriculture.

## LITERATURE SURVEY

Several researchers have proposed greenhouse monitoring systems using different technologies. Early systems were based on wired sensors and manual control mechanisms. Later, wireless sensor networks were introduced to improve flexibility. Some studies focused on temperature and humidity monitoring using microcontrollers. GSM-based greenhouse monitoring systems enabled SMS alerts for farmers. Researchers explored ZigBee and Bluetooth communication technologies. With the emergence of IoT, cloud-based greenhouse systems gained popularity. Studies implemented Arduino and Raspberry Pi for data processing. Many systems focused on irrigation automation using soil moisture sensors. Some researchers integrated weather prediction for better decision making. Energy-efficient greenhouse systems were proposed using solar power. Mobile applications were developed for remote monitoring. Researchers analysed data for crop growth optimization. However, many systems lacked scalability. Some designs had high implementation cost. Limited automation was observed in early models. Security issues were rarely addressed. Real-time control accuracy varied across systems.

Integration of multiple sensors posed challenges. Literature shows the need for a fully automated, scalable, and cost-effective greenhouse system.

## **EXISTING SYSTEM**

Existing greenhouse systems are mostly based on manual or semi-automated control methods. Farmers manually monitor environmental conditions using basic instruments. Decision making depends on personal experience and observation. Manual irrigation often leads to water wastage. Existing systems lack real-time monitoring capabilities. Environmental changes are not detected instantly. Some systems use basic automation with limited sensor integration. Remote monitoring is not supported in traditional systems. Data logging and analysis are absent. Crop growth prediction is difficult. Labor requirements are high. Human errors affect crop quality. Existing systems are not energy efficient. Lack of automation increases operational cost. Environmental conditions may fluctuate frequently. System response time is slow. Existing solutions are not scalable. Maintenance is difficult. Limited use of modern communication technologies is observed. Overall, existing systems are inefficient and unsuitable for modern smart agriculture.

## **DRAWBACKS**

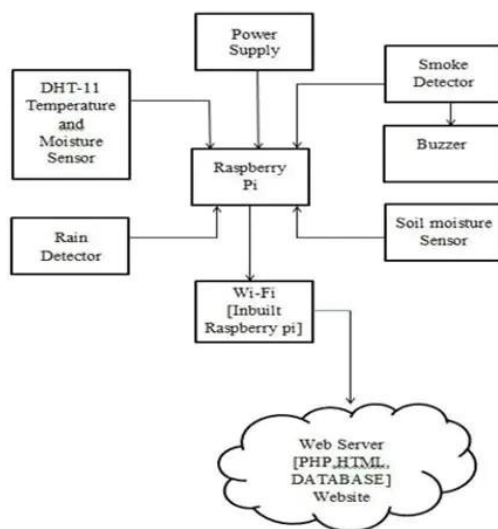
- The system depends heavily on continuous internet connectivity.
- Initial setup and sensor installation cost can be high.
- Sensor malfunction may lead to incorrect control actions.
- Data security and privacy issues can arise in cloud-based systems.
- Regular maintenance and calibration of sensors are required.

## **PROPOSED SYSTEM**

The proposed IoT based greenhouse monitoring and controlling system uses advanced sensors and automation techniques. Sensors continuously monitor temperature, humidity, soil moisture, and light intensity. A microcontroller collects sensor data and sends it to the cloud using IoT protocols. Cloud platforms store and process data in real time. Automated control of irrigation, ventilation, and lighting is achieved using actuators. Threshold-based control ensures optimal plant growth conditions. A web or mobile application provides real-time monitoring and control. Alerts are generated when parameters exceed safe limits. Data analytics helps in understanding crop behavior. The system reduces human intervention. Water and energy usage are optimized. Remote accessibility improves farmer convenience. The system supports scalability and flexibility. Security features

protect data transmission. The design is cost-effective and easy to implement. Integration of multiple sensors improves accuracy. Automation enhances productivity. The system supports precision agriculture. It ensures consistent environmental control. The proposed system is suitable for smart greenhouse farming.

## SYSTEM ARCHITECTURE

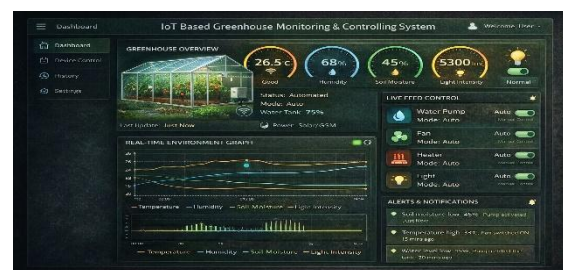


**Figure: System Architecture**

The system architecture of an IoT based Greenhouse Monitoring and Controlling System consists of sensors, a controller unit, communication modules, cloud services, and user interfaces. Various sensors such as temperature, humidity, soil moisture, and light sensors are deployed inside the greenhouse to continuously monitor environmental conditions. These sensors send real-time data to a

microcontroller or single-board computer, which acts as the central processing unit. Based on predefined threshold values, the controller activates actuators such as water pumps, fans, heaters, and lights to maintain optimal conditions for plant growth. Communication modules like Wi-Fi or GSM transmit the data to a cloud platform. The cloud stores, processes, and analyses the data for monitoring and decision making. A web or mobile dashboard allows farmers to view live data and control devices remotely. Alert systems notify users during abnormal conditions. The architecture supports automation, remote access, and scalability. Overall, this architecture ensures efficient, reliable, and smart greenhouse management.

## RESULTS AND DISCUSSION



**Figure 3: Home page**

## CONCLUSION

The IoT based greenhouse monitoring and controlling system provides an efficient solution for modern agriculture. The system

successfully automates greenhouse operations. Real-time monitoring improves decision making. Automation reduces labor and operational cost. Optimal environmental conditions improve crop yield and quality. Resource utilization is optimized. Remote access enhances convenience. The system supports sustainable agriculture. Data logging enables future analysis. Alerts prevent crop damage. The system improves reliability and efficiency. Scalability allows expansion. Integration of IoT enhances performance. The system is cost-effective. Implementation is simple. It reduces human errors. Smart farming practices are promoted. Environmental control is consistent. The system supports climate-independent farming. Overall, the proposed system improves greenhouse management significantly.

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