# *SMART AGRICULTURE BASED ON IoT*

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***ABSTRACT :*** *Agriculture has been done by hand for centuries. As the rest of the world moves toward new technologies and implementations, agriculture must follow suit. In smart agriculture, the Internet of Things plays a critical role. Agriculture fields can be monitored with Internet of Things sensors. We've proposed an automated IoT and smart agriculture solution. This Internet-of-Things-based farm monitoring system used wireless sensor networks to collect data from various sensors mounted at various nodes and transmit it via wireless protocol. The temperature sensor, moisture sensor, water level sensor, DC motor, and GPRS module are all part of this smart agriculture using IoT system, which is driven by Arduino. The water level, moisture level, and humidity level are all checked when the IoT-based agriculture monitoring system starts up. It sends an SMS alert to the phone when the levels are reached. The water level is sensed by sensors, and if it falls below a certain level, the water pump is immediately started. All of this is shown on the LCD module. All of this can be viewed in IoT, which displays humidity, moisture, and water level information together with date and time based on per minute. Temperature can be controlled to a specific level depending on the type of crops grown. If we want to forcefully close the water on IoT, there is a button provided by the water pump that may be used to do so.*

***Keywords:*** *IoT, Automation, Wi-Fi, Sensors, Microcontroller, Water Management.*

## II. INTRODUCTION

The main goal of this project is to assist farmers in automating their farms by providing them with a web app that allows them to remotely monitor field parameters such as temperature, soil moisture, and humidity, as well as control equipment such as water motors and other devices, without having to physically be present in the field. The goals of this initiative are to provide new technology to farmers, eliminate manual labor, reduce water waste, and improve farm productivity. productivity of crops by providing the ideal conditions.

### *A. Problem statement*

Farmers must be present at the farm at all times for its care, regardless of the weather. They must ensure that the crops are well watered and that the farm's state is physically monitored. To get a good yield, the farmer must spend the majority of his time on the field. In difficult times, such as when a pandemic is present, they must work hard in their fields, risking their lives to feed the country.

### *B. Proposed solution*

We bring IoT services to farmers to improve and simplify their working conditions. We use the internet to enable the farmer to continue his work remotely via the internet. Farmers can keep track of field parameters and operate farm equipment.

### *C. Methodology*

We designed an automatic temperature control and irrigation system that monitors parameters like temperature, humidity, and soil moisture content using the DHT11 sensor and moisture sensor to always maintain a suitable climate inside the greenhouse and to retain appropriate moisture content within the soil. Each section of the greenhouse is separated into several divisions, with one moisture sensor in each portion.

## III. LITERATURE SURVEY

The author offers a concept in which the direction and flow of water are monitored and controlled. DHT11 and a soil moisture sensor are used to do this. This system also suggests a means to choose the direction of water flow, and this information is supplied to the farmer's phone and Gmail account. The farmer may also turn on and off the motor with a simple click using this type. This project shows an energy-efficient model. [1] It must be sustainable, automated, and cost-effective. The model, according to the author, concentrates on water level, flood, wind, direction, wind speed, and weather. Humidity, temperature, and soil moisture sensors are used to do this. This information triggers an alarm. This model improves water management and sustainability [2]. Soil sample is done manually in the traditional way, and a chemical analysis is performed using three techniques: optical method, electrochemical techniques and conductivity measuring. These approaches aid in the quantification of primary nutrients [3]. The author presents a smart irrigation system and presents a methodology for smart data sensing. Various sensors are interfaced with the Raspberry Pi in this concept, resulting in an effective wireless sensor network [4].

*A. Block diagram*

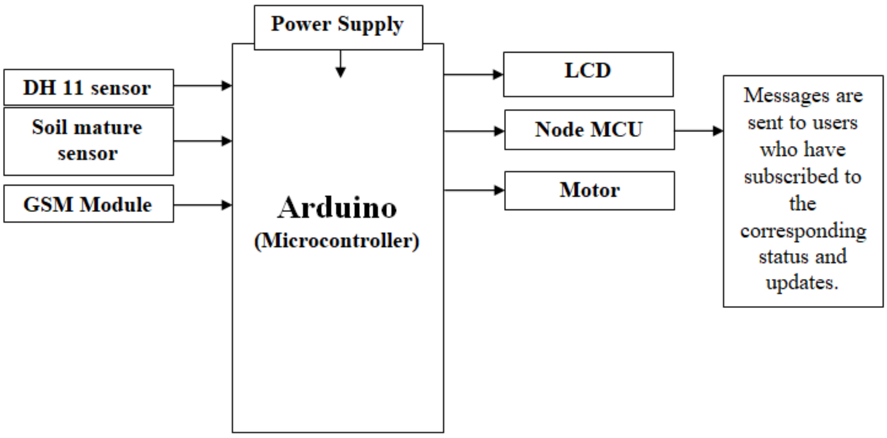
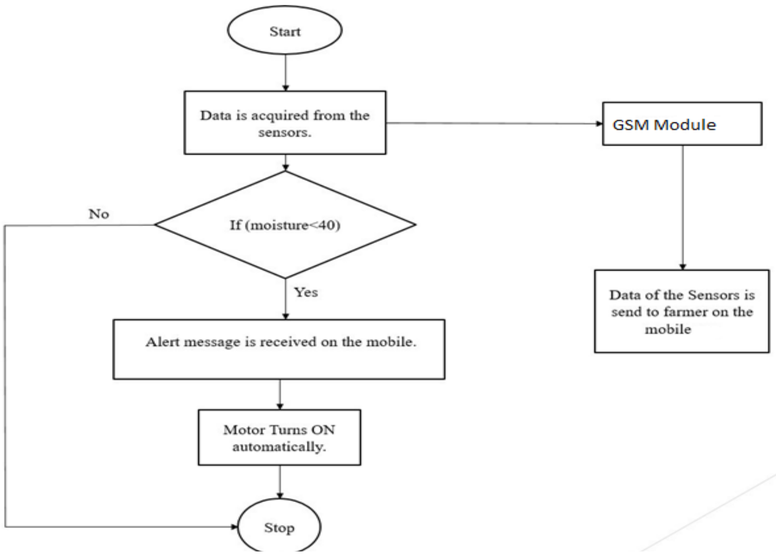



Fig.1**:** Block diagram of the proposed system

*B. Flow Chart*




When data from various sensors, such as humidity, temperature, and soil moisture, is collected, it is sent to the user's mobile phone, and if the water content in the soil is less than the cut off value, an alert message is received on the user's app, and the motor is automatically switched on using a relay.

***1.Node MCU:***

It's an open-source firmware and development kit for creating Internet-of-Things (IoT) gadgets. It contains hardware with an ESP-12 module and firmware that runs on an ESP8266 WiFiSoC. There is an analogue clock with the package (A0). The board also features digital (D0-D8) pins. It also aids serial port communications like SPI, UART, and I2C. The data is uploaded to the server by IoT devices.

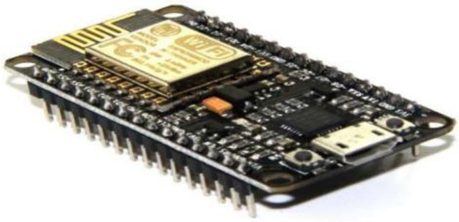
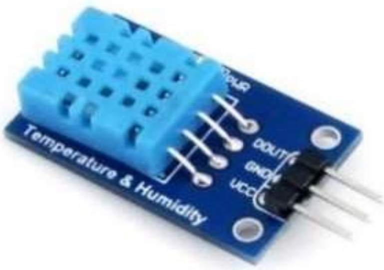


Fig.2: Node MCU

*2.DHT11 Sensor:*

This sensor is a digital humidity and temperature sensor with a low cost. Despite requiring an ADC, this sensor produces digital output and may thus be directly linked to the microcontroller's data ports. It also has an eight-bit microprocessor for serial data transmission of temperature and humidity information. VCC, GND, DATA, and NC are the four pins on the board. It is powered by a 3.3-5-volt battery




. **Fig.3: DHT11 Sensor**

*3.Soil Moisture Sensor:*

The process of determining how to monitor soil moisture can be hard, but METER's simple, plug-and-play soil sensors make it easier. It detects both dry and wet soil conditions.

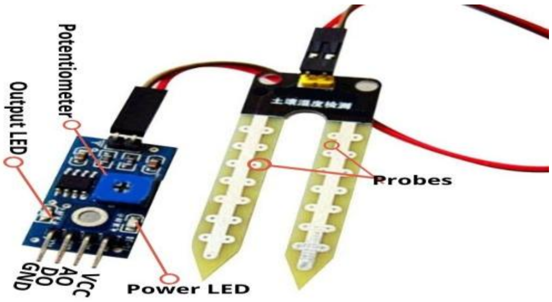



*Fig.4: Soil Moisture Sensor*

***4.Thing Speak Cloud:***

It's an Internet of Objects (IoT) platform that allows people and things to connect in meaningful ways. It supports many platforms with real-time data collecting, data analysis, data processing, and data visualization via a connected Social Networking Service (SNS) via an open-source API. It facilitates data transfer from embedded devices such as Arduino, Raspberry PI, and NodeMCU, among others. It also works with a variety of languages and contexts. Using Thing Speak, our suggested system reads and delivers sensor data. The major goal is to create and install an automated system that visualizes sensory data as graphs. The information gathered can be viewed anywhere in the world at any time.

***5.Relay:***

It functions like a switch. Many electromagnet relays are used to mechanically control switches, but other fundamentals, such as solid-state relays, can also be employed. As a result, the relay functions as an automatic switch that operates on a high-current circuit utilizing a low-current signal. A relay is an electrically actuated switch found in industrial systems, cars, and household appliances.

*6.Motor:*

It's a cost-effective and portable mini submersible pump that runs on dc 3-6v. With extremely low current use, it can consume roughly 120 litres per hour. The water level should be higher since overheating can injure the parts of this device if the motor is utilized without water. Controlled fountain water flow, hydroponic systems, and controlled landscape watering systems are just a few examples.

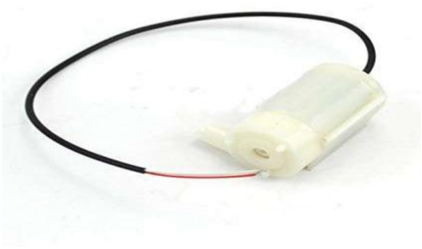
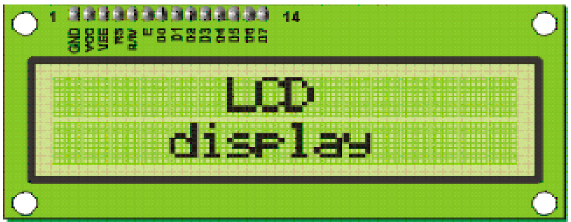


Fig.6: Motor

*7.Liquid Crystal Display:*

The model presented here is the most commonly utilized in practice due to its low cost and extensive capabilities. It uses the HD44780 microcontroller to display messages in two lines of 16 characters each. All of the alphabets, Greek letters, punctuation marks, mathematical symbols, and other symbols are displayed. In addition, it's possible to show symbols that the user creates themselves.




*8.GSM Module:*

GSM (Global System for Mobile Communications) is an open, digital cellular technology that allows mobile voice and data services to be transmitted. GSM (Global System for Mobile Communication) is a digital mobile phone system popular in Europe and other areas of the world. GSM is the most extensively utilized of the three digital wireless telephone systems, and it employs a variant of Time Division Multiple Access (TDMA) (TDMA, GSM, and CDMA). GSM digitizes and compresses data before sending it along with two additional streams of user data, each in its own time slot, via a channel. It uses the 900 MHz or 1,800 MHz radio bands to communicate. It can make phone calls and transport data at up to 100 Mbps.

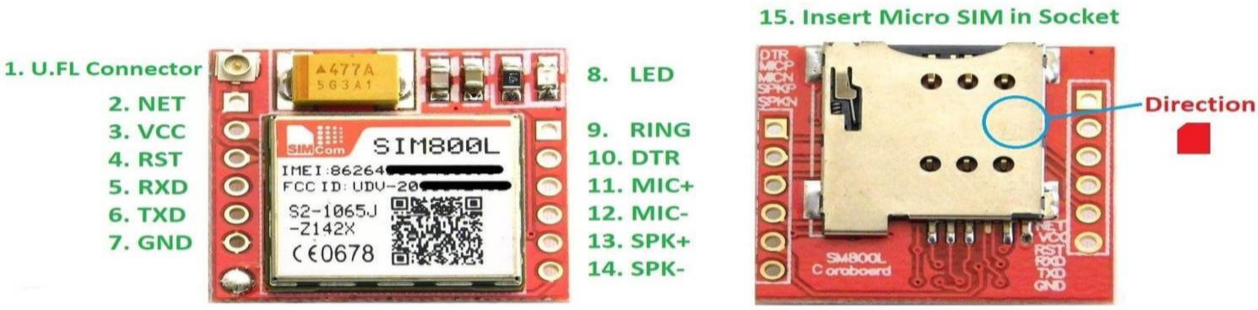



Fig.8: GSM Module

*9.Arduino Uno Microcontroller:*

The Arduino Uno may be a microcontroller board supported the ATmega328. It has 14 digital input/output pins (six of which are PWM outputs), six analogue inputs, a 16 MHz ceramic clock, a USB port, a power jack, an ICSP header, and a reset button. It comes with everything you'll need to get started with the microcontroller; simply plug it into a computer with a USB cable or power it with an AC-to-DC adapter or battery.

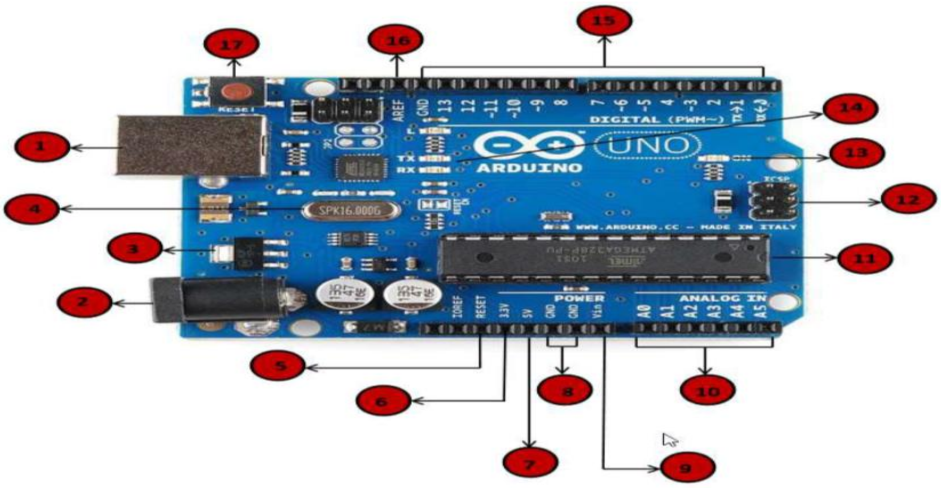



Fig.9: Arduino Uno Microcontroller

## IV. CONCLUSION

The suggested model investigates the application of IoT (Internet of Things) in agriculture. This model tries to improve crop production by assisting in the prediction of a better crop sequence for a specific soil. Thing talk assists in real-time soil sampling, and the data collected can then be used to analyse the crop. We've also collected a lot of measurements of soil moisture, temperature, and humidity in the environment on different days and at different times of the day. Agriculturists can also use cloud data to improve yield, evaluate manures, and track illness in the fields. This solution is both affordable and practical. It also focuses on making the most use of available water resources This study will help farmers improve their farming techniques, enhance output, and make better use of scarce resources.

## V. Future Scope

This project's future scope could include a variety of soil sensors, such as pH sensors and Rain sensors, as well as data collection and storage on a cloud server. This would improve the accuracy of the forecasting and analysis operations. It also entails adapting various data mining methods for agricultural data analysis.

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