



PRECISION AGRICULTURE USING IOT AND CROP PREDICTION SYSTEM

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ABSTRACT: Agriculture is vital to India's economy but is currently hindered by major challenges such as deteriorating soil fertility, inefficient resource utilization, and limited technology adoption. Intensive agricultural practices, excessive use of chemical fertilizers, and inadequate soil management have led to significant soil degradation and nutrient loss. Water scarcity and unpredictable rainfall further compound these problems, with traditional farming methods often resulting in wasted resources and reduced crop yields. The integration of Internet of Things (IoT) technology in soil fertility monitoring provides a promising solution. IoT systems use smart sensors to continuously monitor crucial soil parameters like nutrient levels, moisture, temperature, and pH in real-time. This data-centric approach improves soil health monitoring, optimizes the use of fertilizers and water, and promotes sustainable farming practices. Additionally, advanced analytics and machine learning can forecast soil health trends, allowing for proactive soil management. By adopting IoT technology, Indian agriculture can enhance soil management, increase resource efficiency, and boost productivity, ensuring food security and economic stability for millions of farmers.

Keywords: Internet of Things, Sensors, Machine Learning, Agriculture,

1.INTRODUCTION

Farming is crucial for the development of agricultural land. In India, agriculture employs about 70% of the population and is a significant part of the national economy. However, agricultural challenges have hindered the country's progress. Smart farming, which involves modernizing traditional farming methods using automation and IoT technology, is seen as the solution to these issues. This project aims to enhance agriculture through automation and IoT.

As a major source of food and raw materials, agriculture also provides profitable career opportunities and strengthens the economy. Despite this, some farmers continue to use outdated farming methods, leading to low production and food shortages. Automation has proven to increase yields by replacing manual labor with automated systems. Therefore, integrating modern science and technology into agriculture is essential for boosting production.

Research indicates that wireless sensor networks can collect data from various sensors and transmit it to a central server wirelessly. This technology can help farmers meet the growing food demands by improving farming efficiency. IoT-based automation aims to enhance farmers' productivity in various tasks.

A high-level overview of the soil monitoring system includes sensors that measure temperature, moisture, light, humidity, and pH levels. The Internet of Things framework uses these sensors to detect nutrient levels and provides necessary nutrients to the soil when needed. Smart agriculture encompasses the use of IoT, big data, and advanced statistical technologies to improve agricultural practices, integrating connectivity, automation, and data analysis into traditional farming

2.LITERATURE SURVEY

Sensor-based control systems track agronomic crops, soil, farms, animals, warehouses, and other factors affecting productivity . Smart farm vehicles include drones, robotic systems, and actuators, while smart greenhouses and hydroponics represent connected farm areas. This paper reviews various sensors used in agricultural IoT, highlighting their roles in crop yields, storage, marketing strategies, and future risk evaluation .

Farm owners currently use laboratory testing to check soil fertility, but results take a long time and can be inaccurate due to sample quality or testing team errors. Automation for crop testing is limited to large-scale farms.

Plants absorb macronutrients and micronutrients from the soil necessary for growth. Macronutrients, needed in large amounts, include nitrogen, potassium, and phosphorus (NPK), while other nutrients are secondary macronutrients. Soil testing aims to manage nutrient availability effectively and determine optimal dosing for maximum yield . Nitrogen is crucial for plant health; deficiencies cause yellowing and weak growth. Phosphorus deficiency results in thin, wiry stems and stunted growth, with older leaves turning dark bluish-green. Potassium deficiency appears as yellowing around leaf edges and can cause overall leaf lightening .

To address real-time monitoring of soil nutrients and improve crop yields, a system was developed that uses wireless data transmission and automated control via mobile devices. This reduces labor costs and farmer effort while determining the best crops to cultivate based on soil conditions.

3. OBJECTIVES OF SYSTEM

1. Develop a system for real-time monitoring of soil nutrients to improve agricultural productivity.
2. Implement wireless data transmission and automated control via mobile devices to streamline soil nutrient analysis and crop selection processes.
3. Reduce labor costs and farmer effort by utilizing automated technology for soil nutrient monitoring and crop selection, ultimately enhancing crop yields.

4. MOTIVATION

We're excited about this project because we want to help farmers deal with the many challenges they face. With our smart farming system using IoT, we hope to make farming more precise and efficient. By using sensors, data analysis, and automation, we aim to give farmers the tools they need to make quick and informed decisions.

Our goal goes beyond just using fancy technology; we want to make a real difference in farmers' lives. By helping them manage their resources better, grow more crops, and reduce risks, we hope to make farming easier and more sustainable for everyone.

5.IMPLEMENTATION DETAILS OF MODULE

The main components of this system are sensors, an Arduino Uno 328 module, a water level sensor, a relay, a motor, and a GSM module. The Arduino serves as the central controller for all other sensors. Data can be retrieved from the system either manually or via the GSM module. Various sensors are connected to the Arduino. The motor activates when the soil moisture exceeds the specified threshold, controlled by the relay. Most computations are managed by the ATmega328, which then sends data to the web server using the Node MCU. The Node MCU connects to the Wi-Fi network to transmit data to the server. Additionally, the system can send sensor values via SMS using the GSM module, depending on soil, temperature, and water level readings. Sensor data is stored in a MySQL database, and the Python IDE is used for system development. The system can also predict suitable crops for production by manually inputting the values of essential nutrients like nitrogen, phosphorus, and potassium.

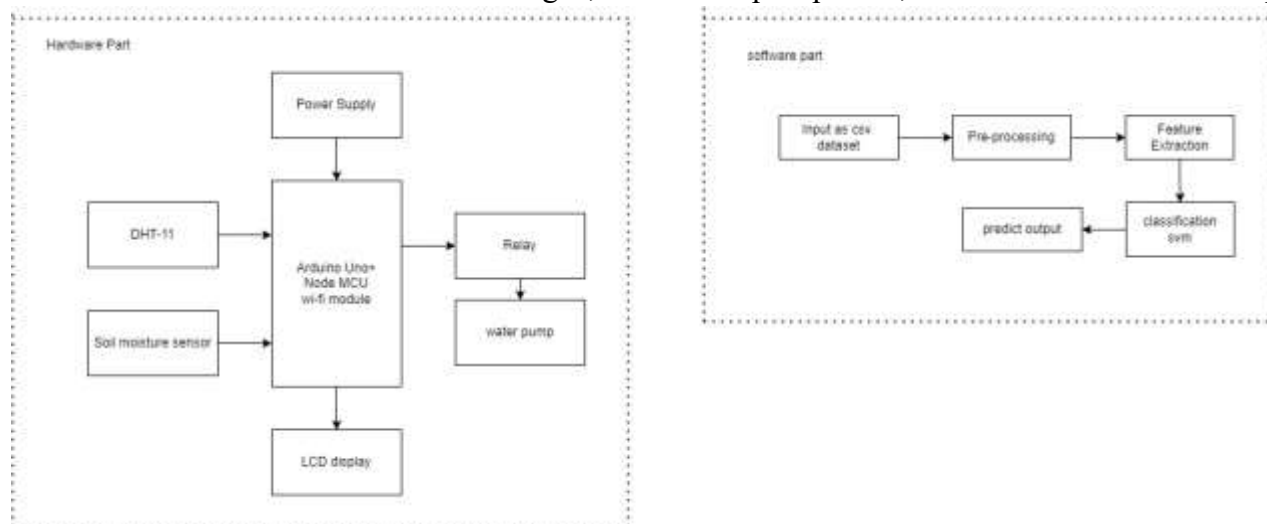


Fig. Precision Agriculture Using IoT And Crop Prediction Architecture

6.EXPERIMENTAL RESULT

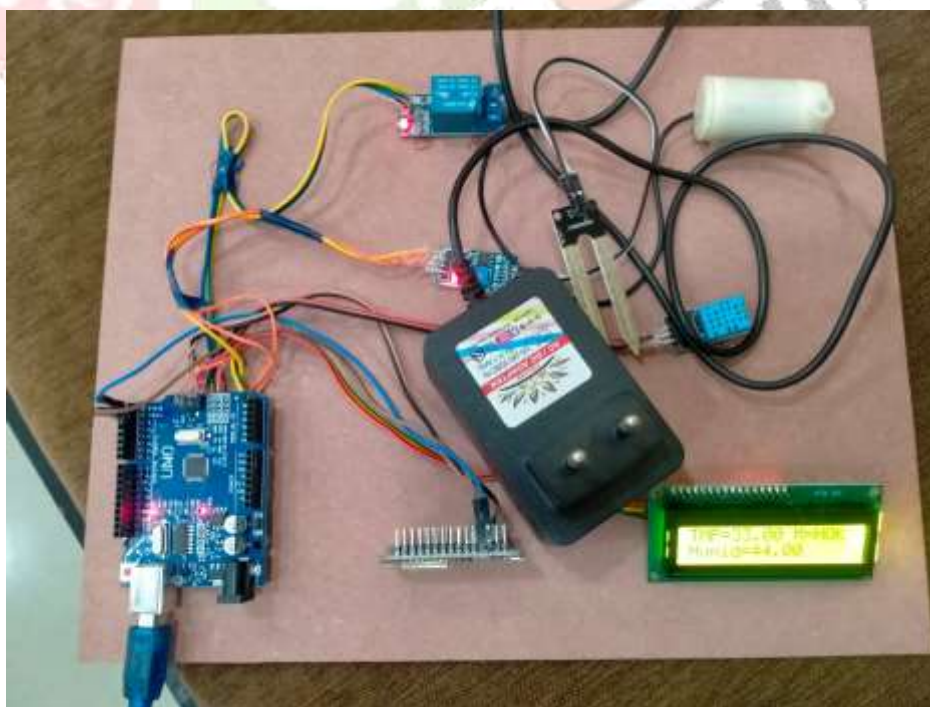


Fig6.1 System Architecture

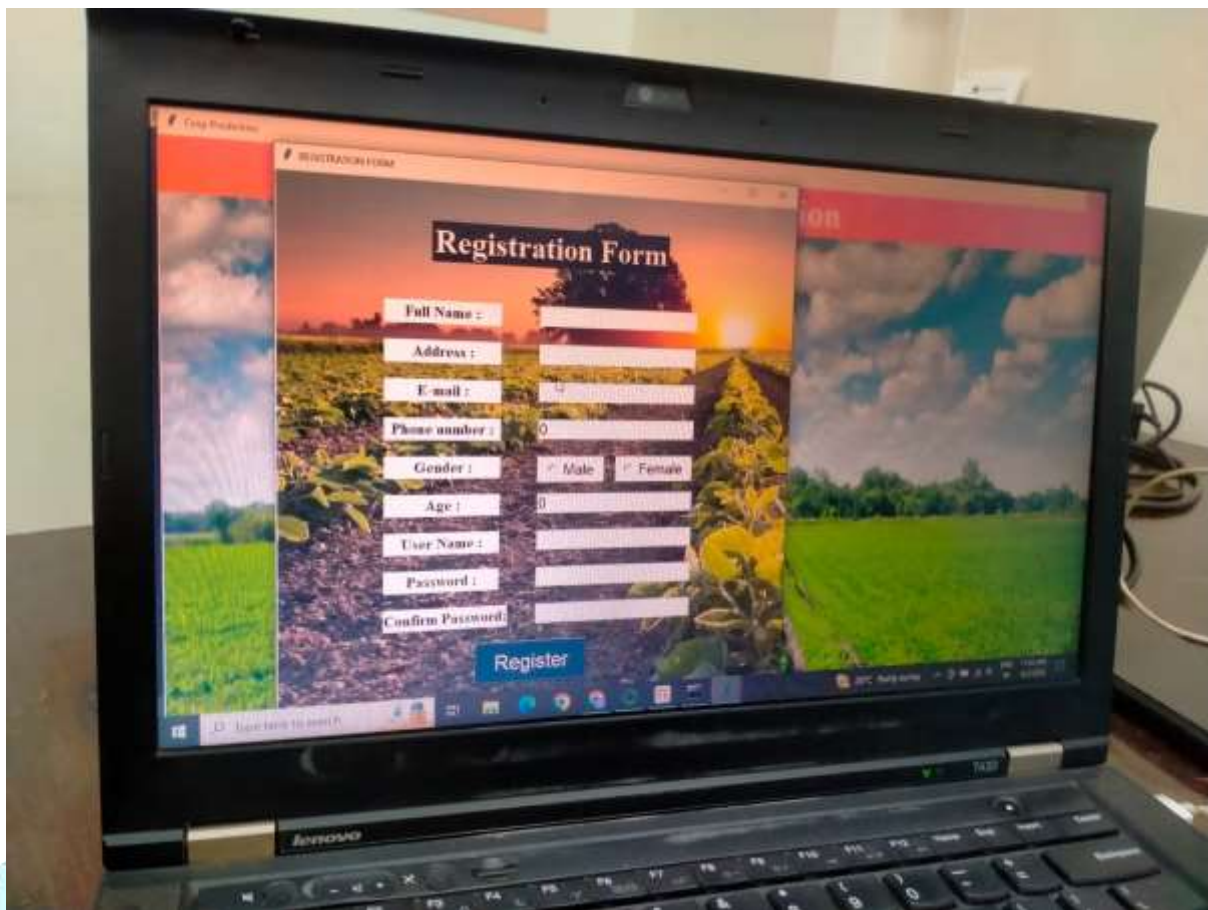


Fig6.2 Registration Details



Fig 6.3 Login Details

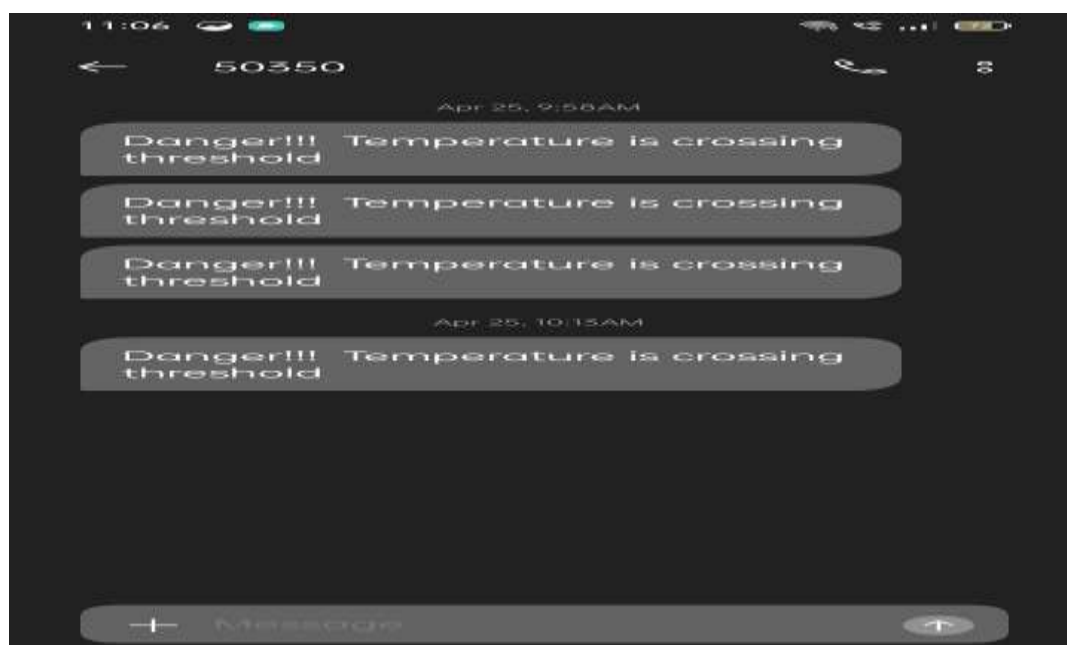


Fig6.4. Msg Received On Sim

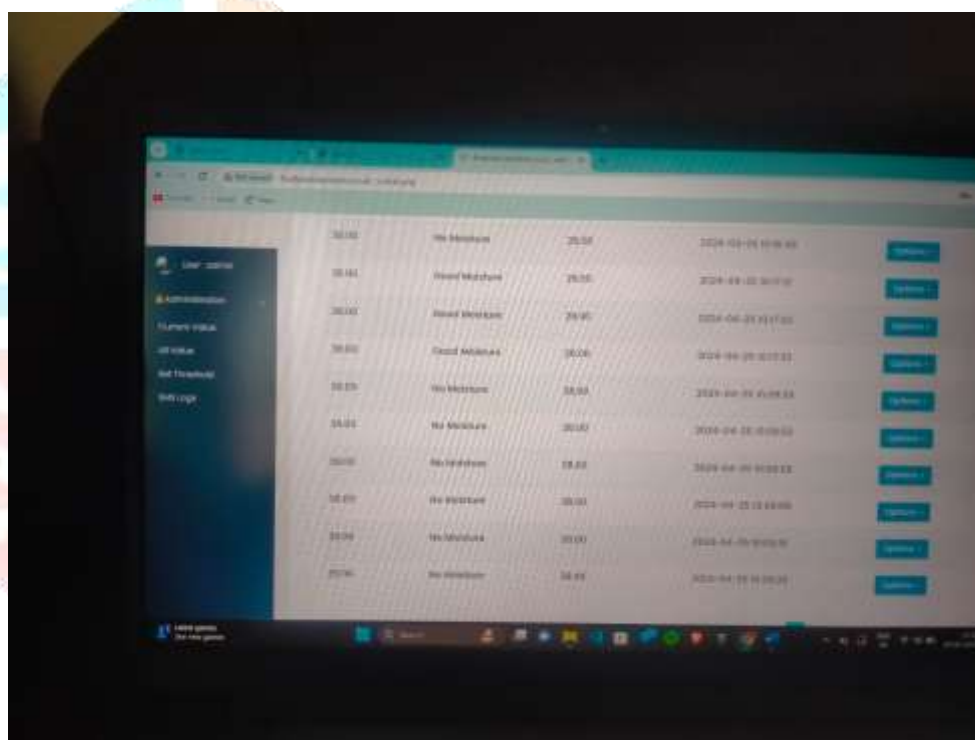


Fig6.4 Main Page of Readings Displayed

7.CONCLUSION

our project aims to make farming easier and more efficient for farmers. By using smart technology like sensors and data analysis, we hope to give farmers the tools they need to make better decisions and improve their crops. Our goal is to help farmers manage their resources better and reduce risks, ultimately making farming more sustainable for the future. Our system will also help predict crop outcomes, so farmers can plan ahead with confidence

8.FUTURE SCOPE

We considered adding many more features to this product, but decided against it to keep the overall cost and size manageable. The Android application could also be made simpler and more user-friendly. In the future, with proper manufacturing guidance and a more attractive design, this product could significantly help farmers perform more efficient farming.

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