SENSOR BASED AUTOMATIC IRRIGATION SYSTEM

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Abstract :- This paper focus on a smart irrigation system which is cost effective and a middle class farmer use it in farm field. Today we are living in 21s t century where automation is playing important role in human life. Automation allows us to control appliances automatic control. It not only provide comfort but also reduce energy, efficiency and time saving. Today industries are use automation and control machine which is high in cost and not suitable for using in a farm field. So here we also design a smart irrigation technology in low cost which is usable by Indian farmers. The objectives of this paper were to control the water motor automatically and select the direction of the flow of water in pipe with the help of soil moisture sensor. Finally send the information (operation of the motor and direction of water) of the farm field to the mobile message and g-mail account of the user.

Keywords :- *Soil moisture sensor, Pressure sensor, Electro magnetic valve, Electro magnetic Relay, Arduino, Thingspeak.*

I. INTRODUCTION

Irrigation is the application of controlled amounts of water to plants at needed intervals. Irrigation helps to grow agricultural crops, maintain landscapes, and revegetate disturbed soils in dry areas and during periods of less than average rainfall. Irrigation also has other uses in crop production, including frost protection suppressing weed growth in grain fields[2] and preventing soil consolidation. In contrast, agriculture that relies only on direct rainfall is referred to as rain-fed or dry land farming.

In the present scenario demand for food is continuously increasing and hence requires rapid improvement in food production technology. Generally a simple and precise method should be used for a country like India, where the economy is mainly based on agriculture. It helps in time saving, removal of human interference in agriculture. Due to uncertainty in the climatic conditions, still an error can occur in adjusting available soil moisture levels and we are not able to make full use of agricultural resources and increase their net profits. The main reason is the lack of rainfall & scarcity of fertile land. Irrigation is the artificial means of supplying water to the soil reservoir. The continuous extraction of water is usually needed in growing the crops. Ground water lever has decreased to a much extent due to which lot of areas have becomes dry and barren but due to the scarcity of land farmers are forced to cultivate the crops in these regions as well. In these areas rainfall is very scarce even in the monsoon season, rainfall arrives very slowly in these regions. Another shortcoming is to protect crops from frost. Very important reason of this is the unplanned use of Irrigation water due to which a significant amount of water is wasted. In irrigation, this technique is very significant. Advantage of this technique is that water is supplied to soil by sensing its moisture content. In this, water is supplied only when the moisture content is below the required level. Due to which a large quantity of water is saved. At the present era, the farmers have been using the conventional irrigation techniques like methods through manual control sprinklers, flood type feeding system (in which farmers irrigate the land at the regular intervals).

Water is supplied generally to lower leaves and stem of the plants along with the soil. This process sometimes consumes more water than requires or sometimes the surface becomes saturated, unable to absorb more water and often stays wet, long after irrigation is completed and the area becomes like quagmire. Sometimes the water reaches late due to which crops are destroyed because such condition promotes infections when leaves get dried. Water deficiency can be detrimental to plant's mold fungi. On the contrary this technique acts before visible wilting occurs. Slowed growth rate, occurs due to the water deficiency. This problem can be solved if we maintain favorable soil condition with the help of controller based irrigation system in which the moisture condition are retained and prevent moisture loss from the plant. This saves requirement of water. Further in country like India.

The rainfall in our country depends on monsoons. Rainfall controls agriculture, but the agriculture is said to be "the gambling of the monsoon" as the monsoon rainfall are uncertain, irregular and uneven or unequal. So irrigation is essential for agriculture. In INDIA there are 80% of the total annual rainfall occurs in four months, i.e. from mid June to mid October. So it is very necessary to irrigation for farm field during the rest of the eight months.

II. METHODS OF IRRIGATION

There are different types of method for irrigating farm field for different types crop field. Basically Indian farmer use these three methods .

a. Channel system,
b. Sprinkler system,
c. Drip system.

Channel system is a traditional method of irrigation. But a smart irrigation system is a new technology to irrigating farm field automatically And it saves lot of water in our smart irrigation system we are using drip irrigation with automated value controlling, that saves a lot of human efforts and money.

III. SENSOR BASED AUTOMATED IRRIGATION SYSTEM

The smart irrigation system is controlled by autonomous mean automatically control the total irrigation system whether the farmer is not present his farm field and send messages to the farmer about the information of farm field and change in operation of the farm field. Which require no worker for operating, and also less waste of water with compared to previous three methods. In this paper or project we are using drip irrigating system to irrigate the land because it saves more water by supplying water directly to the crop roots.

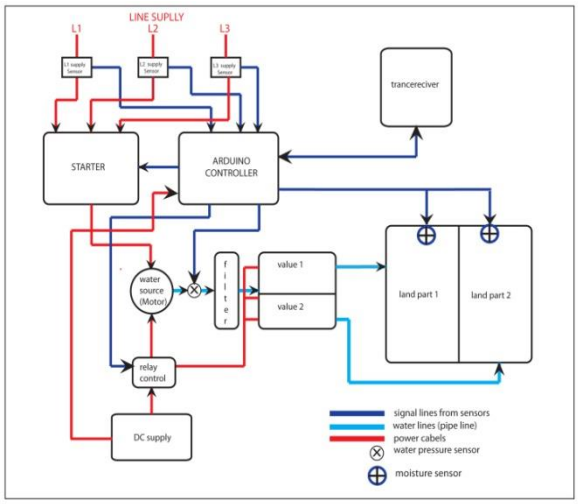

Fig 1 : Block diagram of sensor based automatic irrigation system.

The AC or DC current sensor senses Applied current flowing through the copper conductor, Soil moisture sensors are used to sense the moisture level in soil and send to ARDUINO-ESP32 where an Tensilica Xtensa LX6 microprocessor process the data and calculate the percentage of dryness. The sensor data are voltage values so calculating percentage of dryness from voltage values using an algorithm

Voltage= sensor value*(5/4095)
Percent= (voltage/5)*100

The ARDUINO board has 12-bit analog to digital converter. This means that it will map input voltages between 0 and 3.3 volts into integer values between 0 and 4095. This yields a resolution between readings of: 3.3 volts/4095 units to read an analog input, so the maximum reading rate is about 10,000 times a second. Which generate a large number of data so we take a delay of 30 minute. In each 30 minutes ARDUINO controller give one output value of percentage in dryness. The value of dryness fed to the ARDUINO controller to control the electromagnetic valve and operate motor. User knows the status of the farm field through the data sent over the cloud to registered user ID.

The ARDUINO- ESP32S is used to control the irrigation system and connects with internet to send data to the registered users trough CLOUD or IoT. The IoT have capabilities to perform remote

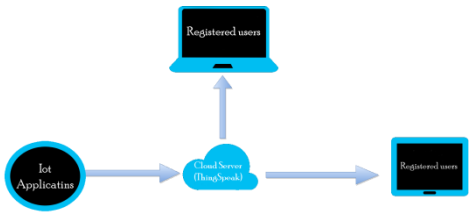

Fig 2 : IoT.

sensing, actuating and live monitoring of certain sorts of data. IoT devices are also enabled to have live exchange of data with other connected devices and applications either directly or indirectly. Here cloud technology interfaces the user with the irrigation system, through that user can monitor and control the process from the remote place. For better understand let's divide working of the system into three stages.

Stage A: At this stage the current sensor is continuously checks for supply, when supply found it intimates the user. and the controller reads the data from the moisture sensor installed at different parts of the land and sends data to the user. if the read moisture value is below the threshold value, the water pump is ON and The corresponding valve is opened. Hence water is supplied through the drip lines to the land.

Stage B: when the sufficient water is supplied to the to the crops, means when the soil moisture level increases to above the threshold value the water pump is turned OFF. And User gets notified that The motor is OFF, along with new reading of soil moisture conditions.

Stage C: incase of insufficient supply of water from the water source the pressure sensor senses the pressure at the water line (pipe line) and turns off the motor. And user will get the notification that motor is turned off for insufficient supply of water.

Fig 3 : Data Monitoring from pc

The updated data to the cloud (ThingSpeak) is accessible to the registered users through the channel created in their ThingSpeak account. The users can access the data through the channel name, if the user want to download the data then he can download the data updated to the particular channel. There are so many actions can be taken on our data, like Publishing data to social medias (eg. Twitter) , react back, plugin's, etc.

IV. ADVANTAGES

a. It helps to get higher yield in crop.
b. Efficient water management.
c. It Saves wastage of power.
d. Reading the moisture level in soil in deferent part of land.
e. Low cost.
f. It controls the motor (ON or OFF).
g. Long life time.

V. DISADVANTAGES

a. It requires continuous internet.

VI. APPLICATIONS

a. It can be widely used in agriculture.
b. It can be used in greenhouses/nursery.
c. It can be used in gardening.
d. We can also use it in water flow control systems.

VII. CONCLUSION

In this Work we present a prototype for of sensor based automatic irrigation system. Here prototypes includes sensor node and control node. The sensor node is deployed in irrigation field for sensing soil moisture value and the sensed data is sent to controller node. On receiving sensor value the controller node checks it with required soil moisture value. When soil moisture in irrigation field is not up to the required level then the motor is switched on to irrigate associated agriculture field and alert message is send to registered mail ID. The experimental results show that the prototype is capable for automatic controlling the experimental results show that the prototype is capable for automatic controlling of irrigation motor based on the feedback of soil moisture sensor. This system is used in a remote area and there are various benefits for the farmers. By using the automatic irrigation system it optimizes the usage of water by reducing wastage and reduce the human intervention for farmers. It saves energy also as it automatic controlling the system. So there are the system is OFF when the field is wet and automatically start when the field id dry. It is implemented in all type of irrigation system (channel, sprinkler, drip). And we present also less number of sensor nodes to use in a large area of field so the cost

of the system also decrease. And power consumption of the wireless network devices are also less and the system perform a long time function.

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