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Smart Agriculture Irrigation System using IOT and Green Crew

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***Abstract*—Agriculture automation using IoT is a rapidly growing research field that aims to optimize water usage, improve crop growth, and reduce manual intervention in farming. This low-cost and scalable system offers efficient irrigation control, crop monitoring, and weather forecasting capabilities through an Android app. By leveraging IoT technology, it has the potential to revolutionize irrigation management and promote sustainable agriculture practices. This paper proposes an automated system for managing humidity, temperature, and irrigation in agriculture and provides a comprehensive overview of design, implementation, and evaluation of an automated system for managing humidity, temperature, and irrigation in agriculture. *At* Green crew is an app where we empower farmers to collaborate with us to get the best rates for their produce. With our website, we provide farmers with an easy, secure and direct -to -consumer way of selling their produce and also to know the exact market rates sitting at their own homes.**

***Index Terms*— IoT Internet of Things, Humidity, Temperature, Irrigation.**

I. INTRODUCTION

Agriculture automation using IoT technology is rapidly advancing, aiming to enhance agricultural efficiency and sustainability. It addresses challenges such as water scarcity, soil degradation, and climate change. By integrating sensors and devices, IoT enables real-time data collection on temperature, humidity, and soil moisture, empowering farmers to make informed decisions. This technology optimizes crop growth, reduces water usage and chemical inputs, and automates various aspects of agriculture, including irrigation and environmental monitoring. The traditional inefficient and unorganized supply chain in agriculture can be improved through IoT integration, reducing food wastage and benefiting both farmers and retailers.

II. LITERATURE SURVEY

An IoT-based smart farming system that includes sensors, actuators, and a cloud-based platform for monitoring and controlling agricultural fields. The system uses data analytics and machine learning to optimize crop growth and reduce water usage [1]. An automated system of irrigation system that uses IoT technology for soil moisture sensing and automated water management. The system includes a web-based user interface and a mobile application for remote monitoring and control [3]. A complete system for smart agriculture that includes soil moisture and temperature sensors, a microcontroller, and cloud-based platform for the data processing and the control. The system can be used for both greenhouse and outdoor agriculture [5]. An IoT-based monitoring

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system and controlling system for smart agriculture that includes sensors for humidity temperature and soil moisture, a microcontroller, and cloud-based platform for data processing and controlling. The system includes a user-friendly web-based interface for monitoring and control [7]. A smart agriculture monitoring system that includes sensors for temperature, humidity, and soil moisture, and a mobile application for monitoring and control. The system uses IoT technology and machine learning to optimize crop growth and reduce water usage [8]. These literature surveys demonstrate the growing interest in IoT-based agriculture automation, and the potential of this technology is to transform the way we grow and manage crops. The studies highlight the numerous benefits of IoT in agriculture, including increased efficiency, reduced waste, improved crop yield improved sustainability, and provide insights into challenges and the opportunities associated with its implementation.

III. METHODOLOGY

The system comprises of sensors, microcontroller and actuators.
Working parameters: Climate changes that are temperature, moisture and light conditions.
An automatic irrigation system in agriculture utilizes sensors to measure soil moisture and other environmental factors, which are transmitted to an Arduino UNO controller. The controller processes the sensor data and activates relays, fans, and bulbs accordingly to create suitable conditions for the plants. The system includes an LCD display that provides user-friendly information about the ongoing events. Additionally, the system can be accessed and monitored remotely through a mobile application connected to the Wi-Fi module, which receives and transmits real-time data from temperature, humidity, and light intensity sensors.
The Green Crew is an app which is very beneficial to the farmers. armers experience price risk, information asymmetry about demand, distribution inefficiency, and receive late payments. Retailers face problems like higher costs, low quality and unhygienic produce, high price volatility, and the everyday hassle of going to the market. The traditional Supply Chain is highly inefficient, unorganized, and has a high rate of food wastage. In order to all these problems we are introducing the Green Crew application, using this application we are eliminating the intermediaries by directly connecting the farmers with the consumers. We provide the farmers with the information of market rates of their produce ensuring they are not cheated anywhere. The consumers are benefitted by direct and door delivery of fresh products at competitive prices. At Green crew, we empower farmers to collaborate with us to get the best rates for their produce. With our app/website, we provide farmers with a easy, secure and direct to consumer way of selling their produce and also to know the exact market rates sitting at their own homes.

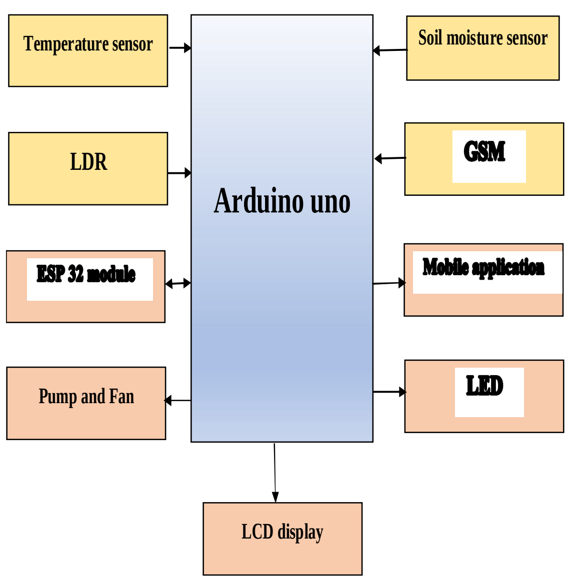

Fig.1. Block Diagram of Agriculture Automation using IoT

Fig.2. Green Crew app home page

IV. Components

Light Dependent Resistor (LDR)
It is used to detect the light when there is no light detected. It will send signal to the microcontroller to detect the light. When the light intensity changes LDR reacts with variable resistance.

Light bulb
This bulb is used as alternative source of light to the plants in the greenhouse when there is no sunlight.

Pump
If there is less moisture detected in the soil the moisture source will sense and switch on motor to pump water to the plants.

Fan
When the greenhouse temperature rises above given specific values, it automatically signals microcontroller and switches on the fan.

Arduino UNO
Arduino is said to be a microcontroller and open-source device. Arduino board are able to read inputs from sensor and turn it into an output by giving command to another electronic device

Soil moisture sensors
In the soil if any moisture is detected it will send signal to the microcontroller. It comprises of two probes which measure the volumetric content of water. The resistance value is calculated by allowing current to pass through two probes measure moisture value

GSM
A GSM module is a compact electronic device that enables mobile communication capabilities through the use of a Subscriber Identity Module (SIM) card.

Temperature Sensor
The temperature sensor is used to sense the temperature in greenhouse and send the corresponding signals to the microcontroller.

Humidity sensor
Humidity sensors, which can be used to measure environmental conditions in field, and can help farmers to identify conditions that may be harmful to crops.

V. Flow Chart

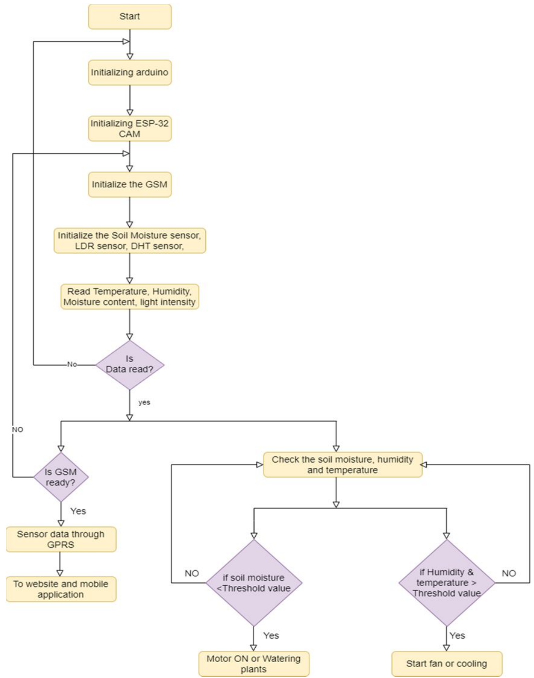

Fig.3. Flow Chart of Agriculture Automation using IoT based Application

VI. Algorithm

Step 1: Initializing the Arduino.
Step 2: Initializing ESP-32 Cam.
Step 3: Initializing the GSM.
Step 4: Initializing the DHT Humidity sensor, soil moisture sensor and LDR sensor.
Step 5: Reads the temperature, humidity, moisture content and light intensity.
Step 6: If data is not read go to step 1.
Step 7: If data is read, check for GSM is ready, soil moisture, humidity and temperature.
Step 8: If GSM is not ready go to step 3.
Step 9: If GSM is ready send the sensor data through GPRS.
Step 10: GPRS sends sensor data to website and mobile application.
Step 11: If soil moisture content value in the soil is less than the threshold value and then the motor will turn ON and waters the plants.
Step 12: If soil moisture is greater than threshold value go to the step 5.
Step 13: If humidity and temperature is greater than threshold value start fan or coolant.
Step 14: If humidity and temperature is less than threshold value go for step 5

VII. Working Model

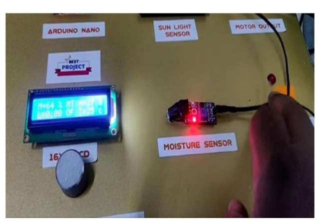

Fig.4. Hardware circuit setup

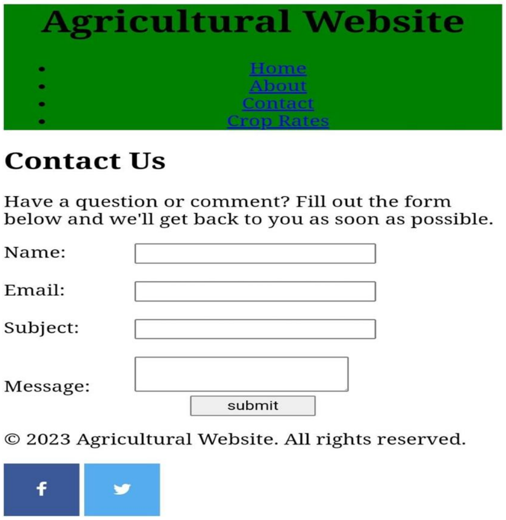

Fig.5. Green crew app contact page

Fig.6. Green crew app crops rate page

VIII. Result

The hardware model of the project shown in the Fig.3. Irrigation system consists of all the components assembled and the soil moisture sensor is kept in the pot to read water content present in soil. The moisture content is lesser than a threshold value so that motor will turn ON Fig.4. and water the plant. The mobile application connected to the hardware model through Wi-Fi module display the light intensity, soil moisture intensity and temperature. The Green Crew application provides the different Crop rates in various markets so that the farmers can compare and take the benefits of it and provides the consumers to directly deals with the farmers to buy the fresh crops without the middleman at the beneficial amount.

IX. Conclusion

The application of IoT in agriculture, particularly in irrigation, has brought significant changes and efficiencies. Automated irrigation systems utilizing IoT technology enable farmers to remotely monitor and control water usage based on data collected from sensors. This ensures crops receive the appropriate amount of water under necessary conditions. These systems offer benefits such as reduced labor costs, increased crop yields, and improved water efficiency, while saving time and resources by eliminating manual irrigation. Additionally, by leveraging this technology, the aim is to provide real-time information on crop rates nationwide, eliminating intermediaries, ensuring fair prices for farmers, and allowing user feedback to maintain up-to-date data.

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