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Smart System for Crop Irrigation

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Abstract – *Agriculture is critical to the development of food production in India. Agriculture in our country is dependent on monsoons, which are insufficient water sources. As a result, irrigation is used in agriculture. The Internet of Things (IoT) represents a watershed moment in technological evolution. IoT is important in many fields, including agriculture, where it has the potential to feed billions of people in the future. This project consists of sensors such as moisture sensors and DHT11 sensors.*

Key Words*: *Agriculture, Irrigation, NodeMCU, Sensors, IoT

1. INTRODUCTION

Agriculture is a crucial resource for humanity because it gives us clean and nutritious food and because it utilizes water to do so. Agriculture has been greatly impacted, water supplies around the world have been negatively impacted, and ongoing development is essential due to environmental devastation and high population expansion. Implement the irrigation management technique employing controlled and Internet of Information (IoT) technology to tackle the issue, maintain air pressure, anticipate temperature, manage the irrigation system, and decrease water wetness. It was designed to use automation and IoT technology to make agriculture smarter. controls the remote position of equipment lowers overall running costs and boosts efficiency and productivity.

2. LITERATURE REVIEW

Automated irrigation system using IoT [1] comprises 3 sections, sensors, IoT, and control. An efficient irrigation system is obtained by setting a certain threshold value from which irrigation is supposed to begin, for the same components such as humidity sensors, Arduino UNO, and ESP8266 modules are used. The Blynk app is used to turn the ON and OFF the motor depending on the moisture values. Sensor Automated irrigation system with IoT provides a sensor-based irrigation system where a microcontroller-based one. [2] A software stack called Android is used which include devices such as operating system, middleware, and key applications. The system is connected to GSM and the GSM and microcontroller are connected to MAX232. Irrigation System using IoT [3] the proposed framework presented a system based on a microcontroller (ATMega328). The system uses a remote sensor system of soil dampness sensor, soil temperature sensor, and pH sensor associated with ATmega2560.The android system here also used rain sensors, soil moisture sensors, and water sensors. A Remote Measurement and Control System for Greenhouse Based on GSM-SMS [4] the system is subdivided into two sections, a central station, and a base station. The central station comprises of GSM module and database system whereas the base station consists of microcontrollers, sensors, GSM module, and actuators.

IoT-based Smart Irrigation System consists of a hardware system of which certain components are Arduino UNO, Moisture sensors, Motor, and GSM GPRS SIM900A modem. [5] The software is being created using PHP and the database is being hosted online using a webpage and the things peak cloud server is used to present graphs. YL-69 sensors are used to understand and analyze moisture content in the soil. GSM-based Automatic Irrigation Control System for Efficient Use of Resources and Crop Planning by Using an Android Mobile [6] major objective of the proposed project is to support a water management system that would subsequently determine the controlling time of the required process and monitor and control the process via SMS through GSM module. Automated Irrigation System Using IoT with IE [7] in this system the software program controls the entire system using an application called the blynk. Modern IoT-Based Gardening System, the project developed an auto irrigation/gardening system using Raspberry Pi. [8] The model used various sensors such as soil moisture sensors, pH sensors, temperature, and humidity sensors to collect real-time data. Cadmium photoresistor also called LDR was used.

Modern IoT-Based Gardening System [9] The system overcomes the drawbacks of existing systems such as high cost, difficult maintenance, and wired connections. The system is wireless between terminal nodes and the web server. The project is divided into 2 steps, one is a functional requirement and the other is a non-functional requirement. This project uses an ARM 7/LPC2129 microcontroller also called a RISC machine. Automated Irrigation System Using a Wireless Sensor Network and GPRS Module [10] this irrigation system comprises a wireless sensor unit (WSU) and a wireless information unit (WIU). The WSU comprises an RF transceiver, power sources, a microcontroller, and sensors. Also, every unit is based on microcontroller PIC24FJ64GB004. Also, the ZigBee module is used at WSU. Whereas the WIU comprises Master Microcontroller, GPRS module, and watering module. Automatic Irrigation System [11] basic intention of this project is to build up a system in the field of horticulture. A dampness sensor is used to

determine the dampness of the field. The circuit is based on raspberry pi and further on the dirt dampness sensor.

GSM-based Automated Irrigation Control using Rain Gun Irrigation System [12] here the GSM module and microcontroller are connected using MAX232. The proposed system has implemented Keil C development tools for the 8051 microcontrollers. Here the Keil C vision 4 helps to provide varied simulated outputs. Application of the internet of things technology in precision agriculture irrigation systems [13] various irrigation systems were being used here of which the hardware components had six modules. And in the network constitution of the irrigation system, there is a network-aware and control layer. Automatic Water Saving Irrigation System Using IoT. [14] ESP8266 is the main controlling unit of this system. The overall system is based on ESP8266 in which 3 sensors are connected to the controller and real-time values are sent by sensors to the web application. Control of Irrigation Automatically By using Wireless Sensor Networks in the various irrigation systems used for the delivery of water. [15] The technique here depends on MORE CROP PER DROP. Wireless sensor networks are used, and a soil moisture sensor is used to measure the moisture content of the soil. A total of 150(T NODES) sensors are used to monitor the crop. The system is wireless sensors with GSM-BLUETOOTH for control and irrigation for real-time monitoring.

A low-cost microcontroller-based system to monitor crop temperature and water status [16] are designed to automate the measurement of soil moisture. The major components that are being used are a real-time clock, a microcontroller, voltage regulators, a binary counter, etc.74HC4060 binary counter is used to provide alternating excitation to soil moisture. Also, various sensors consisting of an infrared thermometer module for measuring the temperature, a TC74 digital temperature sensor for a soil temperature check, and an air temperature sensor with LM35 for air temperature management are used. Water Conservation from Precise Irrigation Scheduling Using a Subsurface Electromagnetic Soil Moisture Sensor [17] main objective of this research paper is to compare water applications and to simulate a water balance in the soil profile by applying the computer-based numerical model. Acclima Digital TDT sensor was installed. IoT Based Soil Monitoring and Automatic Irrigation System this creates a low-cost IoT-based system, monitors the soil moisture, improves the current system using Mobile App, and improves the system by using WSN. [18] The system proposed in this paper comprises 3 nodes. Node 1 consists of a capacitive soil moisture sensor, Arduino UNO & nRF24L01 module. The second module comprises 2 Arduino UNO, Nrf24L01, DHT11 Sensor, and ESP8266 Wi-Fi modules mounted with each other. And the last node has NodeMCU connected to the ThingSpeak API.

3. METHODOLOGY

All of the sensors, such as the moisture sensor, humidity sensor, and temperature sensor, are linked to the NodeMCU. The NodeMCU is powered by 5 volts. A relay receives information about the percentage of moisture in the soil from the NodeMCU. If the moisture percentage is low, the motor turns on automatically and a notification is sent to the device. The user block diagram of a smart irrigation system, which consists of three sensors is connected to a controller whose sensed values are sent to a Web application using ThingSpeak API.

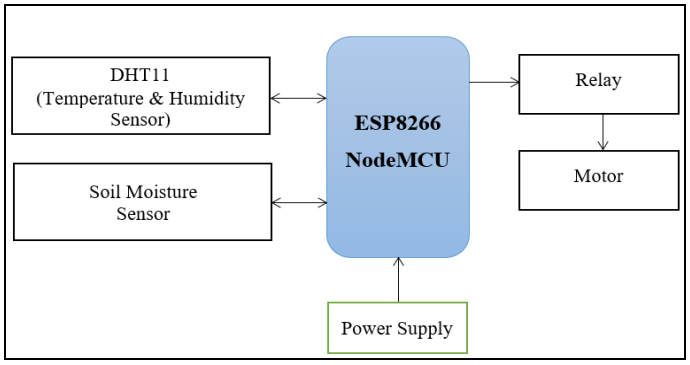

Fig -1: System Block Diagram

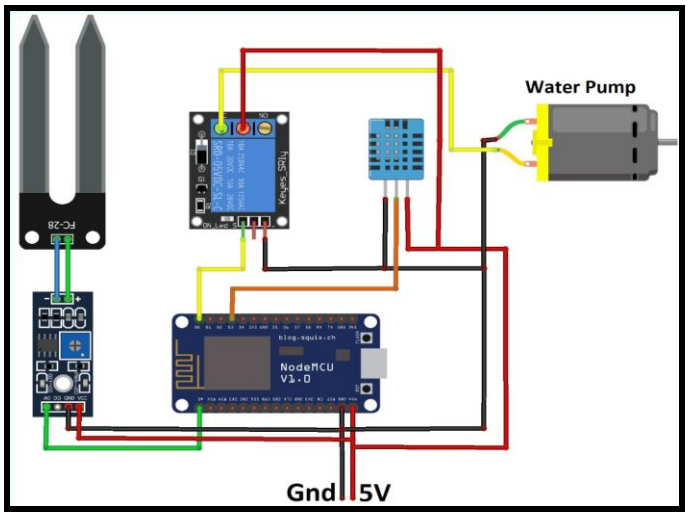

Fig -2: Reference Hardware Circuitry

Fig -1 indicates the connections done and the way they are oriented to each other to register the data transfer between all the peripheral devices with the processor. The above layout is designed as a hardware model and programmed to get it functional. In order to understand the logical function of the model, following flowcharts (Fig -3 & Fig -4) are made which illustrates the working of DHT11 and Soil Moisture sensor.

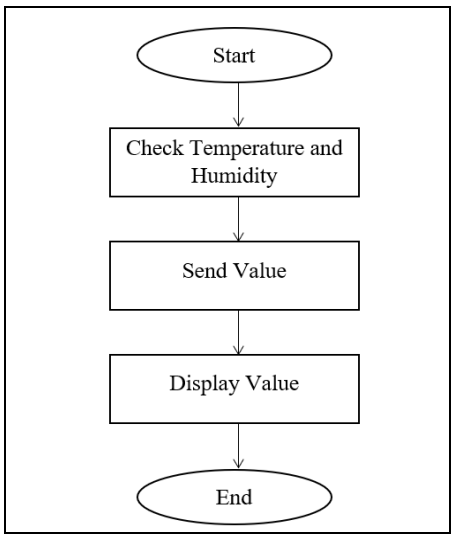

Fig -3: Flowchart for working of DHT11

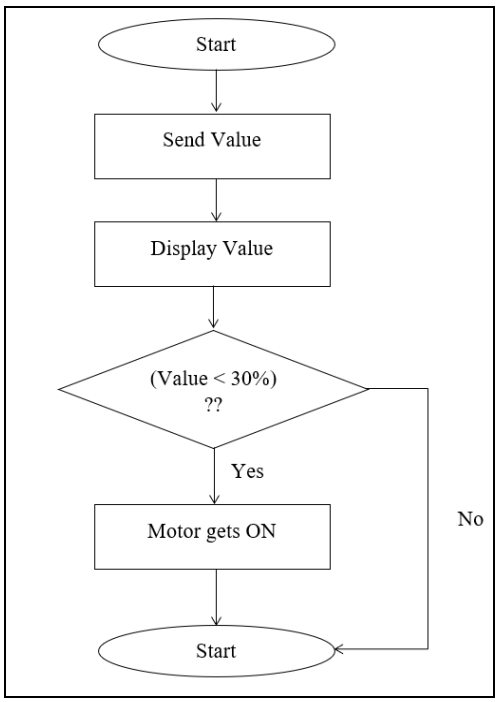

Fig -4: Flowchart for working of Soil Moisture Sensor

4. DISCUSSIONS

The attached sensors will detect various soil conditions and automatically irrigate the land based on soil moisture percentage. It means that when a field needs water, the motor automatically turns on and turns off when it has enough. On user devices, these sensed parameters and motor status will be displayed. These have been running smoothly. It will also reduce the farmer's pores. We can save water, maintain soil moisture, and reduce human power loss with this type of Smart Irrigation System.

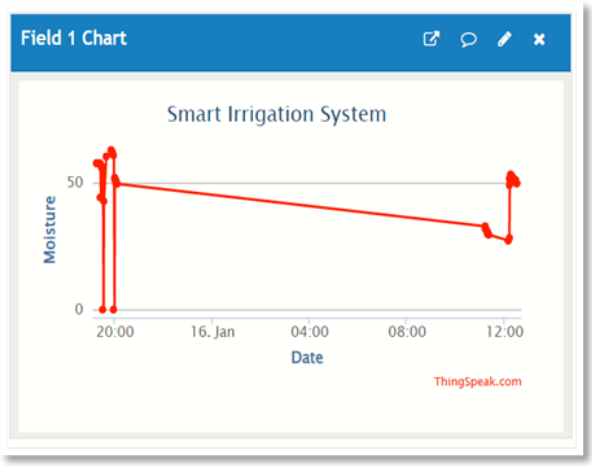

Chart -1: Moisture Percentage Readings

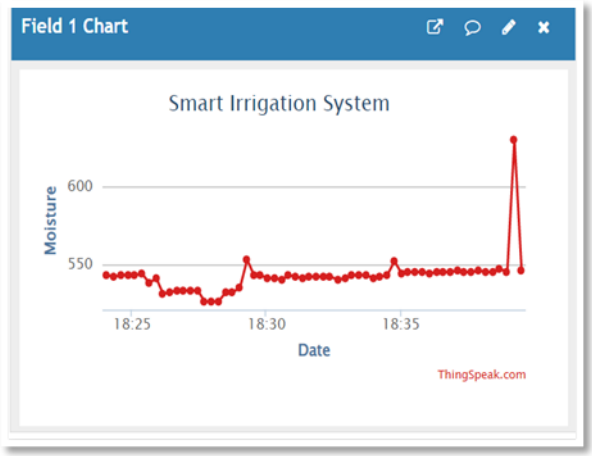

Chart -2: Moisture Scale Readings

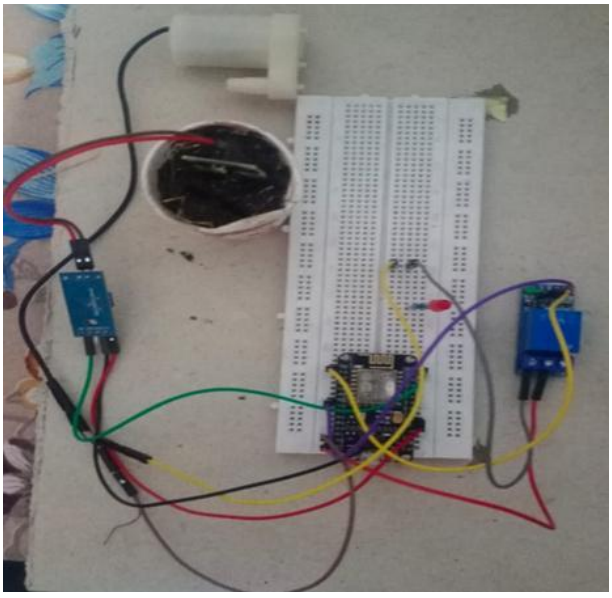

Fig -5: Actual Hardware Circuitry

5. CONCLUSION

The application of agriculture networking technology is not only required for fashionable agricultural development, but it is also an important symbol of the future level of agricultural development; it will be the agricultural development's future direction. After constructing the agricultural water irrigation system hardware and analyzing and researching the network hierarchy features, functionality, and thus the corresponding software architecture of precision agriculture water irrigation systems, applying the web of things to highly effective and safe agricultural production has a significant impact on ensuring the efficient use of water resources as well as the efficiency and stability of agricultural production.

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