A Study On Smart Irrigation Systems For Agriculture Using IoT

Abstract: Agriculture plays an imperative role in the country's development. In our country, more than 72% of people depend upon farming which is one-third of the population invests in farming. Thus, the challenges and issues concerning agriculture need to be focused to hinder the country development. The only recommended solution to this issue is modernizing agriculture using smart technologies. IoT can construct agricultural and farming processes more efficient by tumbling human intervention through automation. In agriculture, irrigation is one of the processes which support crop production by supplying needed water to the soil. The irrigation methods involve a lot of time and effort in farming. A Sensor-based automated irrigation system provides a promising solution to manage agricultural activity.

1. INTRODUCTION

Agriculture is the main source of food production in our country. In India, agriculture contributes 18% of the country's Gross Domestic Product (GDP) which employs more than half of the total population [6]. The Indian government has stressed and highlighted the need of innovations to be in above mentioned criteria's in agriculture, thus seeks an indication of technology exposure and innovative implementation practices to enhance the productivity. The productivity in agricultural, food security, erratic conditions in climates, soil conditions requires new ideas and innovations. While this is largely depends on irrigation system, and current techniques in irrigation which helps to achieve more productivity per drop of water. Automation in irrigation system helps to farmers to manage their work much easier and helps to take decisions even in the absence of farmers. IoT, sensors, smart phone tools are the technologies which helps farmers to know the status of their land, amount of water needed, temperature of soil, humidity, weather conditions, ph level.

Water shortage is one of the major problem in the world. Many different methods are incorporated for conservation of water. We need water in each and every field & is needed for every human beings, animals, plants, etc. Agriculture is one such field where water is required in high quantity. Wastage of water is a major problem in agriculture. Every time excess of water is given to the fields. A number of techniques are available to save or to control wastage of water from agriculture.

Ditch Irrigation: Ditch Irrigation is one of the old methodology, where ditches are dug out and seedlings are planted in horizontally aligned pattern. Water is made to move to different canals via siphon tubes.

Terraced Irrigation: In this process the land is cut into multiple steps and supported by keeping walls while the plain areas are used for plantation and the idea is that the water runs down each step watering each column. This led steep land to be used for multiple crops. This is a very labour involvement method of irrigation.

Drip Irrigation: The most water effective method of irrigation is the drip irrigation method. In this method, water is dropped near the root level of a plant in a slow steady motion. The loss of water through evaporation and runoff can be decreased to a much high extent if the system is installed effectively.

Sprinkler System: This irrigation system is designed on overhead sprinklers fixed on permanent risers. The system is installed underground and the sprinklers level up when water pressure increases, which is a famous irrigation system for use on golf courses and parks.

1.1NEED OF AUTOMATIC IRRIGATION: Automatic irrigation system proves to be very helpful for those who travel. If designed and coded properly, automatic irrigation systems can be very cost effective and can do a lot of water conservation. Watering with a pipe or with oscillator wastes water and none of these method aim plant roots. Automatic irrigation systems can be designed in such a way which gives required amount of water in a targeted area, and which will also promotes water conservation

1.2FACTORS

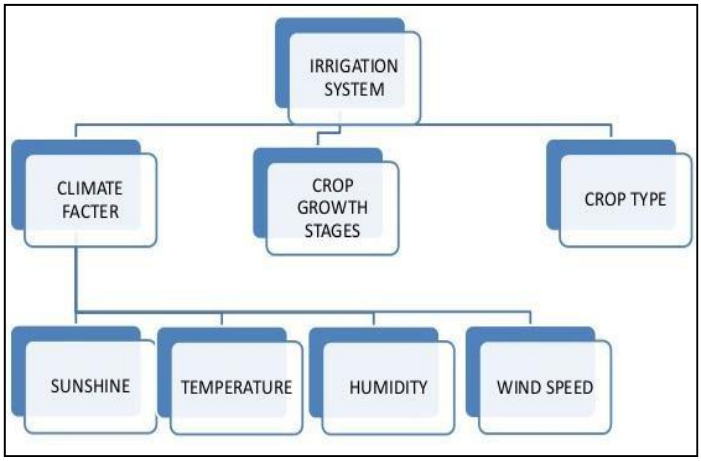

***Fig.1**. Factors influenced Irrigation system*

2 LITERATURE REVIEW

Archana and Priya (2016) proposed a paper in which the humidity and soil moisture sensors are placed in the root zone of the plant. Based on the sensed values the microcontroller is used to control the supply of water to the field. This system doesn't intimate the farmer about the field status

Sonali D.Gainwar and Dinesh V. Rojatkar (2015) proposed a paper in which soil parameters such as pH, humidity, moisture and temperature are measured for getting high yield from soil. This system is fully automated which turns the motor pump ON/OFF as per the level of moisture in the soil. The current field status is not intimated to the farmer

Karan kansara (2015) proposed an automated irrigation system where the humidity and temperature sensors are used to sense the soil conditions and based on that microcontroller will control the water flow. Farmer will be intimated through GSM. This system doesn't monitor the nutrient content in the soil

Prof C.H.Chavan and P.V.Karnade (2014) proposed a smart wireless sensor network for monitoring environmental parameters using Zigbee. These nodes send data wirelessly to a central server, which collects data, stores it and allows it to be analyzed then displayed as needed and also be sent to the client mobile. Weather forecasting and nutrient content is not determined in this system

G.Parameswaran and K.Sivaprasath (2016) proposed a smart drip irrigation system using IOT in which humidity, temperature and pH sensors are used. Irrigation status is updated to the server or local host using personal computer. The farmer can't access about the field condition without internet

3 PROPOSED SYSTEM

In this system we have measure the temperature and humidity levels, soil water moisture content and detecting if their is rain in garden. A pump will be driven if water is required by the plants. Sensors which i am using in the projet are

- DHT-11 Temperature and humidity sensor.
- Arduino soil and moisture level sensor.
- Nodemcu esp8266-12e WiFi module.

DHT-11 is a one wire digital temperature and humidity sensor. It can measure temperature from 0 degree Celsius to 50 degree Celsius with 2% margin of error. It can measure humidity levels between 20 to 80% with 5% margin of error. It requires 3 to 5 volts for its operation.

Project Circuit

Soil moisture sensor analog output is connected to nodemcu analog channel 0. Digital output of the soil/water/rain sensor is connected with GPIO-16 or D0 pin of nodemcu. Soil moisture sensor is powered with nodemcu 3.3 volt output. DHT-11 temperature an humidity sensor data output is connected to GPIO-0 or D3 of nodemcu esp-8266-12e WiFi mule. DHT-11 is also powered with the 3.3 volt output of nodemcu. Note the pin out of dht-11 their is one void pin. DHT-11 comes in two different pin outs. One has four pins and the other has 3 pins. I used the one with four pins. If you are going to interface the three pin sensor than please first check the right pin out before connecting it with the nodemcu. Both the 3 leg and 4 leg dht-11 sensors work the same, their is no difference in working method. To control the relay i used GPIO-13 or D7 pin of nodemcu esp8266-12e WiFi module.

Connect the ground of the motor or pump with the power supply ground if its a dc pump. Connect the anode + lead of power to NO(normally open) pin of relay. Connect the com(common) pin of relay with the anode of motor. If pump is working on alternating 110 or 220 volts connect one lead of pump directly to one end of the power rail and NC contact of relay to another line of rail and comm of relay to second lead of pump.

1. **ARDUINO UNO** The Microcontroller used here is an Arduino UNO. The UNO is a Microcontroller board based on ATMEGA 328P. The ATMEGA 328P has 32kB of flash memory for storing code. The board has 14 digital input and output pins, 6 analog inputs, 16 MHz quartz crystal, USB, an ICSP circuit and a reset button. The UNO can be programmed with the Arduino software.

2. **SENSORS**

   a) SOIL MOISTURE SENSOR Soil Moisture sensor is used to measure the moisture content present in the soil. When the soil moisture value read by the sensor is above the threshold value, low level (0V) will be the digital output and if it is below the threshold level, high level (5V) will be the digital output. The digital pin is used to directly read current soil moisture value to see if it is above threshold or not. The threshold voltage can be regulated with help of potentiometer.

   b) PH SENSOR PH is the measure of acidity or alkalinity of water solution which is determined by the relative number of hydrogen (H+) or hydroxyl (OH-) ions present. The pH value (below 7) is said to be acidic and (above 7) is said to be basic. The pH of a solution can change with temperature respectively.

   c) DHT11 SENSOR DHT11 sensor is used for measuring temperature and humidity. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air. This sensor is cost effective, provides low power consumption and up-to 20 meter signal transmission is possible.

4 ADVANTAGES OF SMART AGRICULTURE USING IOT

Traditional irrigation strategies are not suitable for dealing with the shortage of irrigation water, this sector must benefit from modern technological advances. Hence the new smart agricultural irrigation system has following advantages.

- Increase the productivity: Productivity on farmland is going too increased.
- Reduce water consumption.
- No manpower required.
- Reduce soil erosion and nutrient leaching.
- Cost effective method.
- High quality crop production.
- System not damage by weathers and birds.
- Efficient use of water.

• Adaption of the advanced irrigation systems and the new technologies, especially the new irrigation systems that are complex and difficult to operate manually.

• The system will be operated in night also which results in minimization of the water loss due to evaporation.

• Irrigation process starts and stops exactly when required, thus optimizing energy requirements

6 CONCLUSION

The main objective of this smart irrigation system is to make it more innovative, user friendly, time saving and more efficient than the existing system. Measuring four parameters such as soil moisture, temperature, humidity and pH values and the system also includes intruder detecting system. Due to server updates farer can know about crop field nature at anytime, anywhere

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