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Impact of Smart Irrigation Systems in the Agriculture to Overcome the Losses Due To Open Flow Irrigation

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ABSTRACT: ***Water is an essential requirement for all living things, hence every living thing, plant, and animal should have plenty of it. Agriculture is among the key occupation that feeds food to an entire globe, as science can make anything artificial, but food cannot be replaced. Plants and animals provide sustenance for all living species, and all living beings rely on plants for existence. Because crops are the primary supply, they are grown throughout the year. Irrigation is required for the plants to sustain their growth rate and output. Various irrigation approaches are explored by various specialists based on crop and soil requirements utilizing IoT and artificial intelligence. The study's goal is to research and debate irrigation technology advancements to enhance the irrigation system. Thus, more research aids in examining the most recent irrigation technologies and the system's flaws, as well as suggestions for how to enhance them.***

KEYWORDS: ***Humidity, Irrigation System, Information of Technology (IoT), Sensors, Smart Irrigation, Wireless.***

1. INTRODUCTION

Every living thing needs freshwater, thus conserving water is a top priority for us. Traditionally the watering of crops is done by using a pump where the water has given a particular direction using soil row. By utilizing modern technologies, water should be used efficiently in irrigation. It's critical to stay on top of emerging developments in irrigation to prevent free-flowing water and manage it using Smart Irrigation (SI) techniques. These devices are equipped with hardware, connectivity, and various types of sensors that may be monitored and controlled remotely, as well as communicate and collaborate with others through the Internet.

There are a variety of ways to distribute water in agriculture operations that involve water inputs, commonly referred to as irrigated agriculture. The various alternatives have varying levels of productivity, and in certain surroundings, an exact method should be utilized for a particular yield. Irrigation methods vary greatly, however, we may categorize them as follows: Flood, spray, drip, and nebulizer irrigations are all options for how water is dispersed. The presence of sensing devices can also have irrigation without attention, in which the quantity of moisture is not measured. While in scheduled irrigation, in which the water is distributed according to the yearly needs.

The most crucial medium for plant development is soil. However, several factors such as soil wetness, PH, and humidity differ from one place to the next. Nutrient testing provides useful data about the soil that may be utilized to improve plant development. The suggested project may be

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controlled through the webpage using parameter threshold values and instructions. The suggested system may be controlled and manipulated and turns "on" and "off" based on the given settings. Because it is fueled by photovoltaic (PV) panels, the suggested system has the advantage of mobility and minimal maintenance costs. In addition, the proposed system not only irrigates the land but also can eliminate microorganisms. In many affluent nations, SI systems are used to reduce water waste. The planned project's scope is significant since it irrigates the largest area of land possible while also remotely monitoring the land. A solar-powered robot with a high-resolution camera and sensors is used to monitor crop health. The farmer is alerted through the GSM cellular network if the detected value of moisture in the soil, humidity, temperature, and the water level is less or more than the defined threshold [1], [2].

The necessary steps are conducted to provide soil nutrients via a watering pipeline, sprinkle the field with bacteria-killing chemicals, and maintain the proper threshold values. Agriculture uses a lot of freshwaters all over the planet. Because of the significant population expansion, the ratio will rise over time. As the world's population grows, so will the need for food and water. As we all know, our agricultural land provides all of our food. In everyday living, water waste has long been a big worry for our civilization. The supply of water varies greatly from one place to the next. Some areas have an abundance of water, while others have a scarcity. The irrigation for agriculture is critical, as the wasting of water must be reduced as soon as possible, as water use rises in tandem with population expansion. To compensate for these losses, an automated irrigation system is being developed, to irrigate the whole area. The field is dispersed around the city. The robot passes over all of these regions to feel the field's state and transmits the acquired data through message with the GSM network from a mobile phone application [3]–[5].

Atmospheric conditions play an essential role in both crop development. The thermal conduction commonly has a unit of “Celsius”, “Fahrenheit”, and “Kelvin degrees” and humidity is the number of water vapors in the atmosphere. Moreover, brightness is linked to temperature since direct solar radiation elevates the temperature and causes more evaporation in the soil. The average annual precipitation influences the requirement of irrigation for the crops. The pH sensors functioned to detect the pH of soil and water provided during the irrigation.

A “temperature sensor” measures the temperature of the body which might be available in numerous dimensions, and each one measures temperature using distinct methods as shown in Figure 1. A spring is linked to a rod at the sensor's tip, which leads up to the item scale. The spring senses the end of the stems and sits inside them. When heat is given to the detecting coil, movement is induced in the coil, which causes the gauge's needle to move, indicating the temperature. Temperature sensors are inexpensive, accurate, and dependable in repeated tests. Both integrated as well as surface mount applications benefit from them because of the decreased thermal mass, they have a quick response time. In most cases, any vibratory wire type is fully interchangeable.

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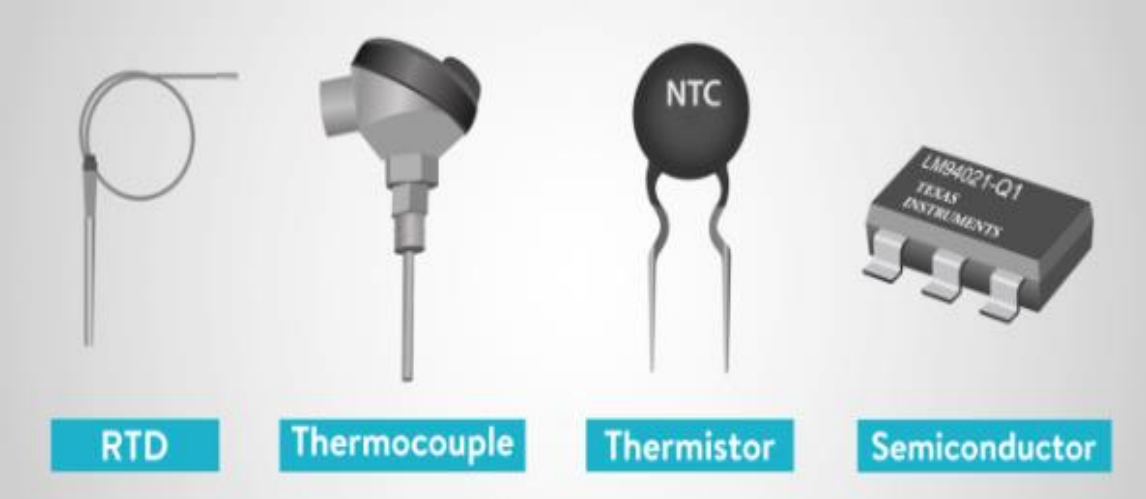

Figure 1: Represents the Temperature Sensing Modules Used in Analyzing the Temperature of the Environment.

“Humidity sensors” are electrical circuits that detect and display the humidity and ambient heat of the environment, wherever it is fixed which helps in understanding the content of water vapor present in the atmosphere. “Capacitive”, “resistive”, and “thermal humidity” sensors are the three most common kinds. To compute the humidity level, all 3 types will detect minor changes in the environment. There will be two pieces to wireless sensors: a transmitter and a receiver. Information from process control devices is converted into wireless communication by the transmitter. The wireless signal is converted by the receiver into the required output. Wireless standards are changing all the time, and as a result, wireless sensors are becoming accessible for these diverse protocols. “NFC", "RFID", "Bluetooth", and "Zigbee-based" sensors are all common wireless sensors.

This section delves into the construction of a sophisticated water system. The system's key components are the soil dampness and "moisture sensor", "Central Cloud Storage", “Arduino Microcontroller", and a variety of applications. Soil dampness and moisture data are continuously collected using the ground and this data is transmitted by the “Arduino” device. The data is sent to an integrated cloud via the “Arduino” pack. This cloud is linked to a wide range of applications. Ranchers can use a variety of treatments to control moisture and wetness. A rancher can specify certain features for a yield. If the actual moisture and soil dampness levels are within their range, the dazzling water system activates the sprinklers. The sprinkler, on the other hand, remains turned off. When the plant roots do not get the water of water they are not able to grow or they may dry with time, so water management should be done.

2. DISCUSSION

A study researched the SI System for Sandy Soils in a dry area. Arabian Peninsula" is a dry region with a scorching desert temperature and a significant lack of water. To prevent surface evaporation losses, IoT-based underground SI systems may be fundamentally created for these locales. The “sandy soil” characteristics in “Western Saudi Arabia” were taken into account in theoretical calculations to assess the effectiveness of an underground SI system in this study. For twin types

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of “sandy soil”, the effect zone of soaking induced by underground reflectors in the desired foundation region of the crop was investigated. The COMSOL is Multi-physics simulation results show that the underground SI system may be used to successfully control the target root zone at optimal saturation conditions while also preventing surface evaporation losses [6], [7].

Few authors discussed on SI system, where sensors are located at the bottom of the plant in the earth to collect the agent's dampness state for logical water distribution booking. The signals generated and identified by soil humidity sensors should be stored in a microprocessor for pre-programmed systems. A “cloud-based” SI system is studied, this system uses sensors to collect constant SI system data, saves it in the cloud, and then sends an order to the owner of the data, who then makes the appropriate action based on the conclusion [8]–[10].

Some researchers studied and developed “Intelligent and SI System Using Edge Computing and IoT”. They used a smart strategy that used ontology to determine half of the choices and relied on sensor data values for the other half. The conclusion is the product of a "machine learning algorithm" that takes into account the ontology decision and the sensor readings (KNN). Additionally, between both the central IoT server and also the GSM module, a periphery server is introduced. This method will not only decrease the delay probability to connects the IoT with a network of devices to resources effectively and efficiently track all the records, analyze the records at the end device, and transmit only some specific information to the main Central network to forecast the irrigation demands of soil, and display the result on display modules.

A sufficient quantity of water is required for effective agriculture, with the soil being able to keep the moisture and absorb it as needed. With the growth of agricultural techniques, the usage of "Aurdino" and IoT is rising, allowing the owner to monitor the providing authentic crops from a single location that uses the GSM network and the internet. The usage of sensors is vital in assessing the status of soil, such as whether it is dry or not; wet soil indicates the presence of water, whereas dry soil indicates a lack of water; hence, the IoT aids in increasing the water availability to crops by providing water to the soil. Most studies are focused on SI systems, and so many technological advancements are beneficial development of society. Food is a primary necessity of active organisms, and as the population grows, so does the demand for food. However, as the land available for agriculture shrinks, farmers must become more creative in their use of modern and sustainable technologies to increase productivity.

The usage of cloud storage makes it simple to determine the length of time that soil will keep a water-based on the temperature difference. As a result, cloud storage makes the data available to the user for a short period, which is beneficial to the farmer. Clean water is essential for all living things so it is necessary to preserve the water as the water is getting wasted during free-flow irrigation which can be reduced using contemporary technology. It's vital to keep up with current innovations in irrigation to avoid free-flowing water and regulate it using SI techniques. As a result, as the temperature rises, so does the amount of water available to crops, which must be met to enhance agricultural yield.

3. CONCLUSION

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The delivery of the proper water volume at the correct location inside the facility is required by scientific scheduling. This needs continuous monitoring of the root zone's soil moisture content, as well as the start of irrigation on the desired schedule based on the plant's characteristics, development, soil type, and environment. As a result, sensors directly to the root zone in the soil are required for scientific irrigation to acquire a realistic moisture condition. The irrigation system described in this article is cloud-based and IoT-based. This system uses sensors to capture actual irrigation data, save it in the clouds, and then transmit a signal to the cloud provider, who then takes action depending on the outcomes. Thus, using the study it becomes easy to analyze the different methods used in agriculture. The use of IoT and AI is helping farmers by reducing their labor and by giving them the best suggestion for their crops. The sector of agriculture will improve with time and within the next few years, it will become robotic farming where common farmers also afford to use robots at minimum costs.

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