AUTOMATIC IRRIGATION SYSTEM

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ABSTRACT

This review paper promotes the efficient application of Internet of Things technology in traditional agriculture. Its foundation is the use of the NodeMCU ESP8266 Relay module to create an autonomous irrigation system. The ease of employing an autonomous irrigation system to irrigate their crop is advantageous to farmers. To gauge the amount of moisture in the soil, we'll utilize a capacities soil moisture sensor. We like the DHT11 Humidity Temperature Sensor to measure both air temperature and humidity. Relay powered by a 5V battery is used to control the water pump. The motor immediately starts when the sensor notices that the soil has little moisture. Consequently, the land will be automatically irrigated. The motor shuts off when the soil becomes damp. Through the online Thing Talk Server, you can keep an eye on everything that is happening.

Keywords*: - Irrigation System, NodeMCU ESP8266, Soil Moisture Sensor, Humidity Sensor, 5V Relay Module.*

1. INTRODUCTION

One of the most urgent problems in the globe is the lack of access to water. Water is heavily used by the agricultural industry. As a result, we urgently need a system that effectively manages both the supply and usage of water. Currently, physical regulation applies to almost all irrigation systems. Due to the long-term viability of irrigated agriculture, pressure on the water distribution system is expanding, and water management is becoming increasingly important. Approximately 70% of the world's freshwater supplies are typically withdrawn for irrigation agriculture, according to the World Bank.

It has been evolving and emerging for decades, and the automatic irrigation system is a unique situation that many academics are interested in. The main objective of automatic irrigation is to conserve electricity, water, and labor. Tensiometric and volumetric techniques, which are nearly simple yet similar to the characteristic curve of soil water, which varies depending on the type of soil, are used to control soil moisture-based irrigation. To operate effectively, all sensors need to be maintained on a regular basis.

The type of irrigation system is typically made to run automatically and use the moisture sensor to water the plants methodically without requiring human interaction. The main objective of the project was to create an irrigation system that combines all of the aforementioned attributes with standard irrigation system functions, like measuring moisture analysis of the area to prevent crop damage. Temperature is measured in order to examine the ambient temperature since crops are sensitive to changes in temperature.

It can operate the irrigation system from any location with internet access in the world. The planned irrigation system will also update farmers on their crops and let them know if any unfavorable conditions arise on their farms. It will quickly grow to accommodate managing and controlling autonomous irrigation. By efficiently watering plants, this device can reduce the need for human labor while also enhancing water conservation.

For the nation's ever-growing need for food, which is necessary for survival and maintaining good health? Rapid advancements in food production technologies are essential to preventing diseases and making it simple to meet daily dietary needs for people. The only source for this is agriculture. This is a key element in human cultures that

contributes to a rising and dynamic demand for food production. The economy and development rely heavily on agriculture.. In countries like India, agriculture is crucial to the economy and prosperity. Farmers employ irrigation since there is less water on earth due to a lack of water and a shortage of water on the land. Irrigation is the science of applying water artificially to soil or land so that plants can receive water based on the type of soil present. In agriculture, two things are crucial: first, learning about the soil's fertility, and second, measuring the moisture content of the soil. Different techniques are now available for irrigation, reducing the need on rainfall. Additionally, this method is mostly powered by electricity and regulated by on/off scheduling. There are more methods that use climate data to schedule irrigation water utilizing smart controllers and microclimate data. Irrigation is also a real-time application. Use the following technique to irrigate using these techniques.

2. ANALYSIS

Fig 1 :- Agriculture Field

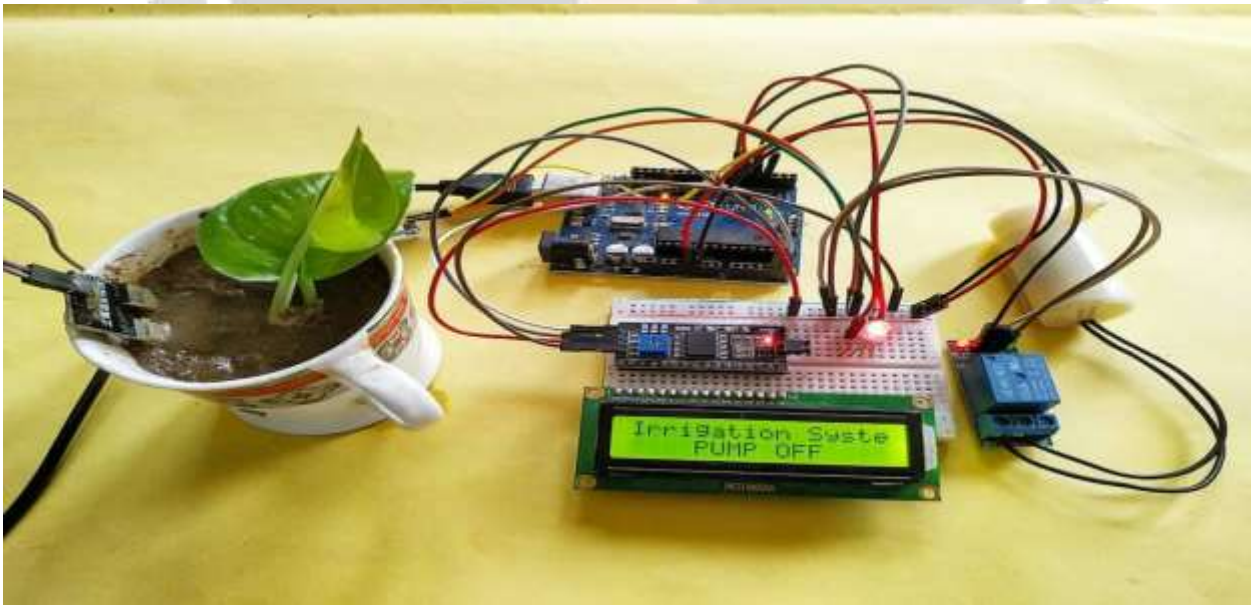

Fig 2 :- Testing of Circuit

3. LITERATURE REVIEW

There has been a tremendous deal of study and development in the subject of agriculture, and it is expanding quickly. The requirement to increase production is directly influenced by soil moisture, temperature, and a number of other variables, including humidity, which has taken centre stage in the agricultural industry. It is determining the soil moisture using soil moisture sensors, depending on which the property was irrigated. This has demonstrated to lessen water waste. The use of drip irrigation has proven to be beneficial since it reduces water waste by supplying water and nutrients directly to the root zone. A significant development in agriculture is the use of sensors in a 5V Relay module-based drip irrigation system. . The evapotranspiration rate of the plant should be taken into account as another crucial factor when planning irrigation. It is possible to maximize battery life by using the available DC voltage.

The automated technology saved 90% more money than the conventional watering system over its 136-day test period. The automated technology has been successfully employed for 18 months in three different locations. The technology has the potential to be helpful in water-limited, remote areas due to its low cost and energy independence. [1]

In this study, an acoustic-based approach was created to detect soil moisture content. The primary goal of this method is to establish a real-time method for measuring soil moisture. The method is based on the link between two variables, namely the sound speed and the level of water saturation in soils. Depending on the type of soil, this experiment discovered that the speed of sound reduces as the moisture content increases. [2]

In this study, a micro-controller-based model of an autonomous irrigation system was created, with solar power serving as the only source of electricity. In the paddy field, many sensors are positioned. Sensors continuously measure the water level and provide that data to the farmer via mobile phone. Without entering the paddy field, the farmer operates the motor using a cell phone. If the water level rises to a dangerous level, the motor will automatically turn off without the farmer's consent. [3]

The automatic system was built on ARM, and GSM was used for communication. The irrigation system offers real-time, appropriate irrigation for a specific area. A sensor that measures soil moisture is installed in the root zone of the paddy field. GSM and the ARM7TDMI core were used to configure the system. GSM is a crucial component of this system. System uses GSM for communication. GSM connects an ARM processor to a centralized unit and operates via SMS. Real-time detection of field and climate conditions is provided by this technology. The standard set of AT (Attention) instructions is used to govern the information sent to the user in the form of SMS and GSM modem. The majority of GSM's features are controlled via these commands.[4]

In this study, internet technologies and a wireless sensor network called Zig-bee were used to irrigate utilizing an autonomous irrigation technique. The concept was created to enhance irrigation systems and lower irrigation water costs. Farms have sensors installed that continuously perceive and gather data. The data is kept at the central monitor, transferred to the interface for data collection, and then transmitted to the wireless sensor node. This information system was automatically controlled via the internet. [5]

In a paper they published, Archana and Priya showed how soil temperature and soil moisture levels could be used to control whether a water motor was turned on or off. Their project's flaw is that they failed to incorporate any method of informing the user of the status of the agricultural area. [6]

With the drawback of the paper written by Archana and Priya, Karan Kansara built an automatic irrigation system project. This project's disadvantage is that the system used to evaluate the nutrient value of the plants is insufficient. [7]

Only monitoring the soil's moisture is covered in the paper, "Automatic Irrigation System on Sensing Soil Moisture Content." But in addition to the soil moisture sensor, our proposed system also includes a temperature sensor. Zigbee-based smart wireless sensor network for monitoring environmental factors was proposed by Prof. C.H.

Chavan and P.V. Karnade. In this paradigm, nodes have the ability to submit data to a central server, which will store, further process, and display the data. The disadvantage of their proposed system is that nutritional content and weather predictions are not determined. [8]

Tom Gill et al. proposed pipe fitting-based venturi meters in 2011. An Underutilized Method for Determining Soil Moisture in Agriculture Fields For a variety of applications, venturi meters made of pipe fittings can be a useful way to measure flow with dependable accuracy. Most of the time, there is very little actual head loss through a venture meter. Most people are aware with pipe venturi meters as a measurement method for piped systems that offers a high level of precision while imposing a relatively low head loss. [9]

R.Nandhini et al. proposed an IOT-based Arduino-based smart irrigation system in 2017. The major goal of this smart irrigation system is to improve upon the current system by making it more creative, user-friendly, time-saving, and efficient. The pump will be connected to the driver circuit, which aids in switching the voltage, if the measured value exceeds the threshold values established in the programme. Through the GSM module, the farmer will be informed of the present state of the field. The farmer can access information regarding the state of the field at any time and from any location by using this technology. The technique is not utilized for plot count. [10]

The automated irrigation system was proposed to be developed using the ARDUNIO board by connecting sensors to the micro-controller unit in this study by N V P Rajendranath et al. The micro-controller unit continually checks the sensor data and sends an alarm SMS to the mobile phone of an owner who is in a remote location if the sensor data exceeds a specific threshold value. The DHT11 sensor's various values are measured under various climatic situations, and the threshold value is chosen based on those useful values. This system can be improved by utilizing WSN nodes for data transmission and database systems for on-site data storage. Solar cells can be used to power the entire system and keep the system in low cost.[11]

Sprinkler systems, which use sprinklers, sprays, or guns mounted on tubes, are also irrigation-based systems. As the water travels through the tubes, sprinklers are located at some ends to apply the water where it is needed. Only when the temperature and humidity sensor at the root zone exceeds the threshold value will the sprinkler turn on. The finest irrigation system for vast areas is the rotary system. Due to sprinklers' 100-foot range, the rotary system uses mechanically operated sprinklers that move in a round manner. Therefore, the device uses less water to sprinkle over time in a broader area. Infrared thermometers are used to measure remote canopy temperature for the watering of cotton crops [12].

In order to gather data from various sensor nodes, the agricultural field uses Zigbee-based transmission. Wireless sensor networks today are crucial to the food sector and to agriculture. Examples of these systems include those that continuously monitor the environment, maintain agricultural accuracy, or use RFID-based traceability systems, among others [13].

There are numerous ways to measure the data in irrigation fields, but Zigbee transmission of data from end devices is the most widely used one. However, using these gadgets, the gap between the two nodes is reduced to just 10 to 100 meters. Therefore, the majority of applications use GPRS-based systems to send data to remote areas [14].

"Automatic Irrigation Control by Using Wireless Sensor Networks," J.S. Awati and V.S. Patil. To define and assess the calibration functions for the integrated sensors, the system was coupled with sensors into a wireless monitoring network. In a soil layer that is drying, the system compares the measuring range and reaction times of the two sensor kinds. Data were made accessible through Internet access after being transferred over a number of kilometers. [15]

4. BLOCK DIAGRAM

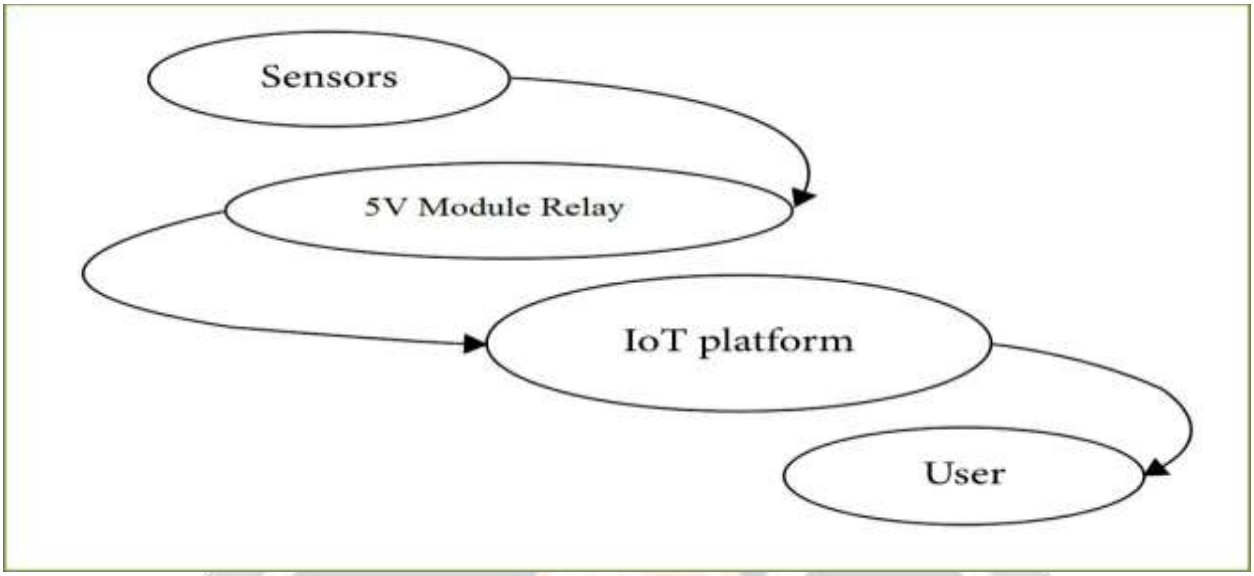

Fig 3: - Block diagram of the agriculture monitoring system.

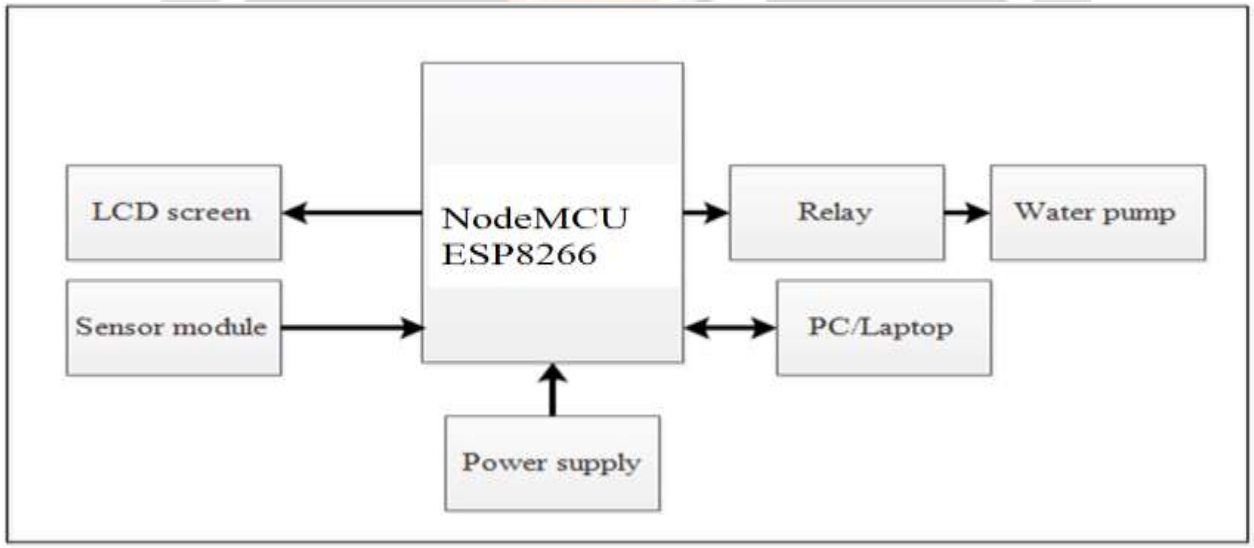

Fig 4: - Block-diagram-of-an-automatic-irrigation-system-based-on-NodeMCU ESP8266.

5. CONCLUSION

Humans have known for some time now how important it is to preserve the environment and nature because they both depend on it. So by planting trees and nurseries, we may entice people to the outdoors or to nature. Therefore, it is necessary for us to water the plants on a daily basis. However, the very next day, they forgot to water the plants. Therefore, our projects utilize automatic irrigation on plants to make manual labour simple. It ensures that plants receive the appropriate irrigation and automatically stop watering. We also take into account the amount of soil moisture, humidity, and temperature that the plant needs to grow healthily.

One of the crucial industries using modern technology to reduce farmer burdens is agriculture, for example, irrigating fields to raise crops. In order to create a better computerized irrigation device with low cost and noticeably reduced circuit complexity for the farmers in agriculture, the potential for future research in the irrigation process is addressed.

For maximizing the use of water resources for agricultural production, the smart irrigation system is practical and affordable. This irrigation method makes it possible to cultivate in dry areas, enhancing sustainability. It demonstrates that water use can be reduced. For organic crops, the usage of solar electricity in this system is crucial.

6. REFERENCE

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