# IoT Based Farm Environment Invigilator Using ESP8266

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*Abstract*— As we have decided to make our final year project which can really help or contribute something to agriculture issues. Hence we have started visiting various agriculture places and by observation on this stream we came to know that the farmers have the sufficient land area suitable for cultivation but they doesn't have the proper cognition or guideline that which type of soil & weather parameters are required for particular crop. So measure all soil & weather related parameters like temperature, moisture, humidity and PH or nutrition information and also conceive a respective database. Then it should be able to compare the acquired database with reference database i.e. required for proper growth of our crop & also according to which it must be able also take further required action. At final all the details will be sent to the farmer's mobile with the help of WIFI Modem & farmer.

***Keywords:*** MQTT Dashboard, Arduino UNO, Temperature & Humidity Sensor, Moisture Sensor, Rain Sensor, Wifi Module ESP8266

## I. INTRODUCTION

Agriculture is backbone of Indian economy, Because India has led to exports of agricultural products worth US$ 22 Billion. Although India is the second largest irrigated country of the world after China, only one-third of the cropped area is under irrigation. Irrigation is the most important agricultural input in a tropical monsoon country like India where rainfall is uncertain & unreliable. To Maintain ecological balance there must be development in agriculture sectors. In the current phase, one of the world's major problems is lack of water and water is consumed abundantly in Agriculture. Therefore an appropriate water Consumption system is required. Currently, almost All irrigation systems are physically regulated. The Transformation in the Automatic.

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## II. IMPLIMATION OF DEVICE

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First crop our make database is potato because Potato is the most important food crop of the world. Potato is a temperate crop grown under subtropical conditions in India. Potato is a temperate climate crop, however it grows under a diverse range of climatic conditions. The vegetative growth of the plant is best at a temperature of 24°C while tuber development is favoured at 20°C. Irrigation has a special significance in the potato production as the plant has shallow and sparse root system. First irrigation should be light and given 5-7 days after planting and subsequent irrigation are given at 7-15 days interval depending upon the climatic condition and soil type. The drip system of irrigation is most economical giving highest productivity and saving almost 50% water. It also enables application of fertilizers through irrigation water. The sprinkler system gives uniform distribution of water and reduces water losses by percolation and run off. Sprinkler irrigation is beneficial on frosty nights as it reduces frost damage in potatoes. It is recommended for areas with undulating topography, extremely sandy soil and scarce water supply. Under such situations, the use of sprinkler systems increases water use efficiency by 40% as compared to furrow irrigation.

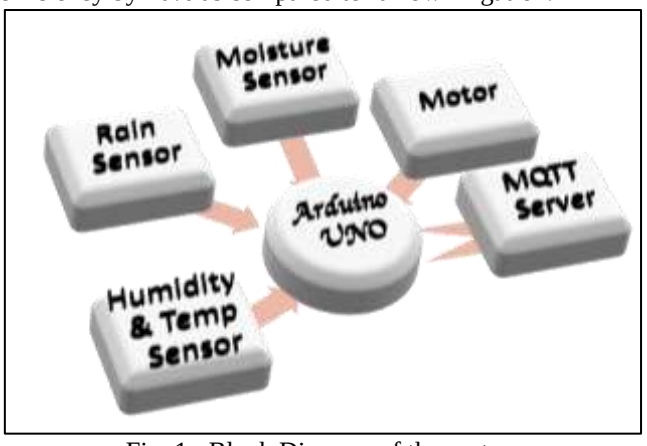


Fig. 1: Block Diagram of the system

The device measures four of the most important and basic parameters for growth of plants namely Soil moisture, Rain Sensor, temperature and humidity. The microcontroller is Arduino Uno. The FC28 Hygrometer, Rain Sensor and DHT11 sensors are used to measure soil moisture, Rain and temperature and humidity respectively. The sensors read the data and send with help of WIFI Modem & MQTT Dashboard.

 


Fig. 2: Flow chart of the system

Also, automated irrigation system have been developed using sensors technology with Arduino to efficiently utilize water for irrigation purpose. This project requires Arduino board having inbuilt ATMega328 microcontroller. This project is need of the hour to convert manual irrigation into an automated irrigation which with the help of soil moisture sensor will detect dankness content of soil leading to turn ON/OFF of pumping motor. Human efforts can be reduced using this technique and increase saving of water by efficiently irrigating the plants. The design has been made with better resource management and low power consumption.

## III. PROPOSED METHODOLOGY

### A. *Message Queuing Telemetry Transport (MQTT)*

MQTT is a simple messaging protocol, designed for constrained devices with low-bandwidth. So, it's the perfect solution for Internet of Things applications. MQTT allows you to send commands to control outputs, read and publish data from sensor nodes and much more.

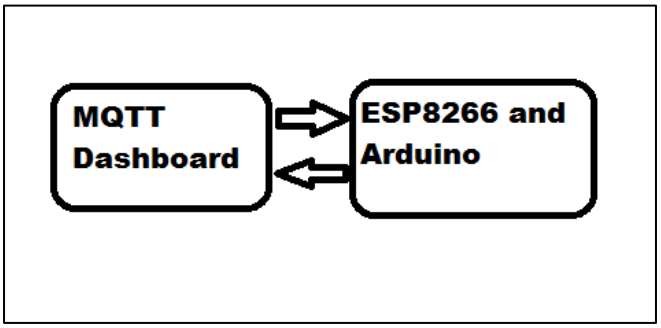


Fig. 3: Block Diagram MQTT Dashboard to connect Arduino using ESP8266 WIFI chip

The broker is primarily responsible for receiving all messages, filtering the messages, decide who is interested in them and then publishing the message to all subscribed clients. Messages are the information that you want to exchange between your devices. Whether it's a command or data.

In MQTT there are a few basic concepts that you need to understand:

- Publish/Subscribe
- Messages
- Topics
- Broker

### B. *Arduino Uno*

The Arduino Uno is an open source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

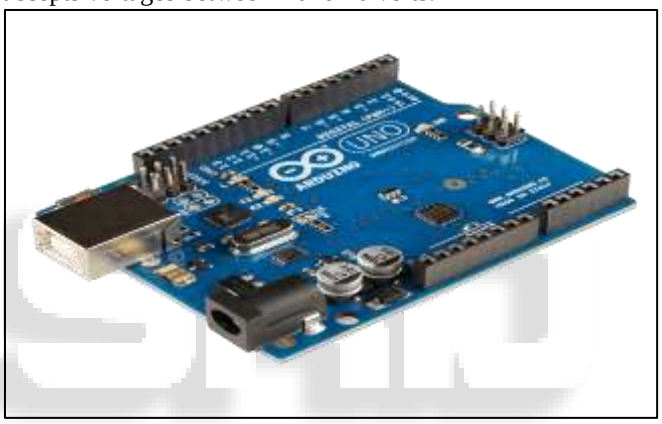

Fig. 4: Arduino UNO

### C. *ESP8266*

The ESP8266 is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability. ESP8266EX is integrated with a 32-bit Tensilica processor, standard digital peripheral interfaces, antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules. All of them are included in one small package, our ESP8266EX.

### D. *Interfacing Arduino and ESP8266*

All ESP8266 arduino compatible modules must be powered with DC current from any kind of source that can deliver stable 3.3V and at least 250mA. Also logic signal is rated at 3.3v and the RX channel should be protected by a 3.3v divisor step-down. You should be careful when using this module with Arduino or other boards which supplies 5v, because this module usually do not come with overpower protection and can be easily destroyed.

### E. *DHT11 Temperature & Humidity Sensor*

This DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing

 

technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component.

Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration. The calibration coefficients are stored as programmes in the OTP memory, which are used by the sensor's internal signal detecting process. The single-wire serial interface makes system integration quick and easy. Its small size, low power consumption and up-to-20 meter signal transmission making it the best choice for various applications, including those most demanding ones. The component is 4-pin single row pin package. It is convenient to connect and special packages can be provided according to users' request.

### *F. FC28 Moisture Sensor*

Despite the importance of soil moisture information, widespread and/or continuous measurement of soil moisture is all but non-existent. "The lack of a convincing approach of measurement of soil moisture is a serious problem". Clearly, a need exists for continuous measurements of surface soil moisture. Also, remote soil moisture sensing increases the efficiencies of irrigation systems by preventing over watering and leaching of fertilizers and other chemicals offsite.

Soil Moisture sensor FC-28 comes with a pair of tech probes that can be inserted in the soil. A small current flow through the probes and the level of resistance will be measured. The resistance increases if the soil is dryer. The output from the sensor is an analogue output.

### *G. FC37 Rain Sensor*

If the rain sensor plate of the rain sensor module is in dry state, analog output (AO) from the module is 5V. During rain, the sensor plate elements are bridged by the rain water and hence this analog output gradually changes from 5V to 0V, based on the moisture level between the sensor pads. By this way, the sensor reports the absence and presence of the rain in an analog way, help us to determine whether the rain is light or strong by 243 ours243ng the outputted analog signal. The approximation is handled by a simple Arduino sketch. An additional function is delaying of the alert generation; Arduino raises an alert only when raining with a certain threshold is detected, within a pre-defined time interval.

## IV. RESULT

The device measures Four of the most important and basic parameters for growth of plants namely Soil moisture, Rain Sensor, temperature and humidity. The microcontroller is Arduino Uno. The FC28 Hygrometer, Rain Sensor and DHT11 sensors are used to measure soil moisture, Rain and temperature and humidity respectively. The sensors read the data and send with help of WIFI Modem & MQTT Dashboard.

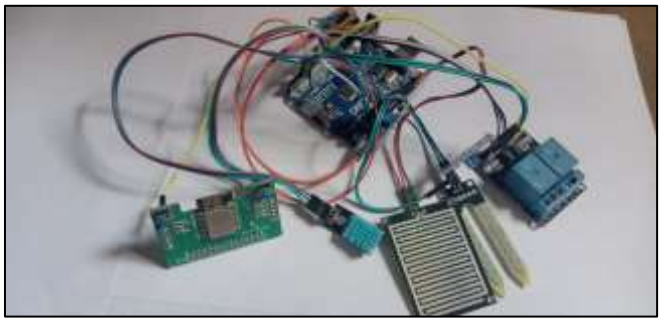

Fig. 5: Interfacing of devices with Arduino Uno


Fig. 6: MQTT Dashboard Result

## V. CONCLUSION

This Project measure all soil & weather related parameters like temperature, moisture, humidity and PH or nutrition information and also conceive a respective database. And automated irrigation.

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