Solar Powered Automatic Drip Irrigation System With Alternate Water Storage

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***Abstract*— The main aim of this project is to provide automatic drip irrigation to the crop; it helps in saving water as well as power and money. This paper proposes intelligent and smart Irrigation system which can be used for controlling the watering or irrigation of plants. It controls the irrigation of plants automatically where the need of human intervention can be reduced. This mainly focused on wastage of water, which is a major concern of modern era. It also aids time saving, cost effectiveness, environmental protection, low maintenance and efficient irrigation service. The system has sensor which measures the moisture of the soil and switches relay which controls solenoid valve according to the requirement. This also provides an alternative to the limited power supply to the 3-phase motor, by additionally accumulating water in a storage tank, which can be used 24x7. Solar power enables the system to be independent and working at low maintenance.**

Keywords*— *Soil Moisture sensor, Solar Power, Drip Irrigation, Solenoid valve, Microcontroller.

I INTRODUCTION

Most of the worldwide available water resources is used in agriculture, around 85% and this percentage will not decrease soon keeping in mind the rate of population growth, leading to high demand of food. IT'S already high time to create and implement new methodologies using smart technologies for sustainable agriculture. In our country Agriculture is major source of food production to the growing demand of human population. In agriculture, irrigation is an essential process that influences crop production. Equipment used in drip irrigation systems is plays a major role. There are many pieces of equipment required. They include plastic hose or pipe, spaghetti hose, emitters, pressure regulators, pressure gauges, valves, fertilizer tanks, filters — both sand and SCREEN, TIME CLOCKS, evaporative pans, meters, and fertilizer injectors. One of the most important items in the hardware for drip irrigation systems is the filter. The five most important parameters to consider when creating drip irrigation are humidity, temperature, ground water, carbon dioxide, light intensity. Automation in irrigation system makes farmer work much easier. Sensor based automated irrigation system provides promising solution to farmers where presence of farmer in field is not compulsory. A small processor programmed for controlling an electromagnetic valve and also compare to electromagnetic valve operate motor to start watering. A timer for the automation of drip irrigation is set, which works accordingly to the sensors and combining all this features the flow of water in fields will be automatically controlled rather than manually. It also contains the moisture sensor. Sensors are installed in the root zone at the undisturbed soil. The soil moisture sensor is a sensor connected to an irrigation system controller that measures soil moisture content in the active root zone. Soil moisture sensor can reduce irrigation application by 50%. Sensors are placed at least 5 ft from the downspouts for avoiding the high moisture areas. Tensiometer can be used as the moisture sensor to detect moisture contents of soil. The sensor will not be damaged by temperatures as low as -40°C (-40°F); it is safe to leave the sensor in the ground year-round for permanent installation. These sensors are buried in the ground at required depth. Once the soil has reached desired moisture level the sensors send a signal to the micro controller to turn off the relays, which control the valves. This project will automatically turn ON or OFF the supply by detecting the water content in the soil. An automated irrigation system will not only minimize the excess wastage of water but also imply reduction of labor and other overheads. This project is a mini model for gardening purpose at home which contains two modules- one for measuring soil moisture content in soil and the other for detecting and controlling water level in tank.

II EASY OF USE

- The major scenario of limited power supply for 3-phase motor can be easily overcome by providing an alternative water storage tank with a single phase motor supply, so that the watering needs of the crop goes uninterrupted.
- The lack of continuous 3-phase motor power will be enhanced by a backup using storage water tank with 1-phase sump motor.
- However the system is designed to work 24x7 by solar power supply.
- So this project will change the lack of water supply during unavailability of 3 or 2 phase power supply, through the alternate storage and common household power supply. Also the drip system will take care of judicious use of water and solar supply will ensure the system to work uninterrupted at all times.

III MOTIVATION OF THE PROJECT

Generally farmers visit their agriculture fields periodically to check soil moisture level and based on requirement water is pumped by motors to irrigate respective fields. Farmer need to wait for certain period

before switching off motor so that water is allowed to flow in sufficient quantity in respective fields. This irrigation method takes lot of time and effort particularly when a farmer need to irrigate multiple agriculture fields distributed in different geographical areas.

In this electronics era, a smarter approach of leading a life should be carried out and thus we have "Solar Powered Automatic Drip Irrigation System" for smarter irrigation. It is the combination of two major efficient irrigation methods, automated irrigation as well as Drip Irrigation. Automated Irrigation System will regulate water flow in soil without much human intervention, while maintaining moisture of the plants.

Really INDIAN farmers need cheap and simple user interface for controlling sensor based automated irrigation system. Saving water and electricity for the future is a challenging task for farmer and landlords. We have used solar panel and battery to provide water at the right time to the crops. Solar panel converts the heat energy into electrical energy. It serves to overcome the effect of the power supply failures. The battery supplies the electrical energy to the system in case of power failure. Thus, our system provides an uninterrupted power supply, timely deliver, and right amount of water to the crops and plants.

IV LITERATURE SURVEY

Researchers in the field of Agriculture have been trying to reduce the water wastage amount used for irrigation of plants, therefore different technologies can be used to make this possible which has been highlighted by many researchers. Some of such researches in agriculture field are summarized below.

The main idea in this paper [1] describes the automated irrigation using micro controller and sensor from which the farming can be done using various new technologies to yield higher growth of the crops. There is more production and also their efficiency is high in the agriculture. A suitable network has been taken from Jia Song [2]. They proposed a system Zigbee for Greenhouse Monitoring and Control System (GMCS) using 8051 microcontroller. They have discussed about GMCS Based on Zigbee using the ARM controller. It is accessible to the user through the Internet which gave a much clearer picture of the idea we used to implement. The idea of the GSM network, which communicates through the micro controller and the working of the GSM were discovered in the IEEE standard 802.11[3]. The author [4] has used a microcontroller based home GSM system which gives the proper communication between the microcontroller and GSM. Android phone is used for entering the password to get into the house. When a wrong password is given the door will not open and alarm is used for the indication. The study of sensor that used in our project is moisture sensor; it was deliberated by the study of sensors in moisture [5]. In this paper [6], the author used an SMS based communication for controlling the various devices. This method is cost effective, easy to access and simple to understand. Even a novice user can use the system very easily. Jia Uddin, etal. [7] have used a solar energy as a backup during power failure. The system maintains the water level in the farm by automatically sensing the moisture of the water.

V PROBLEM STATEMENT

Of all the already proposed systems, a pinch of energy efficiency methods are lacking. Hence making the system more efficient towards the use of energy as well as maximum optimization in minimum use of water resource brings out the keen objective of this project. Maximizing the possibilities of agriculture in areas with less water abundance and automation.

A. Challenges Faced Currently

1) Water

Most of the worldwide available water resources is used in agriculture, around 85% and this percentage will not decrease soon keeping in mind the rate of population growth, leading to high demand of food. So the scarcity in availability of water is a growing concern.

2) Power/Electricity

Despite the availability of resources, Power is another major factor which concerns the farmers to use the resources in limited time. Lack of electricity or limited supply of electricity urges the farmers to attend their fields at irrelevant times.

3) Time and Effort

Generally farmers visit their agriculture fields periodically to check soil moisture level and based on requirement water is pumped by motors to irrigate respective fields. Farmer need to wait for certain period before switching off motor so that water is allowed to flow in sufficient quantity in respective fields. This irrigation method takes lot of time and effort particularly when a farmer need to irrigate multiple agriculture fields distributed in different geographical areas.

4) Alternative Water Storage

Generally farmers are unaware of the water and power supply availability, and hence this may result in lack of proper irrigation due to lack of resources. Therefore this system provides an alternative storage tank that can overcome the issue of uninterrupted water supply.

VI BLOCK DIAGRAM OF THE SYSTEM

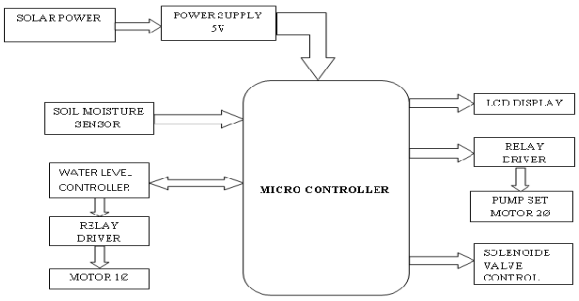

Fig. 1. Functional block diagram of the proposed system

VII OFTWARE FLOW CHART

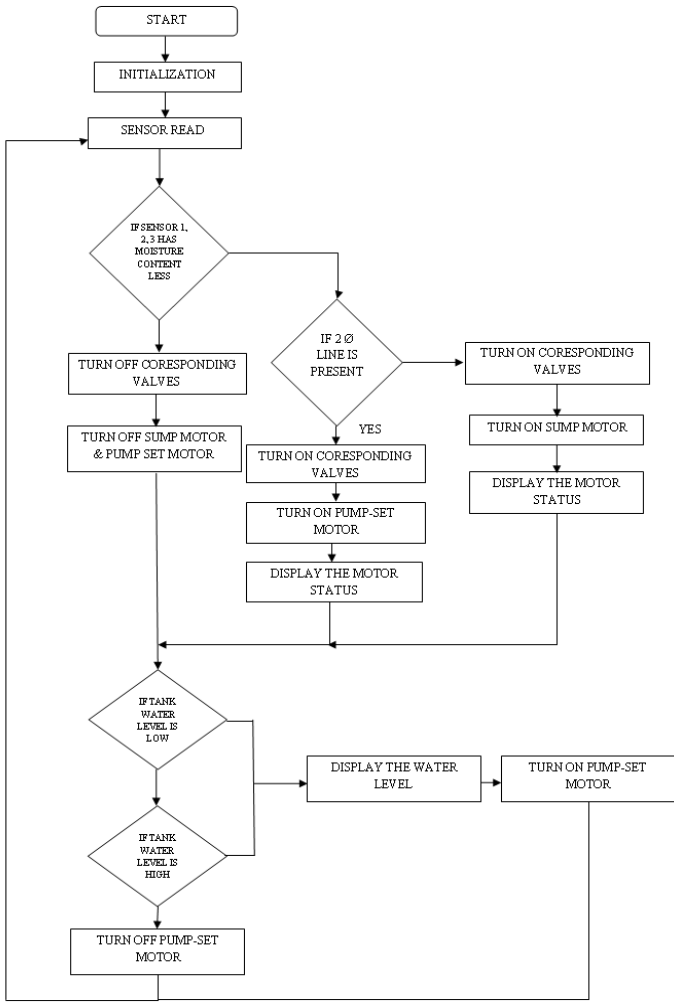

Fig. 2. Software flow diagram

Fig. 3. Testing moisture content

Fig. 4. Development stage of prototype

VII OUTCOMES AND CONCLUSION

This system is effective for optimizing water resources for agricultural production. This irrigation system allows cultivation in places with water scarcity thereby improving sustainability. The intervention of human is much reduced using smart irrigation system. It uses low cost sensors and other devices which makes the system cheap. The Microcontroller based drip irrigation system proves to be a real time feedback control system which monitors and controls all the activities of drip irrigation system efficiently. The present system is a model to modernize the agriculture industries at a mass scale with optimum expenditure. They can provide irrigation to larger areas of plants with less water consumption and lower pressure. Using this system, one can save manpower, water to improve production and ultimately profit. The lack of continuous 3-phase motor power is enhanced by a backup plan of using storage water tank with 1-phase motor. Uninterrupted operation of the system can be provided using solar power. This will provide betterment of the farm and also ensuring durability of the soil and fast growth of the crops giving huge future revenue for them.

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