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# Automated Plant Watering and Fertilizing with Soil Quality Testing

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**Abstract -** India is mostly a farming nation. For most Indian households, agriculture is the most important line of work. It is essential to the growth of an agricultural nation. In India, agriculture accounts for 10% of total exports and roughly 16% of GDP. The primary resource for agriculture is water. Water can be supplied by irrigation, although there can sometimes be significant water waste. Consequently, in order to conserve time and water. Agriculture uses the Internet of Things (IoT) technologies a lot these days. As a result, this article discusses a project that is built on the Internet of Things (IoT) and focuses on the agricultural sector with the aim of reducing water usage in the sector. As a result, this essay discusses a project that leverages the Internet of Things (IoT), where all information can be accessed and managed at the touch of a finger, to reduce water consumption in the agricultural sector. We have an idea for a project called an Automated Plant Watering and Fertilizing with Soil Quality Testing. The proposed method makes use of a variety of sensors that sense the different aspects of the soil, such as temperature, humidity, and soil moisture sensors, automatically irrigate the land by turning the motor on and off depending on the soil moisture value.

***Key Words***: Sensors,PH Sensor,Arduino Board,Temp Humidity Sensor DHT-11,Soil Moisture Sensor,Water Motor, Internet of Things (IOT), Solenoid Valve

## 1.INTRODUCTION

India is an farming based country. Agriculture has a good chunk of share in Indian GDP, which is close to 16 percent in 2021-22. India has a good lead in total agriculture production in the world. As India has a hot and humid climate and it sometimes becomes difficult to yield maximum profit from the crops being grown or cultivated due to otherwise harsh weather conditions. This may be due to inappropriate used for fertilizers or pesticides or any kind essentials that the crops grown must be needed according to the requirements at that instance. So it's time that we evolve our agriculture system. A transition from traditional farming to Smart Irrigation System. By using this method one use only the required amount of water and essential rather then overusing it which happens many times. It helps to grow agricultural crops, maintain landscapes, soil, consolidation and re-vegetate disturbed soils in dry areas and during periods of less than average rainfall. Irrigation is a system where the plant are being watered systematically and is often used widely in agriculture purpose and there are some who use it for gardening.

Internet on Things (iot) is notably utilized in connecting devices and gathering records data.net of factors is used with iot frameworks to address and interact with statistics and data. inside the tool clients can register their sensors, create streams of records and technique facts. iot are applicable in numerous methodologies of agriculture. programs of iot are smart cities, clever surroundings, clever water, clever metering, safety and emergency, commercial enterprise control, smart agriculture, home automation, e-fitness and so forth. ‘net of factors’ is based totally on tool that's able to analysing the sensed records and then transmitting it to the man or woman. In those technique we're the use of factor communicate cloud page for tracking the Sensors data. the records is gathered from the sensors and displayed graphically on the component talk cloud net web page so that it is straightforward to reveal.

Irrigation System:. A plant will die if sufficient care is not done or if it is not practiced properly because earlier methods either involved water channeling or manual irrigation. In addition to this, manually operating water pumps for tank filling and sprinkler operation wasted both water and energy due to work that was unnecessary. This IOT-based module makes it possible to maintain the ideal conditions for the plants, enabling them to grow to their full potential. The Soil Hygrometer Detection makes it simple to determine the soil's moisture level.

**Hardware Needed:**

1) **Arduino :**

Arduino is an open-source electronics platform based on easy to use hardware and software. A developer can send a set of instructions to the microcontroller. All Arduino boards are open-source, empowering users to build them independently, and ultimately adapt them to their particular needs. Arduino/Genuino Uno board consists of an ATmega328P microcontroller chip. It has 14 digital input-output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, and a reset button. The ATmega328 on the Arduino Uno comes programmed with a bootloader that allows uploading new code.

**Fig:1.1 Arduino Uno**

2) **PH Sensor**

The soil pH sensor is a device that measures the current pH of the soil. It detects the pH value of the soil by inserting two stainless steel probes vertically into the soil. We offer rs485 soil ph sensor, 0-5V soil ph sensor, 0-10V soil ph sensor, and 4-20ma soil ph sensor.


**Fig:1.2 PH Sensor**

3) **Soil Moisture Sensor**

The Soil moisture sensor is used to know the moisture level of the soil. By this value the DC pump can be controlled through ARDUINO. The moisture level differ for different plant, climatic condition the plant growth. Even high moisturizing level in the plant can affect the plant. Good moisturizing will improve nutrient uptake. The difference for watering the plants will be based on the type of plants. This Moisture Sensor can be used to detect the moisture of soil or judge if there is water around the sensor, let the plants in your garden reach out for human help. They can be very to use, just insert it into the soil and then read it. If you are a gardener, you can use this sensor to know when your plants need to be watered.

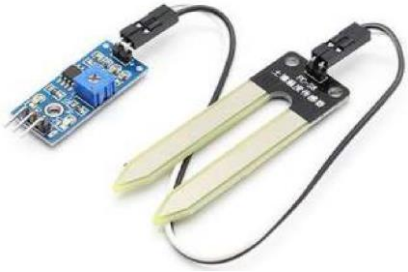

**Fig:1.3 Soil Moisture Sensor**

4) **Solenoid Valve:**

A solenoid valve is used as a water controlling valve, it is a simple electromagnetic device that converts electrical energy directly into linear mechanical motion. A solenoid valve is the combination of a mechanical valve and basic solenoid. So a solenoid valve has two parts namely- Electrical solenoid and a mechanical valve. Solenoid converts electrical energy to mechanical energy which operates a mechanical valve that is to open, close or to adjust in a position. The solenoid valve is shown in figure

Fig:1.4 Solenoid Valve

Fig:1.6 Water Motor

5) **DHT-11 Temperature Humdity Sensor:**

The **DHT11** is a commonly used **Temperature and humidity sensor.** The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers.The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. So if you are looking to measure in this range then this sensor might be the right choice for you.

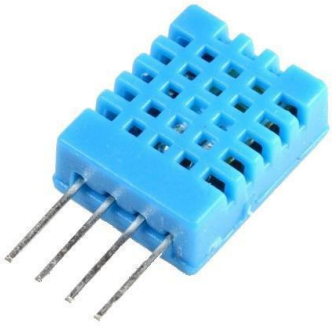

Fig:1.5 DHT-11 Temperature Humdity Sensor

6) **Water Motor:**

Water motors normally have positive and negative leads. When these leads are connected to a battery the motor will rotate. The motor will rotate in the opposite direction if the leads are switch.Water motor is used to pump the water mechanically to the plant which requires by means of the use of the sensors records.

**Modules:**

1. **Admin(Web App):**
   - Login: Admin can login in his personal account using id and password.
   - Add Farmer with hardware kit.
   - Admin can View Farmer with hardware kit.
   - Admin can Delete Farmer with hardware kit.
2. **Farmer**
   - Login: Farmer can login in his personal account using id and password.
   - View current sensor values
   - View logs of sensor if sensor value crossed threshold value on/off motor.

**Objectives:**

The objectives are as follows:

1) Measure water consumption accurately.
2) Perform a daily verification of Soil Moisture.
3) Give signals from the utility company to the client such as closing the valve and sending consumption data.
4) To design a new infrastructure of irrigation method.
5) To develop an irrigation system for the farmer to monitor their plant or field.
6) To test the functionality of this project by implementing it in suitable condition.
7) To develop an IOT based irrigation system having a low-cost equipment.

8) To monitor moisture contents at different conditions
9) The main objective of this work is to control the water application.
10) As well saving our time is major purpose.
11) To save the plants from being dry and improve their lifetime.

**Future Work:**

Since we have diverse soil textures in different parts of our country, a significant portion of our Indian agriculture's potential is still unrealized, and we still have a long way to travel in this field of study. Through the actual implementation of this anticipated software, farmers may benefit. The internetworking of the nodes in an agricultural area and the creation of user-friendly software that is easily understandable by farmers are real challenging problems that have to be confronted and which can still be overcome.

## 3. CONCLUSIONS

This study will show how a real-time, internet-based solution to smart irrigation fertilizer systems using IOT has been successfully implemented. a PH sensor that measures soil quality and overcomes the limitations of conventional irrigation and fertilizer systems. Our team claims to reduce water waste on agricultural fields by between 40% and 50% with the suggested concept. Every sort of crop being grown receives a significant and abundant supply of water because of the system's focus on crops. The farmers can more easily control and run the irrigation system on their mobile devices thanks to the usage of wireless sensor networks, which reduces physical labor. Therefore, the project offers less labor force, greater efficiency, and smarter use of agricultural practices, all of which will increase yield, profit, and gain agricultural production that is both highly efficient and secure will have a substantial impact on assuring the effective use of water resources as well as the effectiveness and stability of agricultural production.

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