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Drip Irrigation Management Using Moisture Sensors

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Abstract- Agriculture is a major user of ground and surface water all over the world, mainly in India, Israel and the United States, accounting for approximately 80 percent of the Nation's consumptive water use and over 90 percent in many Western States. This paper presents the details of a solar-powered automated irrigation system that dispenses the exact amount of water required depending on the soil moisture, hence minimizing the waste of water. The automated drip irrigation system will help reduce the problems associated with water waste in farming, avoid evaporation, and as a result increase food crop production.

Keyword:- ***moisture sensor Solar energy, Batteries, Field capacity, Drip irrigation,***

1. INTRODUCTION

Water management is the most important issue on which the growth of agriculture sec-tor largely depends. Indian agriculture sector is in dire need of investment to meet the expenses. To fuel the capital needs of the agricultural economy and also to ensure that the benefits of growth percolate to bottom of the socio-economic pyramid, farming has to be projected as an avenue of investment for the urban population. The scarcity of available water both in its quantity and quality and the migration of labour from agriculture for various reasons resulted in modernizing and automating farming practices that will pave way for revamping agriculture. Whenever physical conditions change rapidly, these allow for real-time data processing at a minimal cost. Sensor Networks (SNs) are increasingly considered by the scientific community as the future of Environmental Monitoring. Solar energy is a very large, inexhaustible source of energy. The power from the sun intercepted by the earth is approximately $1.8*10^{11}$MW, which is many thousands of times larger than the present consumption rate on the earth of all commercial energy sources.

India is called country of agriculture. Here 70-80% economy depends on agriculture. According to human population. Agriculture is only one source to grow the seeds of food.

2.Literature Review

According to the survey conducted by the Bureau of Electrical Energy in India in 2011 there are around 18 million agricultural pump sets and around 0.5 million new connections per year is installed with average capacity 5HP. Total annual consumption in agriculture sector is 131.96 billion KWh (19% of total electricity consumption).

In this proposed system we utilize the solar energy from solar panels to automatically pump water from bore well directly into a ground level storage tank depending on the intensity of sunlight.

3. What is irrigation?

Irrigation is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops,maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall.Additionally, irrigation also has a few other uses in crop production, which include protecting plants against frost,suppressing

weed growing in grain fields and helping in preventing soil consolidation. In contrast, agriculture that relies only on direct rainfall is referred to as rain-fed or dry land farming.

4.Water management

The main requirement of paddy is wet soil for its growth and sufficient water management according to need. Flooding is unnecessary if the weeds can be removed manually but if not then the fields are flooded to suppress weed growth and maintain nutrients such as phosphorus, potassium, silica and calcium iron. Water is needed only at three critical stages ,at the initial seedling period (10 days), flowering and panicle initiation stage. After the transplantation till the seedlings grow it needs standing water at a depth of 2-5 cm. Then till the dough stage of the crop, 5cm of water should be maintained.

5.Essence of an accurate and efficient Irrigation

Irrigation is an artificial application of water to the soil. An irrigation system is a system that delivers water to an area where water is needed but not normally present in the required amounts. Generally, it is used for agriculture and landscaping purposes. Additionally, irrigation also has other uses in crop production, which include protecting plants against frost. suppressing weed growing in gain fields and helping in preventing soil consideration. In contrast, agriculture that relies only on direct rainfall is referred to as rain-fed or dryand farming

6.Experimental set up

a. Solar Plate
b. Battery
c. Moisture sensor
d. Dripper

Fig.1. Photograph of s system used for drip irrigation system using moisture sensors.

7.Working:

Soil moisture sensing network is used to monitor the moisture contained in soil. Three different sensors are used to monitor three layers of soil. And according to that further action is taken by microcontroller as the output of network is given to the microcontroller. Indicator indicates whether the soil is dry or wet. Microcontroller is the heart of the system; it controls the overall irrigation system. It takes the input from moisture sensor 1, 2, 3 etc. & according to the written program it turns ON or OFF the motor pump. It also indicates the condition of soil. Also it provides the data to the PC through zigbee module. When soil is dry motor is on and when soil is wet motor is off. Thus microcontroller controls the operation of motor. Zigbee module is a communication technology just like a Bluetooth but different that it is a full duplex communication. AC or DC motor can be used for whole system. On the basis of soil moisture detection, motor ON/OFF working will be done. Provision of water and considering the need of water to the crop is done by controlling motor. Along with this the valves are made on depending on the state of the soil. LCD is also used at field .It indicates message from the microcontroller soil state, motor state.

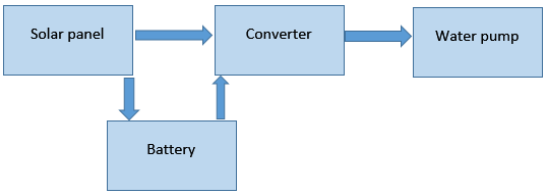

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Fig. 2: Block diagram of solar pumping module.

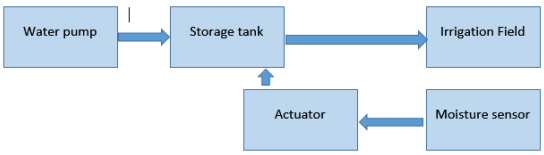

Fig. 3. Block diagram of irrigation using moisture sensors

8. Results and discussion

The smart irrigation system was tested on a garden plant. The plant's water requirement is 600-800mm a day and temperature requirement of the soil ranges from 50₀C- 100₀C. In the Arduino code, the moisture and temperature range were set as 300-700 and 450-800 respectively (which delineates the corresponding resistance value in digital format). Moreover this system proves to be cost effective and proficient in conserving water and reducing its wastage.

Fig3. Photograph showing drip irrigation using moisture sensors.

9. Advantages:-

This technology is recommended for efficient automated irrigation systems and it may provide a valuable tool for conserving water planning and irrigation scheduling which is extendable to other similar agricultural crops. Maximum absorption of the water by the plant is ensured by spreading the water uniformly using a servo motor. So there is minimal wastage of water. This system also allows controlling the amount of water delivered to the plants when it is needed based on types of plants by monitoring soil moisture and temperature.This project can be used in large agricultural area where human effort needs to be minimized. Many aspects of the system can be customized and fine tuned through software for a plant requirement.

10. CONCLUSION

1. The present proposal is a model to harness maximum

available solar energy by tracking the sun and modernize theagriculture industries at a mass scale with optimum expenditure.

2. The solar power irrigation system will help to reduce the gap between required and consumed energy and further conserves the resources thereby reducing the wastage of resource.

3. This system can be improved by adding temperature sensors and dissolved solid sensors. To improve system internet can be used to control the system.GUI can be added to analyze the farm condition and sensors value graphically.

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