International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 06 | June - 2021 ISSN: 2582-3930

Research Work on Automatic Irrigation System Based On Solar Energy

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Abstract: *In recent days, farmers have been struggling to water their crops to keep them green in the summer. This is because they don't have a good idea about power supplies. Even if electricity was available, they would have to wait for the tracks to be deposited properly. Thus, this process limits them from stopping other actions. But there is a solution, when testing the irrigation of a solar installation with a submersible pump, solar cells are used to generate electricity which is stored in a rechargeable battery. These batteries produce energy to power the system. With a control pump, water is pumped from the well to the water storage tank. The water is then raised by a submersible pump just down the road where a built-in sprayer waters the plant or crops.*

Keywords: *Soil Moisture Sensor, Sensor Installation, Water Level Monitoring, Arduino Uno Micro Controller, ATmega328P*

I. INTRODUCTION

Irrigation is ready to apply water to soil or soil. It is used to help cultivate agricultural crops, maintain landscapes and regenerate disturbed soil vegetation in dry areas and during periods of inadequate rainfall. Once an area is reached, water flows along the fences and ends up in the irrigated head (drop) or sprinkler. Many sprinklers have a pipe threaded inlet at the bottom that allows the pipe to be attached and connected. Overhead sprinklers are usually installed at ground level. When the water is under pressure, the head comes out of the ground and irrigates the affected area until the valve closes the area. When there is no more water pressure on the sideline, the syringe head will be pulled back to ground. Emitters are usually placed at ground level or excavated a few inches to reduce evaporation losses. Water is a resource that all living things need. So it is very valuable and should be used in moderation to preserve future generations. Agriculture is an industry that uses a lot of water. In most cases, these resources are not used efficiently and a lot of water is wasted. In the near future, this waste will generate a lot of money. Those who manage these resources efficiently will save time and money.

This project report proposes an automated irrigation system to minimize water intake and human intervention, while meeting the needs of crops. First, the details of the problem are summarized. The objectives and scope of the project are explained. Some common design methods are covered.

2. LITERATURE REVIEW

The development of models and plans for controlling the plant environment began with the shooting environment, that is, with the climate.

One important reason was that influencing variables such as

temperature, humidity, and irradiation or CO2 concentration are easier to measure and to control." (Hans P. K, 2000)

From this research, we can see that there are a few factors that need to be control in the environment. The factor that is to be considered is soil moisture.

Khriji et al (2014) presented a complete irrigation solution for the farmers based on WSN. The automated irrigation system using low-cost sensor nodes having reduced power consumption can reduce the water waste and is cost effective. A node is deployed using Telos B mote and adequate sensors/actuators. Field nodes are used to detect the level of moisture and temperature in the soil. Weather nodes monitor the climatic changes, and the nodes connected to actuators are used to control the opening of the irrigation valve when needed.

Mahir et al (2014) proposed an efficient water usage system by pump power reduction using solar-powered drip irrigation system in an orchard. Soil moisture content is analyzed by Artificial Neural Networks (ANN) to provide even distribution of water for the required location. This will prevent the unnecessary irrigation and reduce the water demand. This system reduces the orchard's daily water usage and energy consumption by 38 percentages.

Farid et al (2013) presented a practical solution based on intelligent and effective system for a field of hyper aridity. The system consists of a feedback FLC that logs key field parameters through specific sensors and a Zigbee-GPRS remote monitoring and database platform. The system is deployed in existing drip irrigation systems without any physical modification. FLC acquires data from these sensors and fuzzy rules are applied to produce appropriate time and duration for irrigation.

Singh et al (2012) presents a solution for an irrigation controller for cultivation of vegetable plants based on the fuzzy logic methodology. In this system the amount of water given to the plants depends on its size, moisture control of soil, which is affected by temperature of environment, evaporation due to wind velocity and water budget. The system feed water to plants in a controlled and optimal way. Solar energy conversion technology is used to feed power to the pump controller.

Xin et al (2013) described an autonomous precision irrigation system through the integration of a center pivot irrigation system with wireless underground sensor networks. The wireless underground sensor aided center pivot system will provide autonomous irrigation management capabilities by monitoring the soil conditions in real time using wireless underground sensors. Experiments were conducted with a hydraulic drive and continuous-move center pivot irrigation system.

Robert (2013) promoted a commercial wireless sensing and control networks using valve control hardware and software. The valve actuation system included development of custom node firmware, actuator hardware and firmware, an internet gateway with control, and communication and web interface software. The system uses single hop radio range using a mesh network with 34 valve actuators for controlling the valves and water meters. J.S. Awati and V.S. Patil, "Automatic Irrigation Control by Using Wireless Sensor Networks".

The system was integrated with sensors into a wireless monitoring network to determine and evaluate calibration functions for the integrated sensors. The system compares the measuring range and the reaction time of both sensor types in a soil layer during drying. Data were transmitted over several kilometers and made available via Internet access.

Nolz et al (2007) integrated the sensors into a wireless monitoring network to determine and evaluate calibration functions for the integrated sensors, and compare the measuring range and the reaction time of both sensor types in a soil layer during drying. The integration of the sensors into the telemetry network worked well. Data were transmitted over several kilometers and made available via Internet access.

Christos et al (2014) described the design of a flexible decision support system as well as its integration with an air conditioner / inverter to implement a closed loop. The use of information to explain the concept of applications emphasizes system flexibility and flexibility and facilitates the implementation of automated acceptance systems. Mechanical learning systems are being put in place to trigger new rules by analyzing logged datasets to extract new information as well as to extend the system's process in order to function.

3. Statement of the Problem

Watering plants is usually a long-term activity; to do this within a reasonable time requires a lot of manpower. It has become a tradition that all steps are carried out by people. Currently, some systems use technology to reduce the number of workers or the time required to irrigate plants. With such a system, management is very limited and many resources are still wasted.

Water is a resource that is overused. Irrigation is one of the methods used to irrigate plants. This method is a major drawback because the amount of water exceeds the needs of the plant. Above the water is evacuated through holes in containers in the greenhouse or penetrates through the soil in the fields.

Modern water perception is a free and renewable resource that can be widely used. However, this is not the reality; In many parts of North America, water use is taxed. It is therefore reasonable to assume that it will soon become a very expensive resource everywhere.

With excessive water costs, labor is becoming more expensive. As a result, more money will be involved in the same process if no effort is made to channel this resource.

4. Objectives of the Study

The aim of this project is to build an automatic plant irrigation system that sense soil moisture using microcontroller.

The following are objectives of the studies:

✓ To reduce human interference and ensure proper watering

✓ Reducing water loss and improving water efficiency

✓ To prevent the pumping machine from working and whether it is bad or not

5. Justification of the Work

The growth of the world's population has led to an increase in the demand for food. This event necessitated the cultivation of more land. Due to climate change caused by global warming, irrigation remains the only reliable method of crop production. As more and more land has been irrigated, optimal water use is needed.

In recent years, knowledge of electronics and computing has been used to solve modern challenges. At the forefront of the electronic revolution was the microcontroller. The microcontroller has been used with various sensors to measure and control physical quantities such as temperature, humidity, temperature and light. By controlling these physical dimensions using the microcontroller; automated systems have been achieved.

Irrigation systems can and can be automated in crop production. This solves the challenge posed by the unreliability of climate change, which requires water efficiency. Automating the irrigation systems of soil sensors is one of the most convenient, efficient and effective ways to optimize water. The systems help to save water and thus bring more irrigation. Plants grown under controlled conditions are generally healthier and thus result in higher yields. A controlled hydraulic system results in the use of fertilizer and thus reduces fertilizer costs.

6. Working Principle of the Overall System

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The system consists of a soil moisture sensor, PIC microcontroller and relay interface card. The irrigation system consists of lanes that flood all areas and the flood is controlled by valves, as shown. There is also a motor pump that is used to fill the water tank..

Fig:1 Simple wiring diagram of the system

7. Result Analysis

Simulation results using MultiSim

By varying the resistance (700 kΩ) in the potential divider circuit as a representation for the dry/wet condition of the sample soil, the circuit was tested and the results are tabulated below:

S/N	Soil Moisture level	Output of the sensor circuit (in Volts)	Output of the main pump controlling circuit (in Volts)
1	Below lower level	2.375	0
2	Increasing but below higher level	3.262	0
3	More than higher level	5.265	10
4	Decreasing but higher than lower level	4.372	10

Table1: Simulation results

The working of the relay for various test conditions is tabulated below

S/N	Voltage range	Soil condition	Q	Amplifier output (digital)	Relay reference pin voltage	Relay 'NO' contact	Water pump operation
1	> 5V	Excess wet	0	1	1	open	OFF
2	<5V&	Optimally wet	0	1	1	open	OFf
3	>3V	Optimally wet	1	0	0	closed	ON
4	<3V	Drv	1	0	0	closed	ON

Table 2: Operation of relay for various soil moisture conditions

6. Soil Condition Analysis

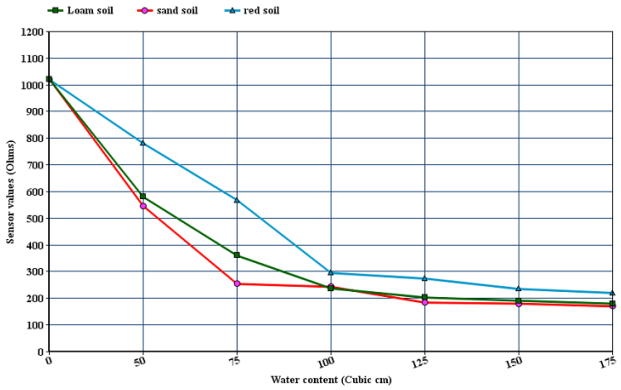

Figure 3: Graph of Soil Condition

7. Conclusion

Therefore, an "automatic soil moisture sensor irrigation system using a microcontroller" has been successfully designed and tested. It is developed by the integrated features of all the hardware components used. the location of each module was carefully considered and added, which contributed to the best work of the unit. Therefore, an automatic soil moisture sensor irrigation system using a microcontroller has been successfully designed and tested. the system was tested to operate automatically. The humidity sensor measures the moisture level (moisture content) of various plants. if the humidity level is detected below the desired level, the humidity sensor sends a signal to the ic (microcontroller) that prompts the water pumps to turn on and supply water to each plant using a rotating platform / sprinkler. When the desired humidity level is reached, the system stops itself and the water pump is turned off. therefore, the functionality of the whole system has been thoroughly tested and is said to be working successfully.

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