IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 5, Issue 10, October 2016

Smart Irrigation

Maria Chettiar[1], Dolcy Koli[1], Jerin Mathew Varghese[1], Merin Francis[1], Sreedevi Nair[1]

Dept of Electronics and Telecommunication, Fr. Conceicao Rodrigues Institute of Technology, Vashi, Mumbai, India[1]

Abstract: This document deals with the tracking of solar energy and usage of this energy to power a water pump and water a piece of land. Based on the soil moisture levels the pump will be made ON/OFF. This employment of a green resource will help farmers in times of drought and also help them obtain a better yield than otherwise.

Keywords: PV panel, irrigation system, moisture sensor, water pump.

I. INTRODUCTION

With world demands growing at an alarming rate, due to population growth, industrial and economic development, renewable energy resources like solar power have a great potential as an alternate resource. Also, India receives sunlight around 300 days of the year, so theoretically calculated solar energy incidence on its land area alone is about 5,000 trillion kilowatt-hours (kWh) per year. Thus, utilizing solar energy will not only prove the user penny-wise but is also sustainable and beneficial in the long run. India being an agricultural country and 2/3rd of the total agricultural land is dependent on irrigation, continuous and timely water supply is paramount to farmers in India. Due to erratic weather changes and unavailability of water, the crops are prone to a stunted growth, get desiccated and destroyed. To overcome this existing problem, farmers in today's world have begun to shift to automatic solar based irrigation.

II. IMPLEMENTION

Block diagram

The proposed system is an off-grid solar tracker used for solar irrigation. The LDR placed on the solar panel helps to track maximum intensity of sunlight at different times of the day. The solar energy that is captured by the solar cells is then given to a charge controller. The charge controller is connected to a battery to store the captured energy and is used to power the irrigation system. The analog values of the LDR are converted to digital form via the ADC0808 .The digital values are taken as input for the microcontroller which is interfaced to the water pump, soil moisture sensor. fig 1.1

1) Solar panels - A solar panel consists of an array of photovoltaic cells arranged in series/parallel that supplies solar energy. Solar panels are the only power source in this irrigation system and so it is important to design a system that is capable of providing 1.5-2 times the required power to guarantee that the system will run. Current calculations indicate that solar panels providing around 125 W of power are sufficient to run the water pump.

2) Moisture Sensor- Soil moisture sensors are useful to read the amount of moisture present in the soil surrounding it. Its operating voltage is 5V AC and its working current is <20 mA.

If the moisture content of the soil is less than the threshold, then an indication is given to supply water. As soon as the threshold is reached, water supply stops.

3) Motor -The proposed system would have a water pump obtaining consistent power derived from the solar panels and will not be affected by power fluctuations at the grid as a charge controller is provided. The motor used operates at 120W, 24V.

4) Charge controller-The solar charge controller is a voltage/current regulator that helps protect the batteries from overcharging. MPPT (Maximum Power Point Tracking) controllers are used in order to extract maximum power during various times of the day.

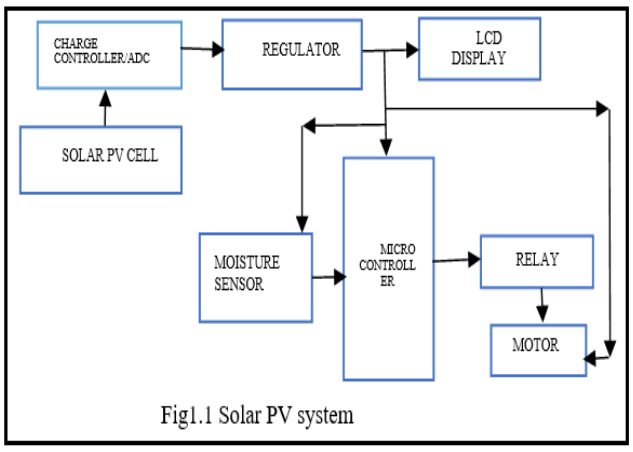

Fig1.1 Solar PV system

5) Batteries- The right battery size needs to be estimated depending on the capacity of the solar panels, as well as the power consumed by the load.

6) Microcontroller- A microcontroller is used to control the whole system by monitoring the sensors and as sensors sense dry condition of soil, then the microcontroller will command the relay driver IC which will switch on the motor and it will switch off the motor when the soil is wet.

IJARCCE
ISSN (Online) 2278-1021
ISSN (Print) 2319 5940
International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 5, Issue 10, October 2016

III. EXPERIMENTAL RESULTS

If moisture sensor value goes below 75 on the scale from 0-100, then the pump will be ON and once the value exceeds 75, pump will be OFF automatically.

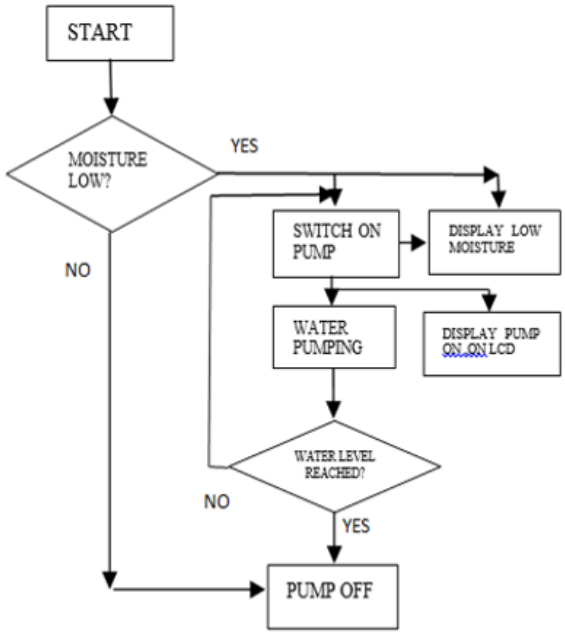

Fig 1.2 flowchart of automatic water level controller with feedback

The following empirical results were obtained-

Condition of soil	Indicator from the sensor
Dry	Moisture level 0 (need to supply water)
Partially wet	Moisture level <70 (continue water supply)
Wet	Moisture level >70 (stop the supply of water)

The following is the Proteus simulation of the pumping mechanism which encompasses 2 soil moisture sensors, microcontroller Arduino Uno, motors, motor driver etc.

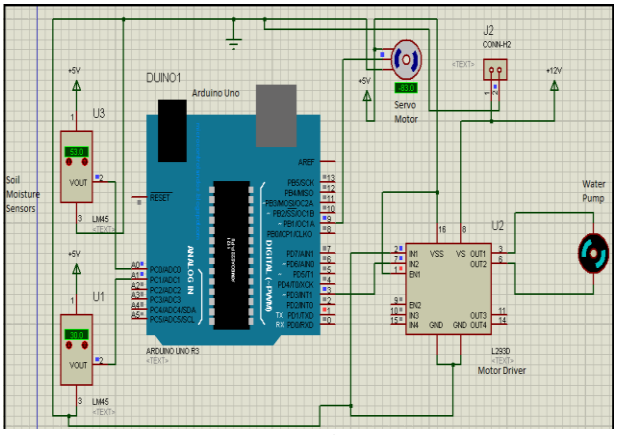

Fig 1.3

The two moisture sensors help identify the moisture content on various portions of the land under consideration and help determine the portion with the most need as water content may vary across large acres of land. This also helps improve efficiency and impedes the wastage of water. The servo motor which is connected to a water pipe acts as a mechanism that allows water to reach a particular spot. And the water pump along with the motor driver provide for the flow of water determined by the moisture sensor.

IV. ADVANTAGES

Based on the results obtained, the automatic irrigation system has the following advantages.

1. A maximization of solar energy obtained from the panel through the use of MPPT algorithms.
2. The microcontroller makes the system automatic, thus saving man power as well as the wastage of water.
3. As the amount of water supplied is minimal, there is no stagnant water, thereby warding off the breeding of Dengue and Malaria causing mosquitoes.

V. CONCLUSION

In majority of the villages in India, even today farmers are relying on traditional methods of obtaining water from rain or through the nearby lake or dam. However, due to erratic climate changes, these sources of water may soon get depleted. Thus, it is essential to adopt newer, safer and reliable means of irrigation. Solar based irrigation is profitable on the long run, and also is a clean green resource.

VI. ACKNOWLEGDEMENT

We would like to thank our project guide, Mrs Sreedevi Nair and the Electronics and Telecommunication Department for their help and guidance in the completion of our project.

REFERENCES

[1] Binoy Seal and Omkar Shirke-Solar Based Automatic Irrigation System
[2] Spencer Abbott and Isaac Baker –Solar powered irrigation system
[3] Umeh Maryrose N., Mbeledogu Njideka N., Okafor S. O., Agba F. C.- Intelligent microcontroller-based irrigation system with sensors.