SMART IRRRIGATION SYSTEM

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PROJECT COMPONENT

Submitted To

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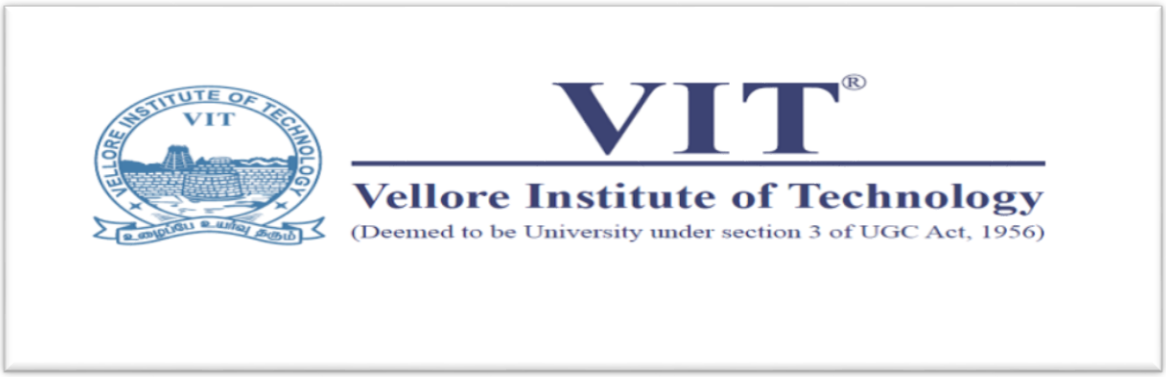

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Abstract

India depends heavily on the monsoons, which are not a stable source of water, for irrigation. An intelligent irrigation system provides water to plants in accordance with the kind of soil being used. This project describes a prototype concept for an intelligent irrigation system based on microcontrollers that will enable irrigation to occur in areas that need watering while avoiding areas with enough soil moisture. A pesticide sprinkling device that prepares the mixture in the proportions demanded by the plants would be another feature of this prototype. This would eliminate human error to the greatest possible degree.

The current state of cost-saving technology and labour-saving in irrigation India currently ranks second globally in terms of agriculture yield. 55-75% of water use is accounted for by irrigation systems. 60% of the water used by the irrigation system will go to waste. A smart irrigation system framework that can conserve water is necessary since a watering system's water requirements are always high. This design steers clear of problems like excessive watering. By automatically supplying water to the agricultural field based on the soil's level of wetness (moisture) and the ambient temperature, it also aids in water saving. Likewise, as engineering companies develop, there may always be a chance to reduce risks while simultaneously making fill-in easier. The Internet of Things (IoT) is a network of physical objects that together provide solutions to a variety of problems. Without requiring human-to-machine interaction, IoT may share information via a network. IoT may be used in industries including agriculture, smart cities, sophisticated mobile homes, healthcare, movement tracking, and more to improve the monitoring and stock management of all equipment.

Here, we keep track of how farming operates as it plays a significant role in the development of the economy of our nation. Using sensors and microcontroller devices, this programme accurately regulates the irrigation system for the farm. It is accomplished by placing sensors in the field to keep track of soil moisture and temperature, which send the information to the microcontroller for calculation of plant water requirements.

The user can monitor and control the status of watering anywhere through the internet. The integration of sensors, cloud, and the servo motor through multiple Node MCUs is the main novelty of this work.

Introduction

In this project, we made an Intelligent Agriculture System which is being built with the purpose to make gardening less complicate, and modern. The microcontroller used is a nodemcu and it is smart. This project utilizes three different sensors, a soil moisture sensor, temperature, and humidity sensor. The soil moisture sensor gives the details of the moisture of the soil which is needed to process the further task for supplying water to it. The 5V motor has been used to supply the water to plant. The data for each loop has been uploaded to cloud which then is been taken displayed in the application. The main aim to build such a system is to make agriculture less complicated with the application of sensors and thereby reducing the manual work**.**

PURPOSE

Day by day the population is increasing which gives a negative impact on water resources. From the below graph it is clear that the years passes per capita water use increases and per capita water resources falls. So, it's our duty to save the planet from water depletion and conserve a single drop of water that is being wasted unnecessary during the irrigation. Smart irrigation system automatically adjusts the watering schedule based on various parameters, such as plant water content, soil moisture content, wind speed, wind direction, and local weather data. It offers several benefits, such as environmental sustainability, reduced labor cost, and less water usage. Such a system eliminates the need for humans to constantly keep a check on the irrigation and eases the process by automating the process and also suggesting irrigation levels required on the basis of numerous factors which can be neglected by humans.

STAKEHOLDERS AND USERS:

1) This system is designed for the purpose of solving different problems related to irrigation process, so this system mainly targets ministry of Agriculture and fisheries and

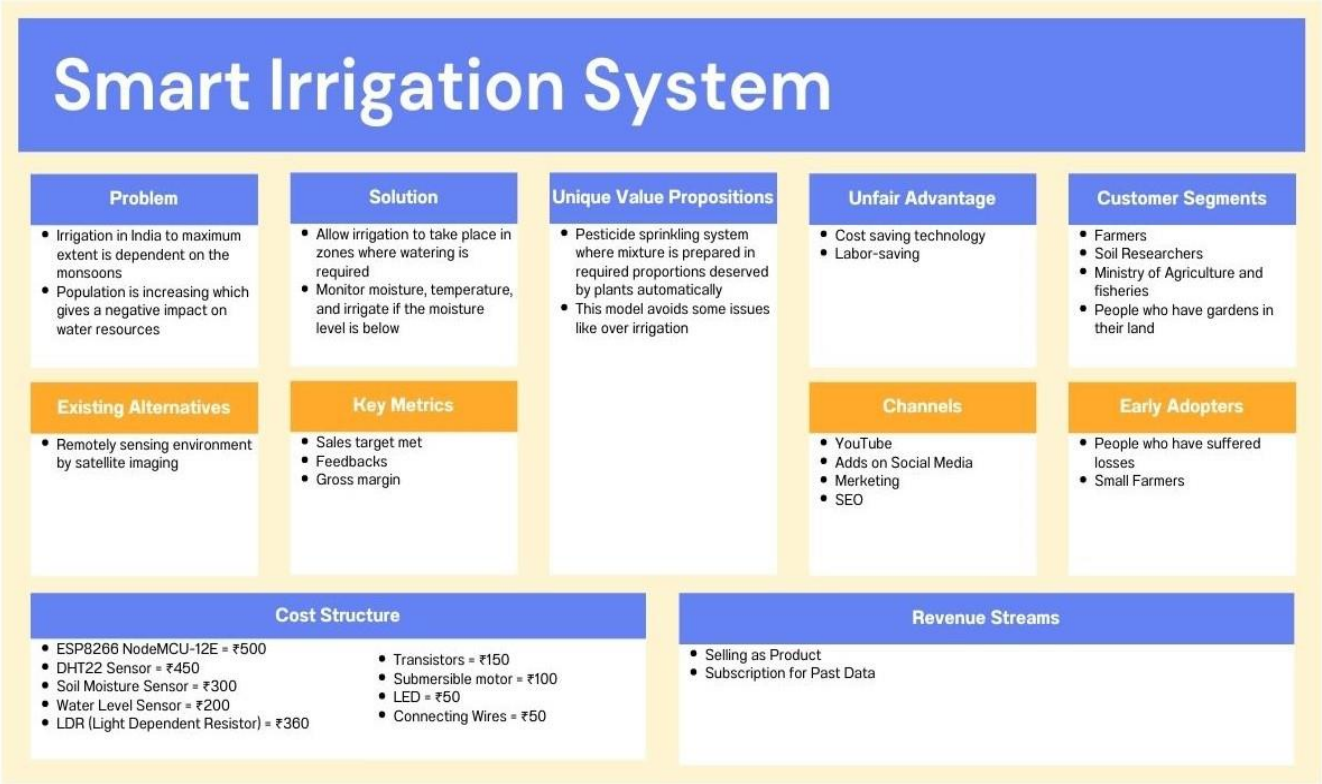
2) As well as farmers and even those people who have gardens in their land. For each problem in different fields, we need to study the conditions, requirements then adapt this project to solve the problem.

3) We can implement this project in different sectors for example it can be like government water supply system.

4) Also, it can be implemented in big industry that is using water for cooling system, it can be implemented by using a water level sensor instead of the moisture sensor.

5) Also, we can use this system (same idea) but using different type of sensors for example in fertilizer processes for plants: if we use sensors which tell us about the minerals that are deficient in the soil such as magnesium.

Lean Canvas:


Smart Irrigation System
Problem
Irrigation in India to maximum extent is dependent on the monsoons
Population is increasing which gives a negative impact on water resources
Solution
Allow irrigation to take place in zones where watering is required
Monitor moisture, temperature, and irrigate if the moisture level is below
Unique Value Propositions
Pesticide sprinkling system where mixture is prepared in required proportions deserved by plants automatically
This model avoids some issues like over irrigation
Unfair Advantage
Cost saving technology
Labor-saving
Customer Segments
Farmers
Soil Researchers
Ministry of Agriculture and fisheries
People who have gardens in their land
Existing Alternatives
Remotely sensing environment by satellite imaging
Key Metrics
Sales target met
Feedbacks
Gross margin
Channels
YouTube
Adds on Social Media
Merketing
SEO
Early Adopters
People who have suffered losses
Small Farmers
Cost Structure
ESP8266 NodeMCU-12E = ₹500
DHT22 Sensor = ₹450
Soil Moisture Sensor = ₹300
Water Level Sensor = ₹200
LDR (Light Dependent Resistor) = ₹360
Transistors = ₹150
Submersible motor = ₹100
LED = ₹50
Connecting Wires = ₹50
Revenue Streams
Selling as Product
Subscription for Past Data

HRS:

S.no	Component	Range/Specification	Justification
1	ESP8266 NodeMCU-12E	1.Integrated low power 32bit-MCU. 2.Integrated 10bit ADC 3.Integrated TCP/IP protocol stack. 4.Working-temperature range:40°C~125°C 5.Frequency range : 2.4GHz - 2.5GHZ 6.Working voltage:3.0v~3.6v 7.Working current: 80mA. 8.WiFi 2.4 GHz, support WPA/WPA2 Security	Node-MCU is a microcontroller which is used to get the data from the different sensors such as LDR, DHT11, soil moisture sensor, water level sensor and send the data to the server and it also C program which is used to build our project.
2	DTH 11 Sensor	• Temperature range: 0 to 50° C • Humidity: 20-90% • Interface: digital	It reads the temperature and humidity around the plant in the analogue form and sends the data to the NodeMCU where the data is manipulated and sent to the server
3	Soil Moisture Sensor	• Working voltage: 5V • Working current: <20 mA • Interface: Analog • Working Temperature: 10°C~30°C	It reads the soil moisture content from the soil. It is immersed in the soil with its send completely into the soil. It constantly reads the soil moisture and sends it to the NodeMCU and where it is processed and sent to the server
4	Relay Module (SPDT RELAY 5V)	1.Supply voltage – 3.75V to 6V 2.Trigger current – 5mA	The relay module may be used to identify and monitor multiple external devices in / off external conditions. A

		3.Current when relay is active ~70mA (single), ~140mA (both). 4.Relay maximum contact voltage – 250VAC, 30VDC 5.Relay maximum current – 10A.	serial port is used to link the user interface. It is used to control motor by acting as switch when it is needed to on/off.
5	Submersible Motor Pump	1)Operating Voltage: 3 ~ 6V 2) Operating Current: 130 ~ 220mA. 3)Flow Rate: 80 ~ 120 L/H 4)Driving Mode : DC, Magnetic Driving. 5)Outlet Outside Diameter : 7.5 mm. 6)Outlet Inside Diameter : 5 mm.	It is used to supply water to the plant using a pipe when it met the required conditions.
6	HP Battery	Required Voltage: 9V Type: Zinc carbon	It is used as power supply for motor pump.

SRS-Software Requirement Specification

Basic software requirements are:

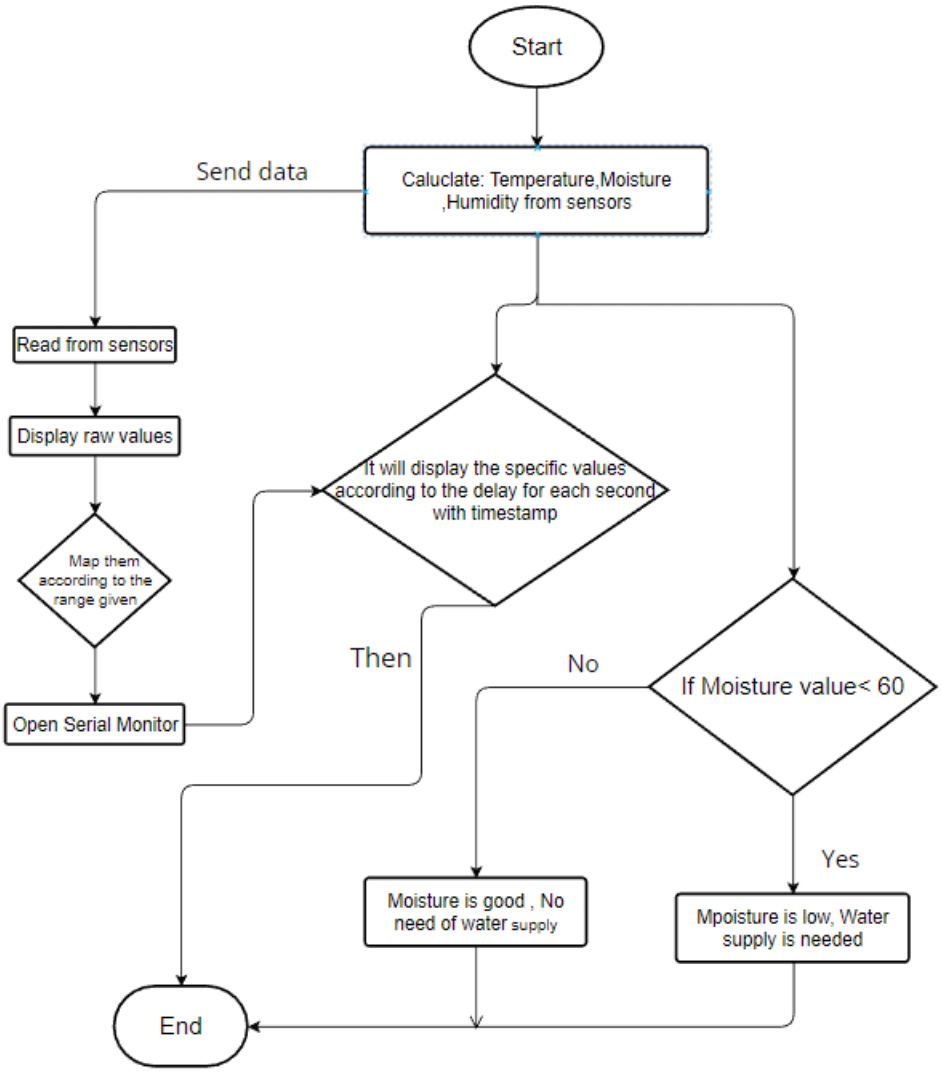
1) Windows OS with a 2GB ram supporting nodemcu code editor.
2) Arduino IDE.

Now,

Process:

1) Connect all the parts accordingly.
2) Create a code that reads the values of the sensors involved in our project.
3) Read the 3 values for displaying the values of Soil moisture, Temperature and Humidity.
4) Also create a switch which performs as a on/off button for water pump motor and light.
5) Now using a port upload the code in nodemcu module by connecting it to a power supply.
6) Start the process and it reads the values and display it according to surroundings.
7) Map the sensor values and convert them according to range of our moisture. It gives values in the units of pressure called bars.
8) Then if soil moisture is low, we can turn on the pump using switch button.
9) Then water will be supplied to the plant, and it will get to a stable state.
10) In this way we can irrigate the plant using any kind of conditions and surroundings by using this smart irrigation system.

Flowchart:


Start
Caluclate: Temperature,Moisture ,Humidity from sensors
Send data
Read from sensors
Display raw values
Map them according to the range given
Open Serial Monitor
It will display the specific values according to the delay for each second with timestamp
Then
If Moisture value< 60
No
Yes
Moisture is good , No need of water supply
Mpoisture is low, Water supply is needed
End

CODE:

```
#include <OneWire.h>
#include <SPI.h>
#include <DHT.h>
#include <DallasTemperature.h>
#define ONE_WIRE_BUS D4
OneWire oneWire(ONE_WIRE_BUS);
DallasTemperature sensors(&oneWire);

#define DHTPIN 2
#define DHTTYPE DHT11
DHT dht(DHTPIN, DHTTYPE);
SimpleTimer timer;
void sendSensor()
{
float h = dht.readHumidity();
float t = dht.readTemperature();

return;
}

void setup()
```

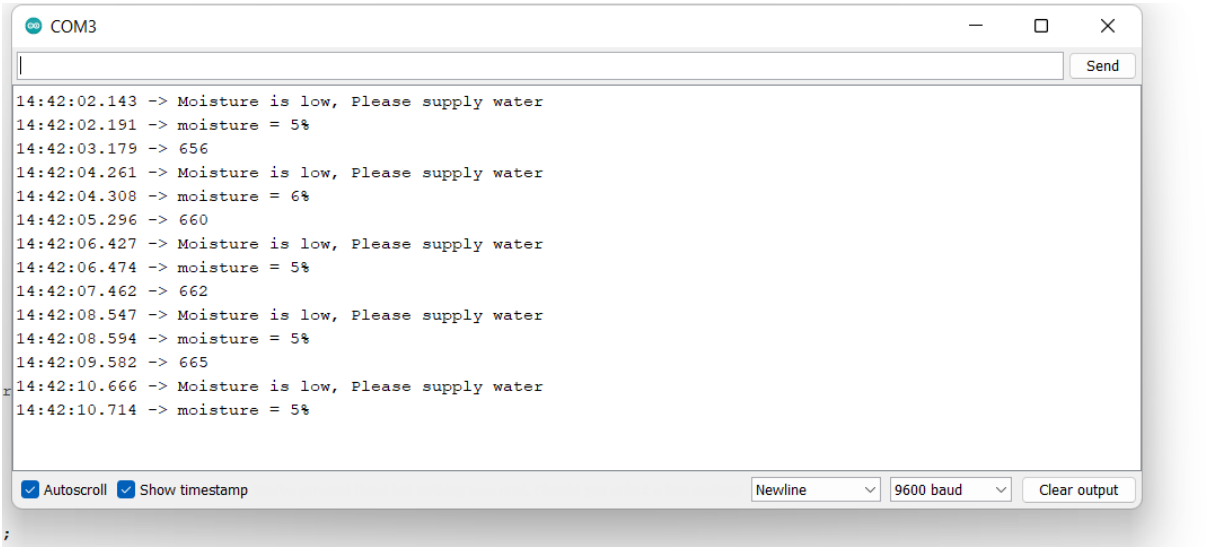
```
{
Serial.begin(9600);
dht.begin();
timer.setInterval(1000L, sendSensor);
sensors.begin();
}
int sensor=0;
int output=0;
void sendTemps()
{
sensor=analogRead(A0);
Serial.println(sensor);
output=(145-map(sensor,0,1023,0,100)); //in place 145 there is 100(it change with the change in sensor)
delay(1000);
sensors.requestTemperatures();
float temp = sensors.getTempCByIndex(0);
if(output<60)
{
  Serial.println("Moisture is low, please supply water");
}
else
{
  Serial.println("Moisture is good, No need of water supply");
```

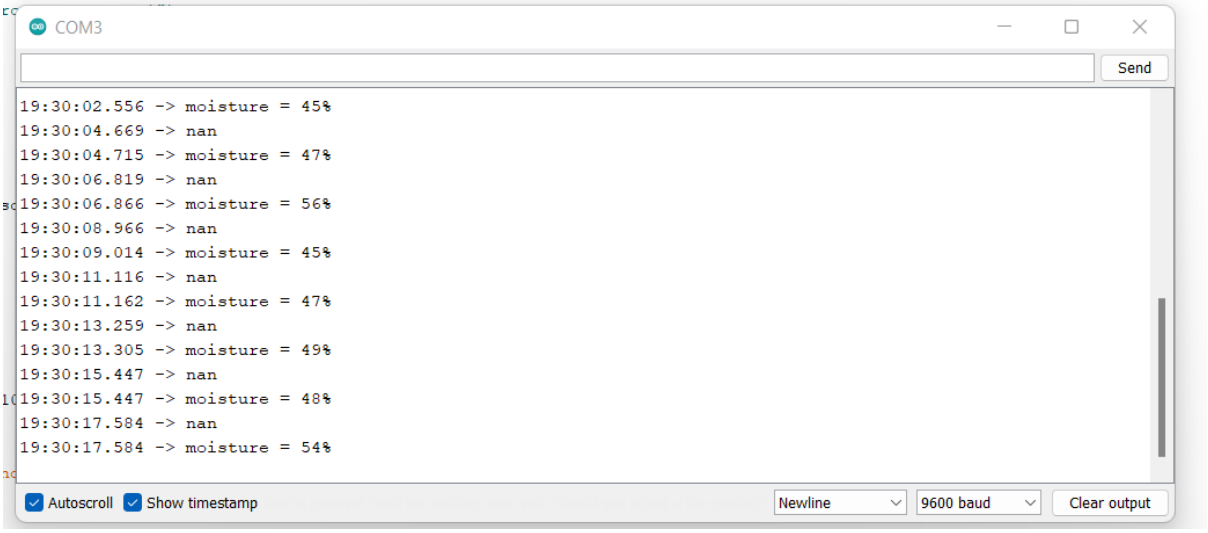
```
}
Serial.print("moisture = ");
Serial.print(output);
Serial.println("%");
delay(1000);
}
void loop()
{
timer.run();
sendTemps();
}
```

Results/Outputs

From IDE:

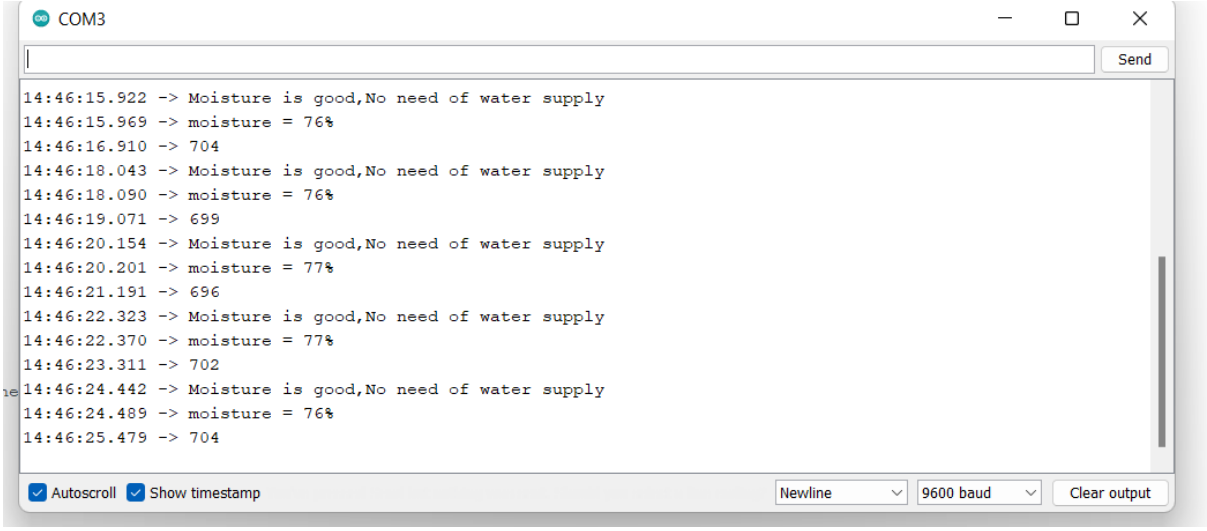
These outputs are displayed in the Serial monitor in Arduino IDE.

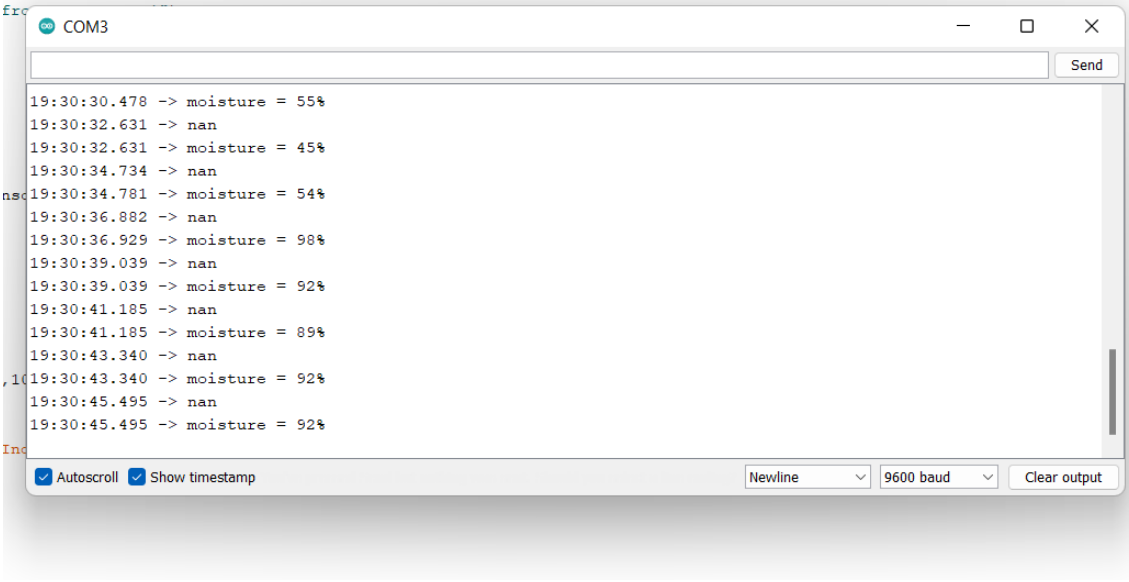




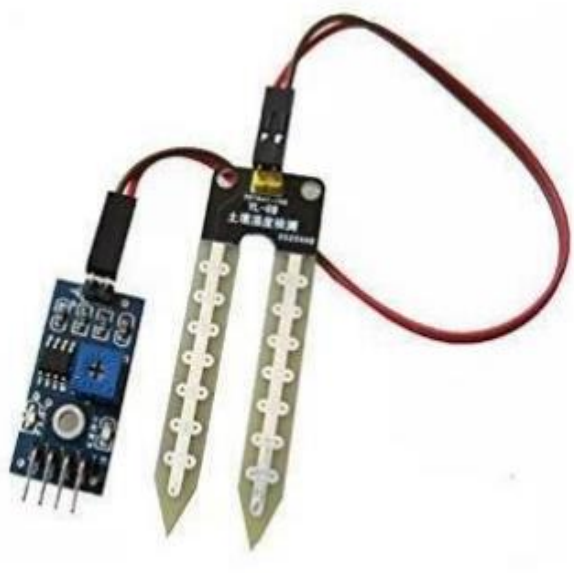
If the soil moisture is low, then we will supply water to the plant to settle it down using a pump as shown in the figure 1.2

Firstly, it will display raw values. Then moisture value and a statement whether eater supply is need or not according to moisture value. Then it will increase due to the water supply.





Photographs of Hardware Component:



Soil moisture senor

It reads the soil moisture content from the soil. It is immersed in the soil with its send completely into the soil. It constantly reads the soil moisture and sends it to the NodeMCU and where it is processed and sent as data.

DTH sensor (Temperature and humidity)

It reads the temperature and humidity around the plant in the analog form and sends the data to the NodeMCU where the data is manipulated and sent as data.

Nodemcu (esp8266 12E)

NodeMCU is used to get the data from the different sensors such as DHT11, soil moisture sensor and send the data.

Submersible motor

When the soil moisture content is low, and the soil moisture sensor sends the message to the NodeMCU then the motor is switched ON and the plant fields are irrigated.

Hardware Setup: Fig-1.1

Fig:1.2

CONCLUSION AND FUTURE SCOPE

It may conserve water usage up to 45% from the conventional irrigation. Recently it is found to be a significant rise in deploying Wireless Sensor Network (WSN) and the major challenge is providing network stability and power consumption. Therefore, in this proposed model, expanding solutions for data aggregation and analytics, efficient cluster head selection and integrating with open source programming platforms, including support for further IoT protocols such as Message Queue Telemetry Transfer (MQTT) and constrained Application (CoAP), giving detailed experimental evaluation of performance metrics.

In future we can also make it as automated system which can be used for various purposes like it can be used as water coolant process for several industries.