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ijirset@gmail.com



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# Solar Powered Automatic Irrigation System

Akash Salunkhe<sup>1</sup>, Sarvesh Sawant<sup>2</sup>, Ayush Shah<sup>3</sup>, Ajay Shanbhag<sup>4</sup>, Shashi Prabha<sup>5</sup>

U.G. Student, Department of Electrical Engineering, MGM's College of Engineering and Technology, Navi Mumbai, Maharashtra, India<sup>1</sup>

U.G. Student, Department of Electrical Engineering, MGM's College of Engineering and Technology, Navi Mumbai, Maharashtra, India<sup>2</sup>

U.G. Student, Department of Electrical Engineering, MGM's College of Engineering and Technology, Navi Mumbai, Maharashtra, India<sup>3</sup>

U.G. Student, Department of Electrical Engineering, MGM's College of Engineering and Technology, Navi Mumbai, Maharashtra, India<sup>4</sup>

Assistant Professor, Department of Electrical Engineering, MGM's College of Engineering and Technology, Navi Mumbai, Maharashtra, India<sup>5</sup>

**ABSTRACT:** This study was conducted with few objectives of design a microcontroller based solar powered automatic irrigation system (AIS) model. To quantify the paddy field water content of and as well to provide adequate water supply in the right paddy field areas. In agricultural areas this may help for the production of crops as well can prevent the wastage of energy. To provide an efficient design to the farmers is the main objective of this paper

**KEYWORDS:** Automatic Irrigation System, Arduino UNO, Renewable Energy Source, Water level sensor, Cost analysis.

## I. INTRODUCTION

Modern world is facing a crisis of energy resources. To resolve the issue, renewable energy sources may be the best option. The conventional energy resources are almost at the verge of end. The most abundant energy resources are mostly renewable energy. Among all the renewable sources solar energy is the most eco-friendly and reliable source of energy. In the field of irrigation use of solar energy may be a great achievement. Farmers of agriculture are really facing various issues approaches to pouring water into paddy fields to provide crops a healthy and green environment especially in summer seasons. The lack of power supply is one of the major tribulations of the farmers. To operate a water pump sufficient power and technology is required. So if the system automation is done, it may help the economically weaker people a lot. Automation helps in reducing the need for human work in the production of goods and services. This type of machine saves energy, rectifies the accuracy and precision and improves the quality. Agriculture plays an important role for the development of food production. For the continuously increasing population in India, it is important to improve the production of food in every way possible. Irrigation particularly is one of the most important steps for optimum production in the agricultural sector.

Irrigation is defined as applying sufficient amounts of water to the plants at regular intervals, or the water which is supplied to land or crops that helps the crop growth, typically using separate channels. Irrigation and cultivation are related to each other and can be used for the agricultural crops during the span of inadequate rainfall and for maintaining landscapes. In India, smart irrigation systems are not widely used.

According to a survey which was done by the bureau of electrical energy in India in 2011 it has been observed that the number of agricultural pumps installed is 18 million and new connections for each year was approximately 0.5 million with an average capacity of 5 hp. If the total annual consumption is calculated then it can be seen in the agriculture sector 131.96 billion kWh is in use which is cited in paper solar power smart irrigation technique. Due to such a big amount of energy consumption, in the future for the agriculture sector electricity may not be available to use. So the proposed system is a solar powered system.



## II. RELATED WORK

Many of the researchers have been trying to implement the agricultural field by providing sufficient water and also to save the remaining water. In order to improve the product of agriculture, some of the technologies have been implemented in different methods that are mentioned here in the paper. Wireless sensor technology is the trending technology at present and usage of this wireless sensor techniques and wireless communication standards over traditional methods gives better growth in agriculture [1]. Irrigation method can be controlled with the help a program from which the sprinkler's geographic location can be identified by using a GPS and later it can be communicate it wirelessly to base station [2]. Remote monitoring systems are one of the use in agricultural field which improves the productivity of agricultural field in which wireless protocol plays a key role for agricultural monitoring [3]. Another efficient method is to send the feedback to the system after the completion of irrigation process in which water will be monitored using wireless sensors [4]. This automatic irrigation method also includes a microcontroller in which the sensing module is interfaced and also GSM module also exists [5]. The conditions of the soil can be identified using soil moisture sensor and temperature through temperature sensor. Its output is then fed to a microcontroller and later with the help of a relay motor can be turned ON and the water pumps to soil [6]. An LCD is also used for displaying the conditions. For updated notifications a GSM module is accommodated so that the concerned person would be able to know the present status of the field [7].

## III. METHODOLOGY

This system uses a solar power panel to supply power to the system. Two sensing devices are used to measure the level of moisture and pH values. The water level present at the field is being measured by the soil moisture sensor. The pH sensor measures the pH level present in the soil which varies for different types of crops. The solar panel gives a supply of 12v to the boost converter circuit. The voltage from the solar panel is controlled by using two resistances of the boost converter as R1 and R2. The voltage controlled device is diode D1. The stored voltage in capacitance is increased by T/2 cycle with the help of PWM pulse generated by MOSFET. It provides regular water supply whenever it's required and it reduces the human errors analysing soil condition and weather conditions like moisture content and pH level of the soil. As we use the sensor based system, these sensors will control the water supplying system. We have used GSM modem for communication like weather monitoring and controlling processes. It will be done by using short message service communication.

The system is being constantly controlled by the PIC microcontroller. In the case of moisture level being low in the field, a signal will be sent to the microcontroller by the sensors used. The microcontroller is used to check the program for different conditions. Various types of crops will have different programs stored in the microcontroller. Each type of crop will have different levels of humidity for their normal growth. Thus depending upon the nature of the crop, a required amount of water is being supplied. The H sensor will detect the pH level of the soil as it varies for different types of crops. Thus the presence of the soil moisture and relay unit will make the irrigation system automated. Depending on the signal sent from the moisture sensor being low or high the relay will turn ON or OFF the motor.

Solar panel energy is used for the entire system. The electrical energy required for the process is conserved as solar energy is being used. The motor needs 230V and the PIC microcontroller needs 5V supply. The power supply is regulated from the solar panel by connecting the regulator and the PIC microcontroller.

## IV. EXPERIMENTAL RESULTS

An experiment has been performed to check the moisture level of soil in different weather conditions. When a plant is irrigated manually, it consumes more water and when it is done using AIS, it consumes less amount of water. Irrigation of soil depends on different parameters like weather conditions, type of plant and type of soil. If the weather is cool then it requires less amount of water and in case of hot weather it requires more consumption of water per a day. This is an effect of the circuit that saves water and energy using solar powered AIS. This project is worked by switching arrangements of ON/OFF for the water pump. The components used in the project are less costly with high efficiency. It is programmed using a microcontroller which costs very less and is easily available.

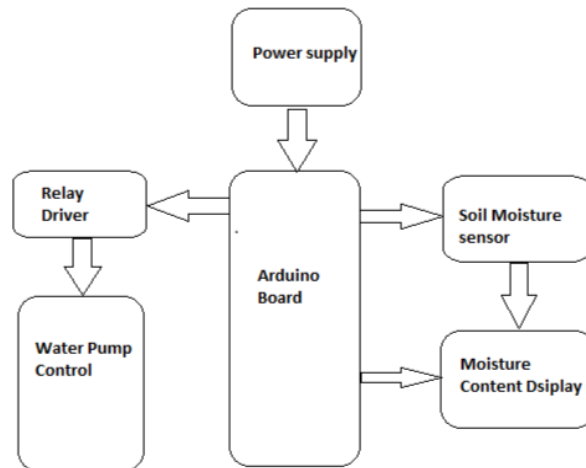


Fig. 1. BLOCK DIAGRAM

The system consists of a solar panel, which converts sunlight into electricity. This energy is stored into batteries for later consumption. This system uses two sensors to sense the moisture level and pH values. The sensor is monitored electronically in a normal condition and can share the information to the circuit to set the desired values. The sensors are connected with the water pump controlling circuit. Generally when an Arduino receives the power supply, then the soil moisture sensor gets activated. When the soil moisture sensor is dipped in the soil, it determines the conductivity of the soil using the two probes and the wet soil is more conductive than dry soil. This soil moisture sensor consists of a comparator in it and it compares the measured voltage with the pre-defined voltage and this analog output is given as input to the analog pin of Arduino. When the moisture level in the soil is less than the threshold value then the pump turns ON automatically and water flows to the soil and in case if it's more than the threshold then it automatically turns OFF. An LCD is also connected to the Arduino in which the status of the field will be indicated over there.

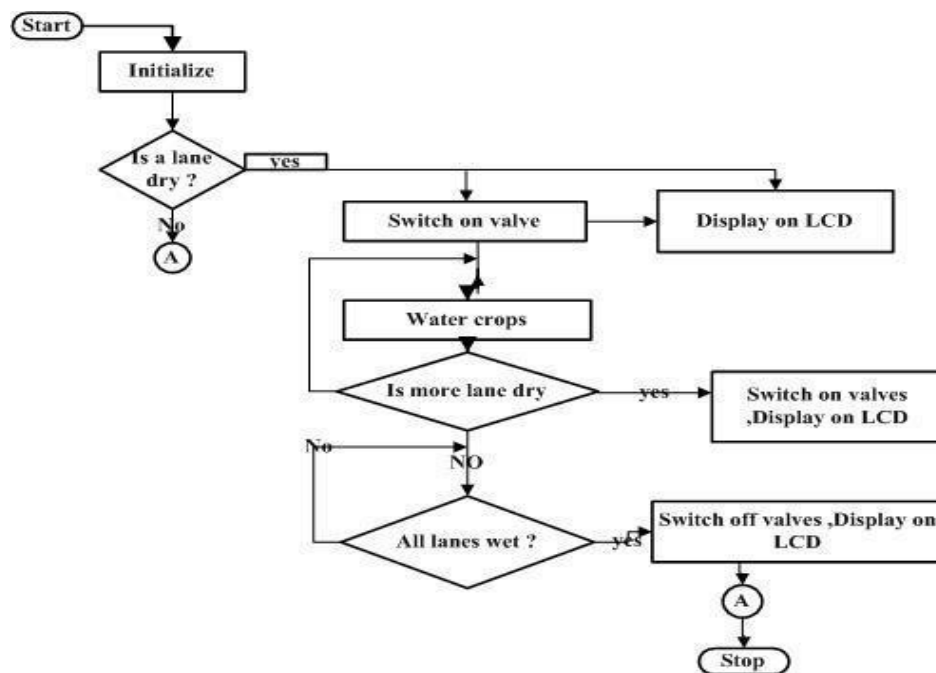


Fig. 2. FLOW CHART



## V. CONCLUSION

The aim of this project is to save time, money and water consumption, by providing a smart control irrigation system using friendly solar power. This smart control irrigation system is beneficial in a lot of places. Minimal maintenance, manual interaction and attention not required as they are self-starting. In the long run this system is economical. From one survey it can be seen that over nine hundred thousand are used by almost all states of India, which cost a huge amount of money for the use of energy. This irrigation costs much using the conventional system. This uncontrolled fund may be used for electricity generation for the cause of electrification in un-electrified villages. A huge amount of energy may be spared using renewable energy sources. Investment also may be systematic and controlled using non-conventional resources. Using non-conventional energy for automation of AIS gives a huge liberty to save energy per year. The excess energy from solar may be fed back to the grid after modification and may cause advantage while payback cost assumption. Automation of the solar powered AIS may be a better solution for the farmers of different regions of India. In any climatic condition this model may be installed and can be made operational. Like the cost effectiveness power consumption of the circuit is also very less

## REFERENCES

- [1] Liserre, M., Sauter, T., Hung, J.Y., "Future energy systems: integrating renewable energy sources into the smart power grid through industrial electronics", IEEE Industrial Electronics Magazine, Vol. 4, No.1, pp. 18-37, 2010
- [2] SaadMotahhir, AbdelilahChalh, AbdelazizGhzizal, SouadSebti, Aziz Derouich, " Modeling of Photovoltaic Panel by using Proteus". Journal of Engineering Science and Technology Review, Eastern Macedonia and Thrace Institute of Technology, 2017, 10, pp.8 - 13. Doi:10.25103/jestr.102.02.
- [3] Chua Hock-Chuan "Getting Started with Arduino" (2016, October 30), retrieve from, <https://www.ntu.edu.sg/home/ehchua/program ming/arduino/Arduino.html>
- [4] SparkFun "Voltage Divider" (2016, November 6) retrieves from <https://learn.sparkfun.com/tutorials/voltagedividers>
- [5] Arduino "Overview of the Arduino", (2016, November 21) retrieve from <https://www.arduino.cc/en/Main/ArduinoBoardUno>
- [6] Mohd Rashid B. MohdKamlon, "Solar Power Measurement System", UniversitiTeknikal Melaka Malaysia, (2007).
- [7] Ganiyu R. A., Arulogun O. T. and Okediran O. O, "Development of A Microcontroller Based Traffic Light System For Road Intersection Control", Journal of Scientific and Technology Research, vol. 3, p.1-4. (2014)
- [8] RehanaKhatoon, DebashisSaikia, "Development of an IoT based Soil Parameters Monitoring System", IEEE Proceedings of ICAEES 2019, pp 61.
- [9] Das Piyali and Chiphang, Ngahorza, "Study of IoT Based Control Technologies for Lighting Control System" International Journal of Computational Intelligence &IoT, Vol. 2, No. 2, 2019. Available at SSRN: <https://ssrn.com/abstract=3355510>
- [10] Piyali Das, 2Mousam Ghosh, Dr.SaswatiMazumdar, "Modified single phase energy meter for rural domestic energy management supplied from solar panel based small grid system", Electrical and Electronics Engineering: An International Journal (ELELIJ) Volume 2, No 1, February 2013 [11] LM 939, ARDUINO UNO and YL-69 datasheet.



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