

IOT BASED FARMING SOLUTION

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This Report Presented in Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science in Computer Science and Engineering

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25TH MAY 2021

APPROVAL

This Project titled “**IOT Based Farming Solution**”, submitted by *Nesaruddin Ahmed* and *Md. Rokibul Hasan* and *Md. Kafiul Bin Islam* to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on *25th MAY 2021*

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of Mr. **Md. Reduanul Haque, Sr. Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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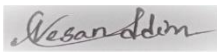
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ABSTRACT

In the recent year's agriculture productivity is decreasing day by day. So that we tried to focus on the automation of monitoring system. In this paper we have briefly discussed about the process, progress and implementation of this farming system. We have also focused on survey and social impact of this digital monitoring system which will be the revolution maker this technological developing arena. Focusing on the complexity of the use, cost effectiveness and productivity incensement developed this paper properly. As per the current demotivation of farming this farming system may be the moral motivation for the farmers and also for the up growing entrepreneurs of our youth network. After upgrading existing system, we got the positive result of development. This paper evaluates that the non-complexity of the farming system, effectiveness of the system, revolution of digitalization and social impact. Survey also measured by the effective evaluation. This impact also focused quality of production that was reflected on prices reported and monetarized by the farmers.

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CHAPTER 1: INTRODUCTION

Even as housing costs rise, there is a growing recognition that these costs are being added over the ages to reduce costs. With these thoughts in mind, Clever Farming Mission enables the customer to create and operate a farm while presenting additional automated programs that keep the smart Wi-Fi client wireless power degree low. Smart-farming will take the Wi-Fi in its environment and allow non-stop manipulation whether the user is present or not. Our goal of project is to manage farming devices beautifully through the Ubidot platform based on IoT (The internet of things). IoT is a community of "subjects" or physical objects that include physics, software programs, sensors, activators, and network properties. by using enforcing this gadget, it's far feasible to discover an expansion of various engineering challenges, which includes software program programming, PCB format, TCP/IP protocols, internet Server precise judgment format, another elements. This automation system gives exquisite insights into the demanding situations of software and hardware formats of the system.

1.1 MOTIVATION

We know that, our country is an agricultural country. From now our agricultural structures are accompanied thru traditional approach even as advanced international locations use computerized device to control their agrarian financial machine to develop greater merchandise than in advance than the usage of same lands and weathers, despite the fact that slight weather situation constantly helps us to develop different vegetation at precise seasons however it does now not supporting us to improve vegetation manufacturing without impeding flowers from natural destruction. So we've considered something that is a great way to manage the temperature and care for the crop to deliver yields in the dry season. This has been made easier by providing some managed sensors. Agriculture is stuck in Bangladesh because of limited technological recognize, how to practice first rate and inexperienced

agriculture and in addition they are still calculating traditional techniques of agriculture that result in smaller production of crops. Thus the productivity of plants can be maximized at a minimum charge using up-coming technology.

Bangladesh is also going to bring in a lot of financial instruments as most of the country's arable land is destroying those documents which is a significant part of GDP.

So through this framework, we provide a solution to this dilemma by confident and inexperienced means of systematic cultivation techniques and automatic introduction of limited formulas and additional yields also allow homeowners in an effective manner.

1.2 DESCRIPTION

Smart farming may be referred to as the 4.0 inexperienced revolution inside the problem of agriculture combining agriculture methodologies with technology — Sensors & Actuators, records and conversation era (ICT), net of things (IoT), Robotics and Drones to gather desired efficiencies of manufacturing with managed fee.

smart farming allows sustainable as well as fee-effective agriculture thru the aggregate of navigation satellites, and earth declaration input to make it smooth for farmers to make informed selection at the same time as farming. smart agriculture, on the other hand, is basically used to denote the application of IoT answers in agriculture. So what is sensible agriculture the use of IoT? by using the usage of IoT sensors to collect environmental and gadget metrics, farmers could make informed selections, and enhance just about each component in their work – from farm animals to crop farming.

as an instance, by means of using smart agriculture sensors to monitor the state of vegetation, farmers can outline exactly how a good deal water stage and mild stage

for photosynthesis they need to use to reach ultimate efficiency. The identical applies to the smart farming definition.

1.3 OBJECTIVE OF THE PROJECT

The intention of smart agriculture studies is to ground a choice making guide device for farm control. By supplying them with the advantages of technological improvements, smart agriculture ambitions to reduce the heavy workload of the farm people, hence enhancing their excellent of life. Smart farming is a necessary part of the agriculture and agricultural business areas in our motherlands. Reason for the necessity, A farmers can hard-working to controlled climatic situations for the best produce. We have decided to do our project to alleviate the hard work of the farmers, to get rid of the worries, to increase the quality of the soil and to produce more crops. Using our project, they can easily see the soil moisture level in their land from home through the website and even turn on the water pump at home if they want to irrigate the land. You will be able to see if the sunlight is shining properly on the crop leaves and if necessary you can turn on the lights. You can also see the temperature and humidity of the crop field sitting at home. If these benefits can be given to a farmer, it will be possible to alleviate their hardships and produce the wrong amount of crop. As a result, agriculture will play a leading role in the country's economy.

CHAPTER 2: PROJECT OVERVIEW

2.1 SYSTEM OVERVIEW

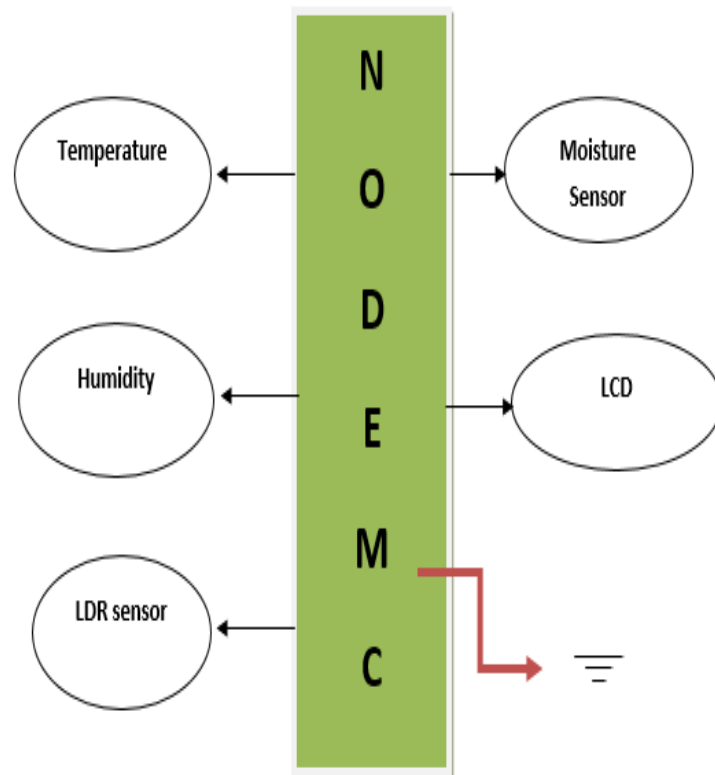


Figure [2.1.0]: Sensor Update Panel |

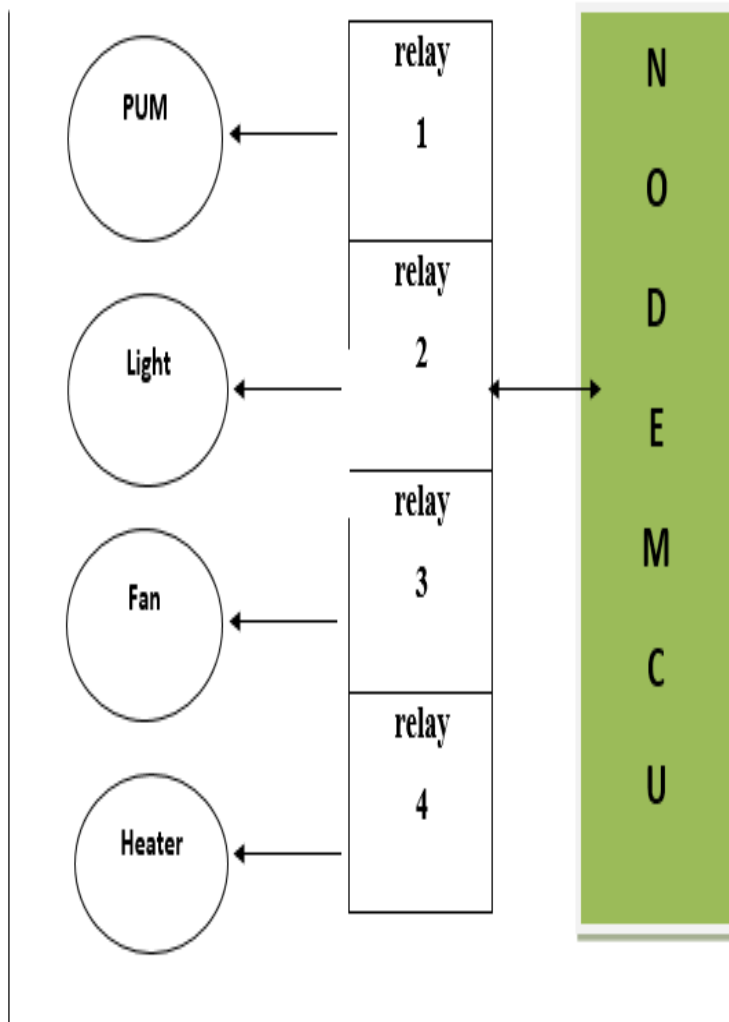


Fig. [2.1.1]: Relay control panel

2.2 REQUIRED COMPONENT

❖ List of Sensor:

Light dependent resistor (LDR Sensor)

DHT11 sensor

Moisture Sensor (Soil)

❖ NodeMCU 8266

❖ Display(LCD)

❖ Relay Module(4-channel)

❖ LIGHT

❖ Alternative and direct current source

❖ JUMPER WIRE

❖ System equipment

Cooling fan

Light

Water (H₂O) pump

Heater

2.2.1. NodeMCU

Node Microcontroller Unit is a software application and hardware which is an open-source to improve the real time environment that is boiled in a less expensive system which is referred to the ESP8266 module. NodeMCU is an open supply prototyping board. We know, it combines node and micro-controller unit.

Node+MCU= NodeMCU.

- An Arduino-like device
- With programmable built-ins
- Built in Wi-Fi
- Strength via USB
- Low fee
- Built-in integrated trouble: ESP8266

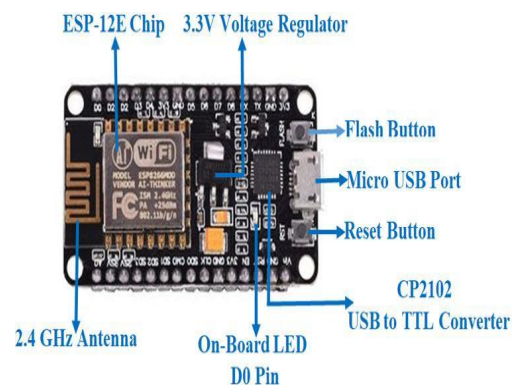


Fig. [2.2]: Block diagram of NodeMCU ESP8266

2.4 RELAY

A relay is an electrical switch which is managed by an electromagnet. We know that, an electromagnet is operating when it gates low power signal from a MC. The relay module has 3 pins.

Normally open (NO) pin

Normally closed (NC) pin

C - Common pin

The primary output of the should be less than when it is not managed. In this case, C - Common pin & NO- Normally open pins are use.

The primary output of relay should be high when it is managed. In this case, C - Common pin & NC- Normally closed pins are use.

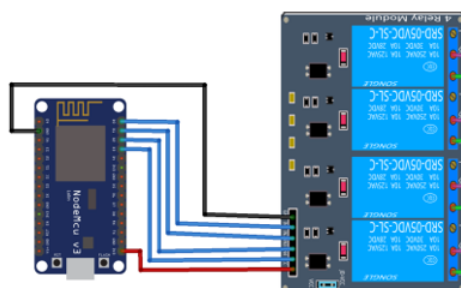


Fig. [2.4]: Relay

2.5 LCD

LCD is very popular and it used many kinds of electronic projects. it is very good for displaying information as like as sensor data from the project, and also its price is very low.

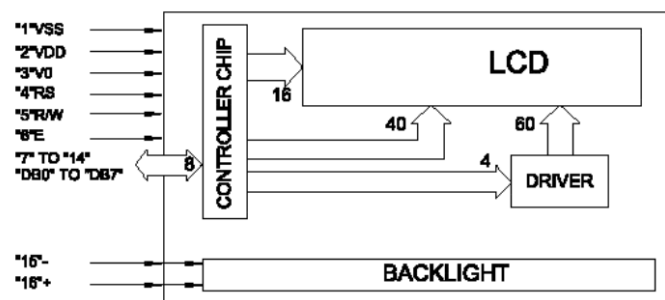


Fig. [2.5]: LCD diagram

2.6 JUMPER WIRE

we recognize that a soar wire also called jumper cable, DuPont twine is an electrical cord or employer of them in a cable with a connector or pin at each end which is commonly used to interconnect the components of a breadboard or extraordinary prototype or check circuit, internally or with different system or additives, without soldering.

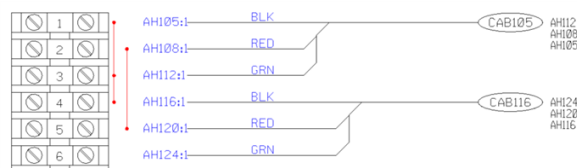


Figure [2.6]: Block diagram of Jumper wire

2.7 BREADBOARD

A breadboard is an advent base for prototyping electronics. In the beginning, the word mentioned a literal breadboard, an elegant piece of wood used for lowering bread. There are two main types of breadboards; those are solder and solderless boards. Solder boards are forums you have to solder components onto the solderless breadboard does not require soldering, it's far reusable. This makes it clean to use for growing transient prototypes and experimenting with circuit format. Because of this, solderless breadboards also are famous among university college students and in technological schooling. The breadboard or solderless breadboard is the maximum famous tool used for prototyping (constructing short digital circuits and checking out them in advance than the very last version is absolutely designed) with none want for soldering.

Breadboards are designed to artwork with through-hole digital additives. The one's additives have long metal leads which are probably designed to be inserted thru-holes in a broadcast circuit board (PCB) which may be plated with a thin copper coating, which lets in the components' outcomes be soldered to the board.

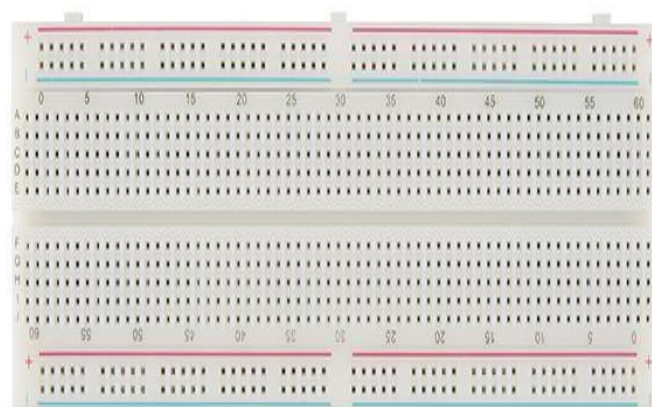


Fig. [2.7]: Breadboard diagram

CHAPTER 3: SENSORS

3.1 TEMPERATURE AND HUMIDITY SENSOR (DHT-11)

DHT11 sensor temperature and humidity measuring sensor. It is a low-cost sensor. it is one kind of sensor that provides digital single not analog signal .it is a reliable sensor and performs in on long term.it measures the temperature and humidity of our desired component.it works as an 8-bit microcontroller, containing high performance including a fast response. to measure relative humidity, it will measure the difference between two electrical cathodes by measuring electrical resistance. small size, low power consumption, which makes it very demanding. it is very easy to use but to grab data user must be careful.it will provide data simultaneously.

it data sending process is quite easy containing three steps, which are given below-

- Request.
- response.
- data reading.

request: when it gets the request it will try to accept it and do necessary things.

response: after getting the request it will give as soon as possible. as a reply.

data reading: after responding it will read the data which has collected.

As it is low power consuming it uses three to five volt and works as an input-output device. it normally uses a small amount of electric power which approximately 2.5mA. humidity reading accuracy approximately 20-80%. it has a couple of limitations. it can measure almost 0 to 50 degrees' Celsius temperature. it cannot measure nor high or low amount of temperature. moreover, it is waterproof, which is

covered by plastic housing, it will be applicable with the breadboard, jumper wire, NodeMCU, LCD, power supply. by DHT11 sensor possible to measure body temperature.



Figure [3.1]: DHT11 Temperature and Humidity Sensor

3.2 LDR

A slightly established Resistor (LDR) or a photo resistor is a tool whose resistivity is a function of the incident electromagnetic radiation. Consequently, they're light-sensitive gadgets. They may be additionally called image conductors, photograph conductive cells, or absolutely photocells. They are products of semiconductor materials having excessive resistance. There are various special symbols used to imply an LDR, one of the most usually used images is proven within the parent below. The arrow suggests light falling on it.

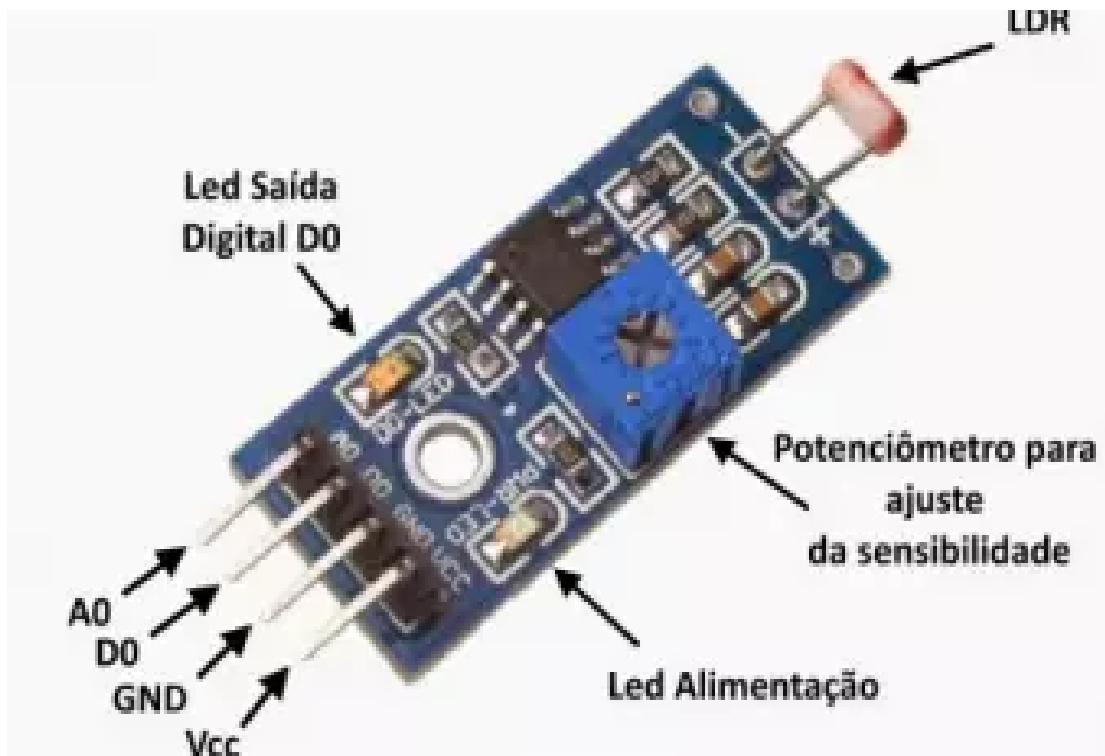


Fig. [3.2]: Light dependent resistors sensor

3.3 SOIL MOISTURE SENSOR

Soil moisture sensors degree the volumetric water content material fabric inside the soil. For the purpose that direct gravimetric size of free soil moisture requires doing away with, drying, and weighing of a pattern, soil moisture sensors measure the volumetric water content material cloth in a roundabout manner by way of the use of using some one-of-a-kind assets of the soil, together with electric powered resistance, dielectric every day, or interaction with neutrons, as a proxy for the moisture content material.

At low cost, the electrodes are located side by side and the electrically driven resistance is measured through sensors. As water is utilized by plant life or as the soil moisture decreases, water is drawn from the sensor, and resistance will increase. Conversely, as soil moisture will increase, resistance decreases. We know that, many kind of research are make use of the soil moisture sensors. likely: developing agriculture and cultivation of plants are included in the irrigation, knowing better about the weather, as well as the soil is dependent on whether that's why environmental issues are still dependent on soil moisture sensors. For the sensor needs a DC current or a battery to work. The voltage limit of the battery or DC current is less than or equal to 20 volts or more than or equal to 3.5 volts in inside. And output voltage limits $0 \leq 3$ volts.

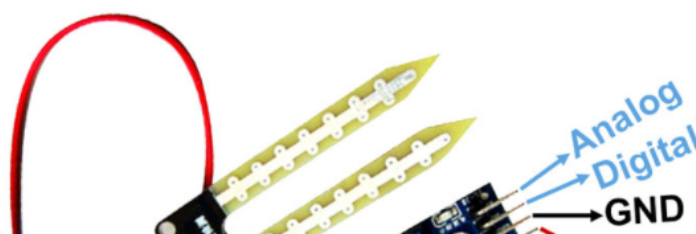


Figure [3.4.1]: Moisture Sensor

CHAPTER 4: METHODOLOGY

4.1 METHODOLOGICAL APPROACH

At first, we take two breadboards to connect with the two nodemcu using a couple of jumper wires. we use the first nodemcu to control the relay. relay is one kind of ac to dc controller. by this we control the light fan cooler pump.to control this component we use necessary code that will make the system accurate efficient. we upload this code in the nodemcu to control it.

```
if (value == 0.00)
{
    Serial.println("Light turned off");
    digitalWrite(load1, LOW);
    client.add("Light",0);
}

if (value == 1.00)
{
    Serial.println("Light turned ON");
    digitalWrite(load1, HIGH);
    client.add("Light",1);
}

if (value == 2.00)
{
    Serial.println("Fan turned off");
    digitalWrite(load2, LOW);
}

if (value == 3.00)
```

Figure [4.1.1]: code of control panel

```
if (value == 7.00)
{
    Serial.println("Pump turned ON");
    digitalWrite(load4, HIGH);
}

}

/*****
Main Functions
*****/

void setup() {
    // put your setup code here, to run once:
    client.ubidotsSetBroker("industrial.api.ubidots.com"); // Sets the broker properly for the business account
    client.setDebug(true); // Pass a true or false bool value to activate debug messages
    Serial.begin(115200);
    client.wifiConnection(WIFINAME, WIFIPASS);
    client.begin(callback);
    client.ubidotsSubscribe(DEVICE_LABEL, VARIABLE1); //Insert the dataSource and Variable's Labels
    client.ubidotsSubscribe(DEVICE_LABEL, VARIABLE2); //Insert the dataSource and Variable's Labels
    client.ubidotsSubscribe(DEVICE_LABEL, VARIABLE3); //Insert the dataSource and Variable's Labels
    client.ubidotsSubscribe(DEVICE_LABEL, VARIABLE4); //Insert the dataSource and Variable's Labels

    pinMode(load1, OUTPUT);
    pinMode(load2, OUTPUT);
    pinMode(load3, OUTPUT);
    pinMode(load4, OUTPUT);
}
```

Figure [4.1.1]: code of control panel

CONTROL UNITE

Then we connect the component like the fan light cooler pump with the relay along with dc direct current. we connect pump in the first relay, light in the second relay, fan in the third relay, cooler/heater in the fourth relay.

Pin to pin connection control panel:

Nodemcu	Relay
D1	In1
D2	In2
D3	In3
D4	In4
Vin	Vcc
GND	GND

Table 4.1: Connection nodemcu to relay

Component	Nc	Com	No
pump	-	Yes	yes
light	-	Yes	yes
fan	-	Yes	yes
Cooler/heater	-	Yes	yes

Table 4.2: Component to relay connection

Circuit diagram of controller unit

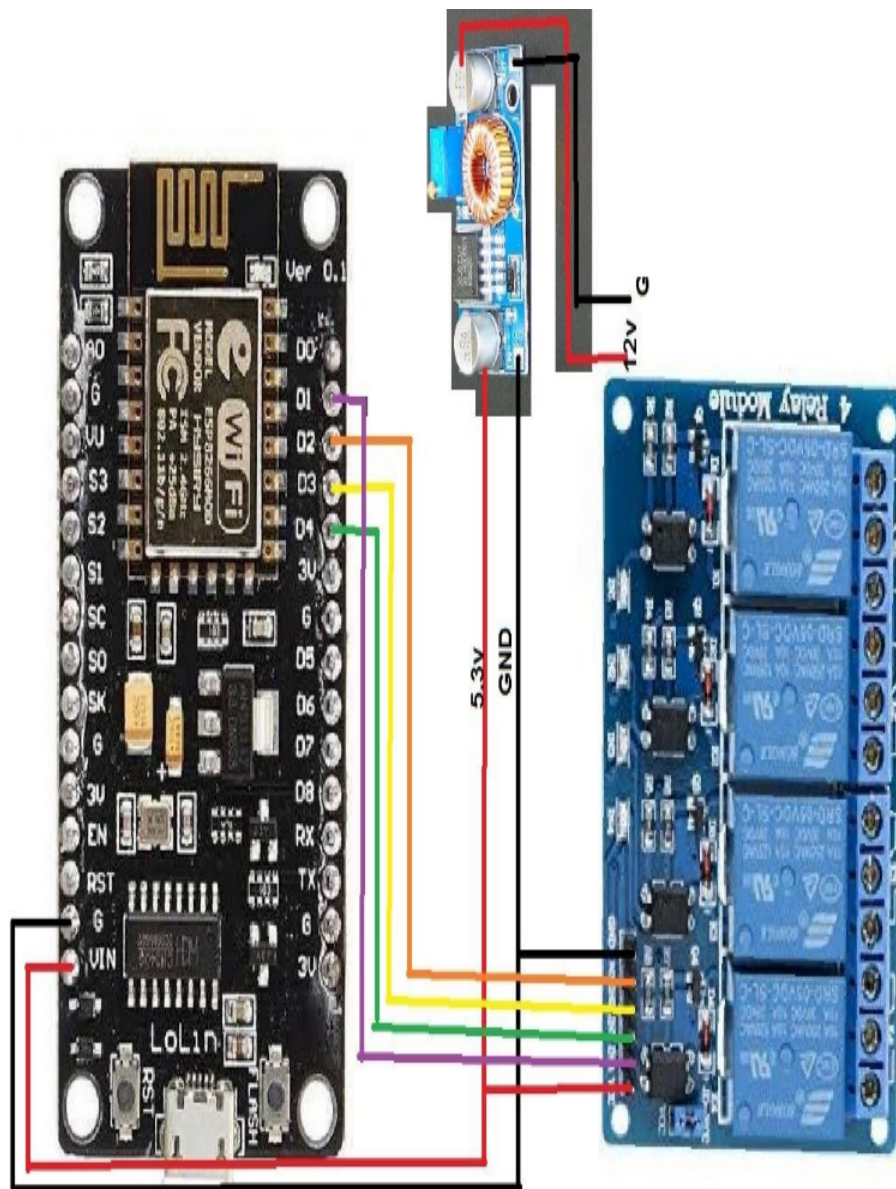


Figure [4.1.2]: Circuit diagram of controller unit

SENSOR UNITE

```
void setup(){
    Serial.begin(115200);
    dht.begin();
    delay(10);
    client.wifiConnection(WIFISSID, PASSWORD);
    pinMode(vs ,INPUT);
    pinMode(vsl ,INPUT);
    Wire.begin(2,0);
    lcd.init();
    lcd.backlight();
    lcd.home();
}

void loop(){

    if (millis() - lastMillis > 10000) { ///every 10S

        float humedad = dht.readHumidity();
        float temperatura = dht.readTemperature();
        float data      = analogRead(vs);
        float datal      = digitalRead(vsl);
        percentValue = map(data, 1023, 200, 0, 100);
        lastMillis = millis();
        client.add("humrel", humedad);
        client.add("temperature", temperatura);
        client.add("soil", percentValue);
        client.add("LDR", datal);
        client.sendAll(true);
        lcd.clear();
        |
        lcd.setCursor(0,0);
        lcd.print("H:"); lcd.print(humedad); lcd.print("% M:"); lcd.print(percentValue); lcd.print("%");
```

Figure [4.1.3]: code of sensor update

Pin to pin connection of sensor unite

Moisture sensor	nodemcu
Vcc	Vin
GND	GND
D0	A0

Table 4.3: Moisture sensor to nodemcu

DHT11	nodemcu
Vcc	Vin
GND	GND
DAT	D1

Table 4.4: Humidity sensor to nodemcu

LDR	nodemcu
Vcc	Vin
GND	GND
D0	D0

Table 4.5: LDR sensor to nodemcu

LCD to nodemcu

Lcd	nodemcu
Vcc	Vin
GND	GND
SDA	D3
SCL	D4

Table 4.6: LCD to nodemcu

Circuit diagram of sensors output unite

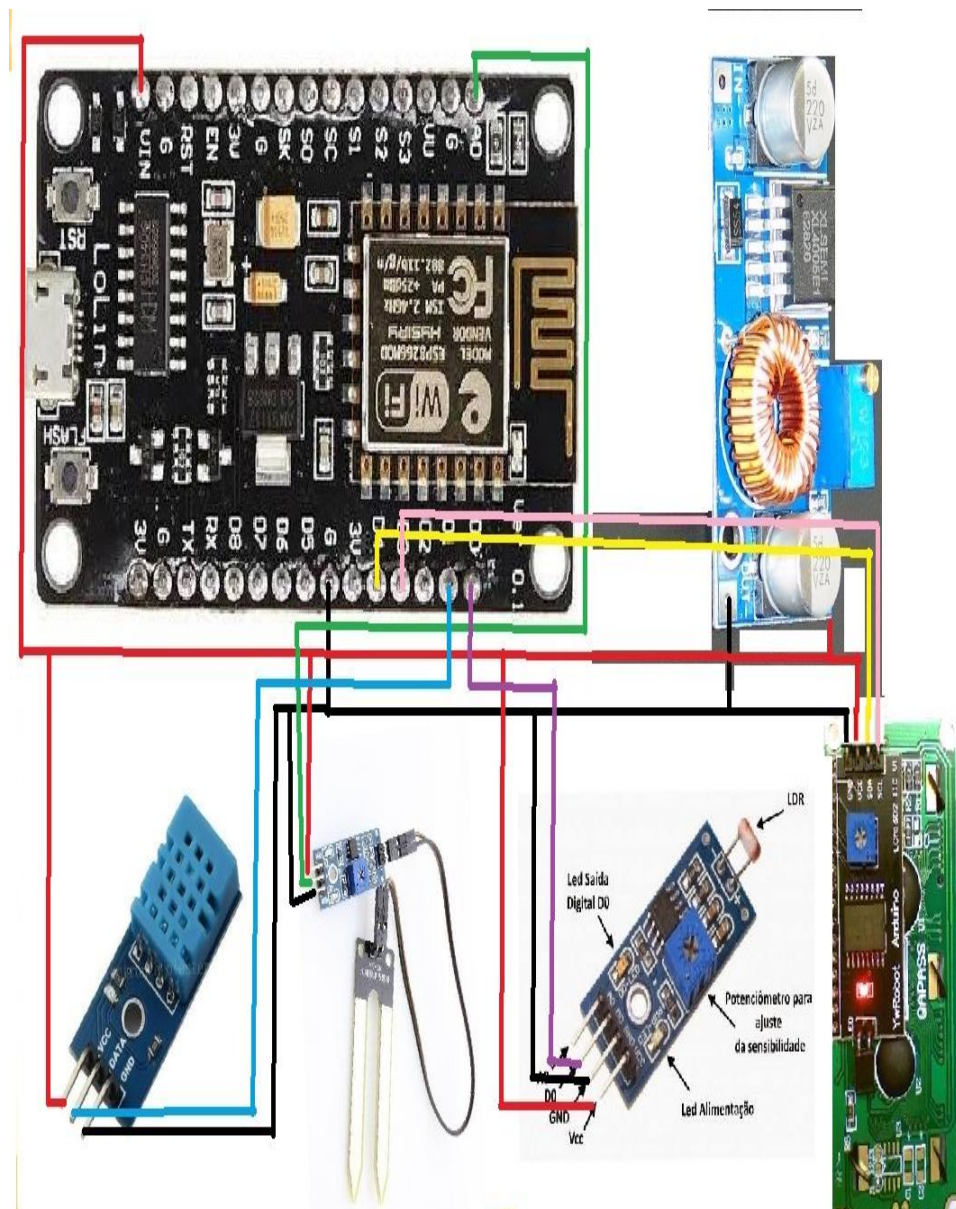


Figure [4.1.4]: sensors output unite

4.2 METHOD OF DATA COLLECTION

Manage the spinned words as you want records gathered through clever agriculture sensors, in this technique of farm control, a key factor are sensors, control systems, robotics, autonomous motors, automatic hardware, variable price era, motion detectors, button digital camera, and wearable gadgets. This information may be used to track the nation of the commercial enterprise in general in addition to staff overall performance, device efficiency. The capability to foresee the output of manufacturing allows to devise for better product distribution.

4.3METHOD OF ANALYSIS

In our system we have used temperature sensors, humidity sensors, for collecting data about the temperature and humidity by using the fan or cooler can maintain the temperature of the farm. And also we used moisture sensor. By using this sensor, we can know the soil's water level. As a result, we can take the necessary steps to solve the problem by using a water pump, heater, or light.

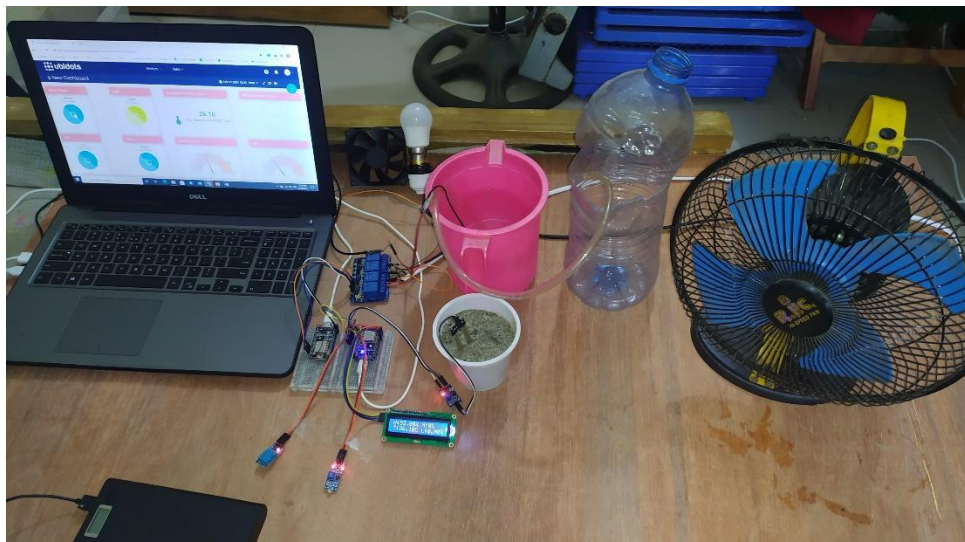


Figure [4.3.1]: Full project diagram

TEMPERATURE

When the temperature is normal, we don't need anything like don't need to turn on the light fan or cooler. At that stage, we are at our desired temperature.

But when the temperature goes high, we have to take the necessary steps to prevent the high amount of heat. We have to reduce the temperature. We fan and cooler to reduce the excessive amount of heat.

Here is the test result in the temperature sensor:

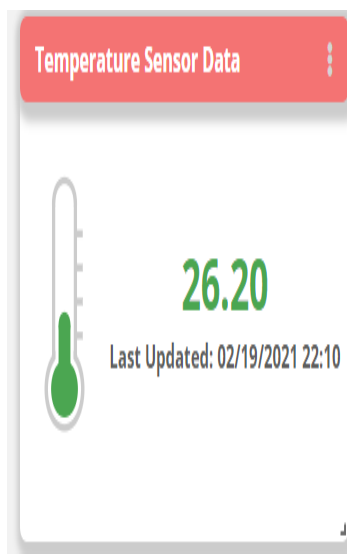


Fig [4..3.2]: Initial state



Fig [4..3.3]: Test state

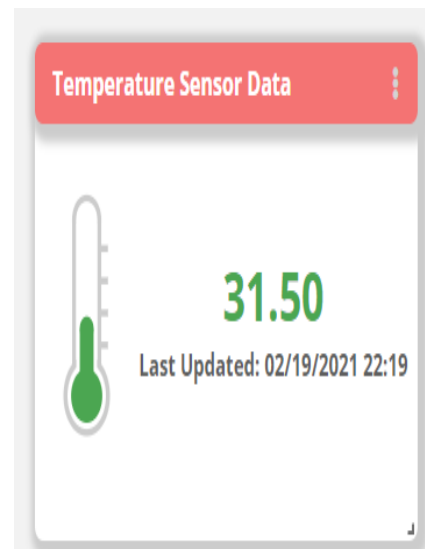


Fig [4..3.2]: Last state

HUMIDITY

Sometimes the humidity goes high, it needs to maintain from damage to the farm. If the humidity goes high will make serious damage to the farm, the tree will be damaged. we have to prevent this kind of serious problem by maintaining the humidity level.

We have light, also can use the heater to maintain the humidity level.

Here is the test result in the temperature humidity:

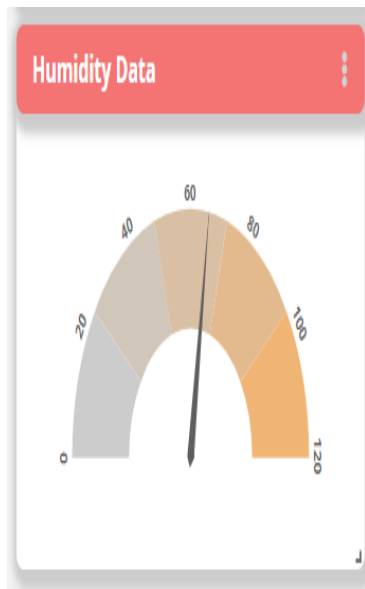


Fig [4..3.2]: Initial state



Fig [4..3.3]: Test state

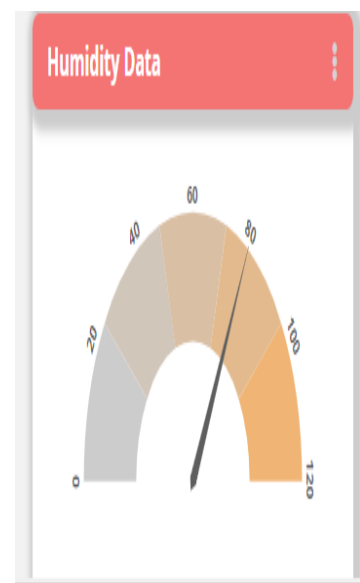


Fig [4..3.2]: Last state

MOISTURE SENSOR

Farmer faces a huge problem which is proper irrigation. They don't know about the proper way of irrigation, by the use of soil moisture sensor, we can easily know about the water level of the soil. if the water level goes low we have to give water to maintain the water level.

To maintain the water level, we have the pump. In our project, we use a pump which power level is 5w. As a result, we maintain the proper irrigation to the field. In the end, the farmer can grow good crops.

Here is the test result in the moisture sensor:

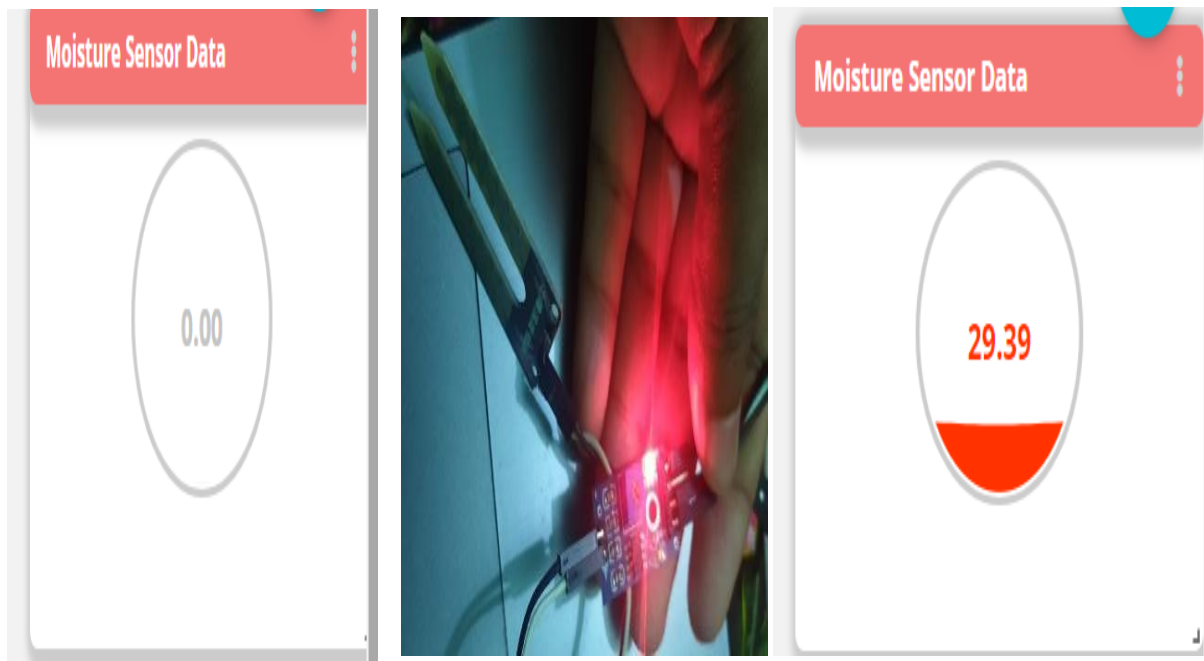


Fig [4..3.2]: Initial state

Fig [4..3.3]: Test state

Fig [4..3.2]: Last state

LDR SENSOR

Light will be essential for photosynthesis but it has a specific light range to maintain the photosynthesis. an excessive amount of light will be harmful to the plants. as a result, the plant will be hammered or get die. so it is necessary to maintain the light level.

in the fig: 1 when the LDR sensor gives the value 0, that will be a natural state of light. that means this much light will be helpful for the plants. when the plants will not get much amount of light, the percentage of photosynthesis will be decreased.

for example,

if the light level less than 0 or greater than 1 photosynthesis range will decrease.

Here is the test result in the moisture sensor:

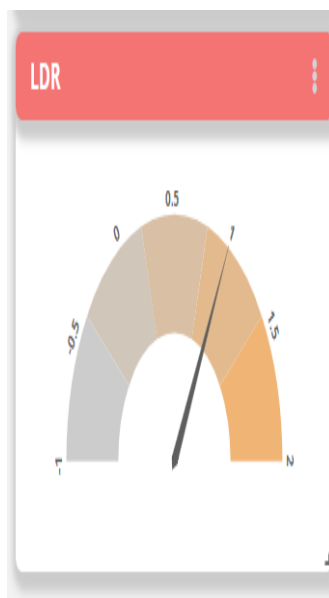


Fig [4..3.2]: Initial state

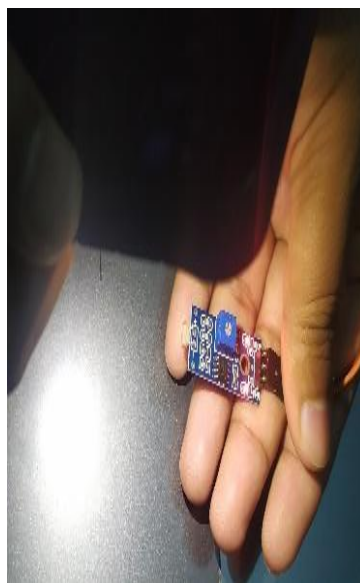


Fig [4..3.3]: Test state

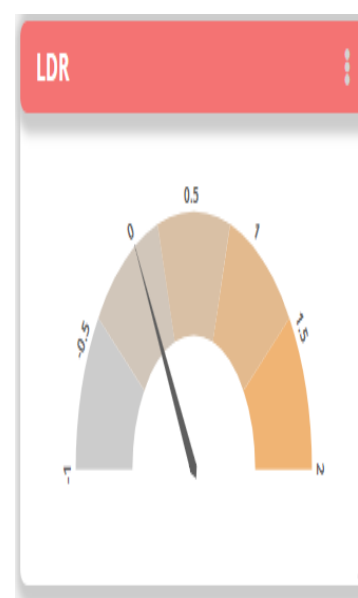


Fig [4..3.2]: Last state

CHAPTER 5: ALGORITHMS AND FLOWCHART

5.1 ALGORITHMS AND SENSOR UPDATE

STEP 1: Start the process

STEP 2: Connection between device

STEP 3: Read all sensor as input

STEP 4: Receive value to NodeMCU

STEP 5: Send data to Ubidots

STEP 6: Data store

STEP 7: Data display

STEP 8: Stop

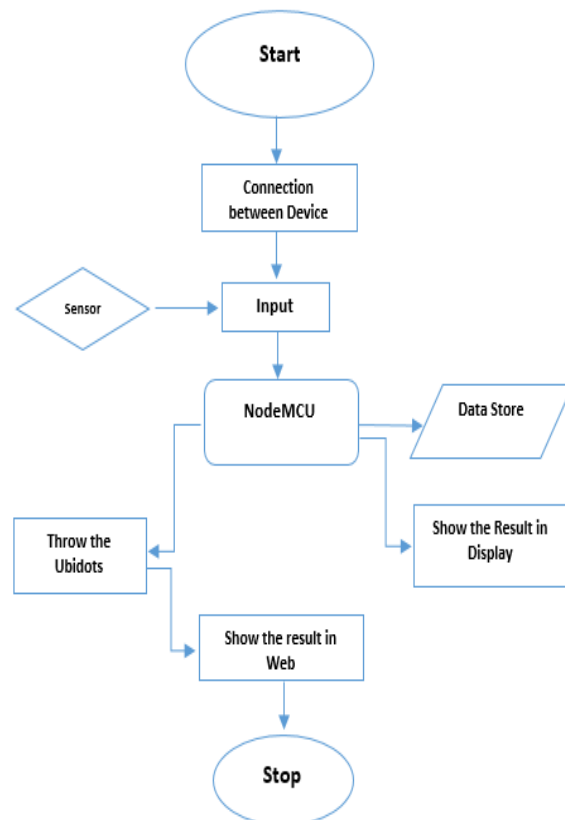


Figure [5.1.1]: Sensor update flowchart

5.2 ALGORITHMS AND CONTROLLER UNITE

STEP 1: Start the process

STEP 2: Connection between device

STEP 3: Read all command as input

STEP 4: Receive value to NodeMCU

STEP 5: Send to relay and control

STEP 6: Send data to Ubidots

STEP 7: Data store

STEP 8: Data display

STEP 9: Stop

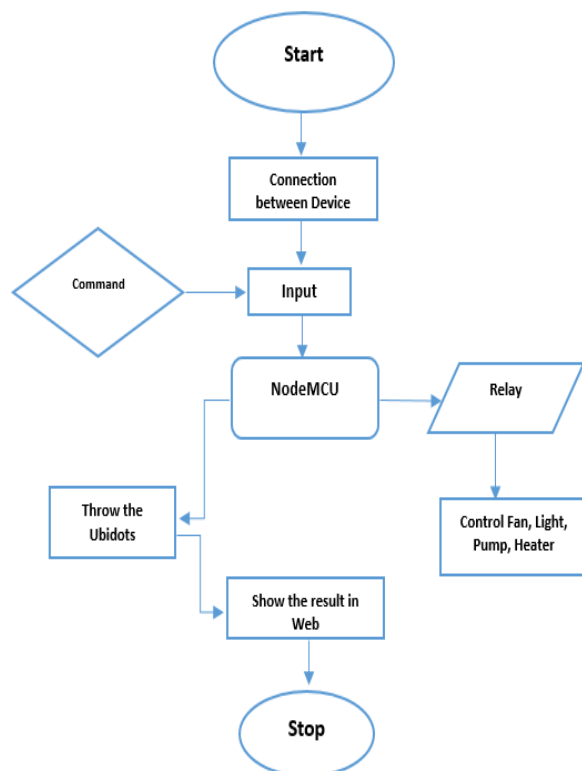


Figure [5.1.2]: Controller Unite flowchart

CONCLUSION

we assume that this type of component could be Effective for the farmer to do the smart manner of farming. with the intention to broaden the total farming zone. brings the mild of clever way of farming to the farmer. It might be used in our destiny company life. additionally, we might want to encompass that farming computerization is the destiny of places of new global.

FUTURE SCOPE

1. In the future we will develop an Android app. we will keep Bengali and English language system in the app. So that an uneducated farmer can manage and understand.
2. Considering a poor farmer, we will bring the project to the market. So that the project can be bought by a poor farmer and used for his agricultural work.
3. In the future we will add a few more sensors to this project. Such as carbon-di-oxide, CFC, carbon monoxide etc. Through which we can manage agricultural work more easily.
4. Also we will use image processing in future. And to find out if the crop has been infested by pests. As a result, the crop yield will be better and the economic condition of the country will improve.
5. In future, we will introduce updated sensor web, apps as well as GSM module to send farmer's mobile phone message system.

As a result, if there is any problem or the value of the sensor is updated, the message goes to the farmer. So that the problem of farmers constantly checking websites and apps can be handled very easily.

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