

IoT Based Water Irrigation System for Agriculture using Solar

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Abstract- Now-a-days whole world is suffering from water stress problem and agriculture is one of the most affecting factor for it. Due to improper management most of the water is wasting in agriculture. So we implement a proof of concept of IoT based cost effective smart irrigation control system for agriculture. In which according to moisture conditions we are controlling the water pump timing. Where we can control the ON/OFF timing of pump using internet. It is one of the most important application of IoT platform. The control system will take input from moisture sensors and publish the data on cloud. So as per moisture level pump, will ON or OFF. This complete control system will definitely useful to avoid of wastage of water in farm and cost effective as well.

Keywords — Irrigation control system, IoT, Cloud, Moisture sensor, Solar

I. INTRODUCTION

Water stress is the most emerging problem of world. From year 2011 India also came into the list of Water Stress Countries. Water stress percentage of world map is as shown in figure below. In which India having High water stress country with 40% to 80% of water stress. For this water stress problem there are many reasons behind it like industrial waste, urbanization, pollution, rainfall wastage and improper agricultural practices. According to Bhartiya Agro Industries Foundation survey 70% of water is wasted during agricultural activity due to lack of automation in agriculture field. which results in soil erosion. still there is very few farmers use the automation in the farms due to the cost of automation and reliability of the same.

In India, farmers still uses traditional methods of irrigation. The traditional methods like manually switch on and switch off the motor pump. This method is totally depends upon the human being so due to the human error there is improper quantity of water is feeds to crops. While irrigation moisture of soil is not consider. Only by specific period of time water is feeds to crops in which sometimes water level become high in soil and extra water is evaporated. So in which billions of liters water get wasted and soil erosion get take place. In other condition soil moisture level get low and due to low water level crops become weak and sometimes crops become die.

In India there is another major problem of electricity load shading. Due to poor management of electricity every time become available in farms to switch on and switch off of water pump is not feasible. To avoid these both the problem it is necessary to increase automation in agriculture area.

Water Stress by Country: 2040

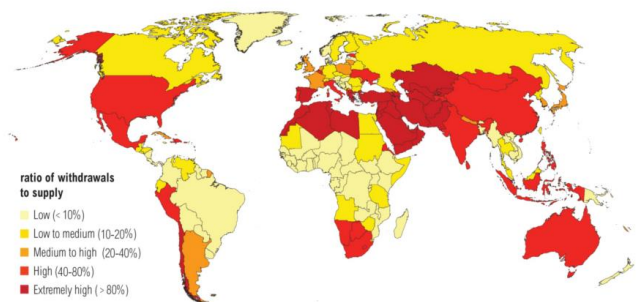


Fig. 1 Water Stress level of World by 2040

II. RELATED WORK

There are many existing irrigation system are available in market and many of researchers working on the same. In [1] proposed system was a sensor network connected with a fuzzy controller and fuzzy logic system so the system response becomes slow and system become costly. So very few of farmers can be use this system. In [2] system, the complete system depends upon the weather website, where system took data from website and give to arduino. Then the arduino gives output to solenoid valve. But sometimes website data not actual to true data so these system fails here. System [5] is PLC based system where water control flow is controlled by PID controller but system not affordable for poor farmers in their farms. System [6] is very complex , in this system there software and database is made locally so it require skilled farmers to monitor it.

System [9] is developed for garden only, large amount of data cannot be handled by raspberry pi. So this system can not be used for farms. In [11] system uses old arm

microcontroller and zigbee technology. For long lasting this system can't be used. A bulky system design[16], in which the design uses arduino UNO and raspberry pi and for wireless communication between these zigbee is used. This system is wireless but not IoT so system can't be handle from remote location. System having raspberry Pi but for internet connection first we have to install internet connection for it. We can't connect GSM to raspberry Pi.

Now this paper aims to achieve all the basic need of farmers with affordable price for poor farmer like Indians. So we design the IoT based smart Irrigation system using ESP8266 microcontroller board and basic sensor with a controllable water pump timing.

III. PROPOSED SYSTEM

This system is developed for the irrigation of farms, gardens and paddy fields using the hardware and software. The purpose of this project is to detect water level of water in soil and accordingly ON or OFF the water pump. Moisture sensor and temperature sensor are connected to the NodeMCU i.e. microcontroller. For switching the water pump automatically relay is connected to microcontroller. GSM is going to send message to user hence connected to controller. Parameters like pump status, moisture level, temperature and humidity display is connected to NodeMCU. The whole system is shown in below block diagram.

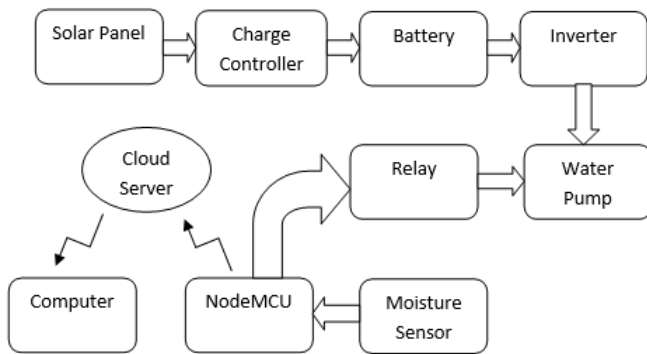


Fig. (2) Block Diagram of System

At day timing solar panel absorbed the solar energy and this energy stored in battery so battery gets charge. At the same instance moisture sensor continuously check the moisture level of soil and if soil moisture gets low automatically relay gets triggered and water pump gets on by utilizing the battery energy. For the different types of crops different moisture level is needed in soil so according to crops we can set the moisture level. The all data regarding this project can be monitor from anywhere you have internet connection also we can ON or OFF water pump remotely.

Figure (3) shows the circuit diagram of complete system. In which firstly solar Plate is connected with 12V Battery. Then we converts 12V DC volts supply into 5V DC supply using IC 7805. Then converted pure DC output voltage is

fedded to the NodeMCU, Moisture sensor and Relay to operate water pump.

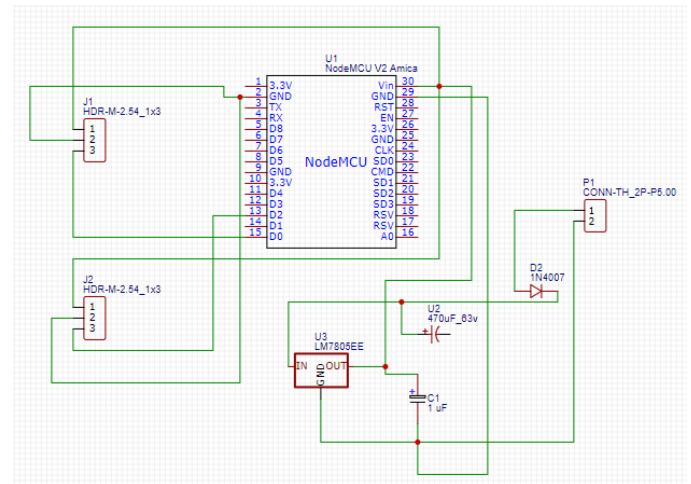


Figure (3) Circuit Diagram of System

IV. RESULTS

The actual readings of this system are taken at a particular field for a single day with specific time interval. Readings are taken in morning time, afternoon time and Night timings which are shown in Table I, II and III respectively.

TABLE I - MORNING TIME READING

created at	Humidity	Moisture	motor
7:45	38	578	0
7:50	38	577	0
7:55	38	577	0
8:00	38	0	100
8:15	38	0	100
8:20	38	0	100
8:25	38	501	0
8:35	38	509	0
8:40	38	513	0
8:45	38	522	0

TABLE II- AFTERNOON TIME READINGS

created at	Humidity	Moisture	motor
2:00	39	412	0
2:15	39	411	0
2:30	39	410	0
2:45	39	390	0

3:00	39	200	100
4:00	39	210	100
4:30	39	215	100
4:35	39	375	0
4:38	39	376	0
4:40	39	365	0

TABLE III- NIGHT TIMING READINGS

created at	Humidity	Moisture	motor
7:45	36	390	0
7:50	36	385	0
7:55	36	370	0
8:00	36	380	0
8:15	36	385	0
8:20	36	370	0
8:25	36	360	0
8:35	36	365	0
8:40	36	360	0
8:45	36	365	0

V. CONCLUSION

Total readings are took at three various slot, Moring time (Table-I), afternoon (Table-II) and at night timing (Table-III). After taking various readings for an several days, the system works accurately and water wastage is achieved by 78%. This system cost and maintenance cost is very less than that of existing automatic irrigation system. So for poor farmers this system is affordable and very helpful in their farming. This system will save water wastage as well as it will reduce efforts of farmers.

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