

# SMART FARMER -

## IOT ENABLED SMART FARMING APPLICATION

### FINAL CODE

```
#include <Wire.h>           //Includes the library for connections
#include <ESP32Servo.h>      //Includes the library for Servo motor
#include <LiquidCrystal_I2C.h> //Includes the library for LED
#include <DHTesp.h>         //Includes the library for DHT22 sensor

// WiFi libraries:
#include <WiFi.h>
#include <WiFiClient.h>
#include <PubSubClient.h>

#define ORG "oqy2ad" // Organization ID of IBM Cloud
#define DEVICE_TYPE "ESP32"
#define DEVICE_ID "NodeMCU"
#define TOKEN "123456789"

// Publishing Event in Watson IOT platform:
char server[] = ORG ".messaging.internetofthings.ibmcloud.com"; //
oqy2ad.messaging.internetofthings.ibmcloud.com
char pubTopic[] = "iot-2/evt/status1/fmt/json";
char subTopic[] = "iot-2/cmd/command/fmt/String";
char authMethod[] = "use-token-auth";
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;

const char *ssid = "Wokwi-GUEST";
const char *password = "";

const int led = 4;
const int servoPin = 2;
const int echo = 12;
const int trig = 14;
const int r = 27;
const int g = 26;
const int b = 25;
```

```

const int y = 33;
const int sec = 0;
const int dht = 15;
long lastMsg = 0;
Servo s;
String data3;

void callback(char *subTopic, byte *payload, unsigned int payloadLength);

#define I2C_ADDR 0x27
#define LCD_COLUMNS 20
#define LCD_LINES 4

LiquidCrystal_I2C lcd(I2C_ADDR, LCD_COLUMNS, LCD_LINES);
DHTesp dhtSensor;
WiFiClient wifiClient;
PubSubClient client(server, 1883, callback, wifiClient);

void setup()
{
    Serial.begin(115200);
    Wire.begin();
    pinMode(A0, INPUT);           // Temperature Sensor
    pinMode(trig, OUTPUT);        // Ultra sonic Trigger
    pinMode(echo, INPUT);         // Ultra sonic Echo
    pinMode(b, OUTPUT);           // BLUE light for LED
    pinMode(g, OUTPUT);           // GREEN light for LED
    pinMode(r, OUTPUT);           // RED light for LED
    pinMode(y, OUTPUT);           // YELLOW light for LED
    pinMode(led, OUTPUT);         // LED for Motor Indication
    s.attach(servoPin, 500, 2400); // Servo Motor
    lcd.init();                   // LCD Display
    lcd.setBacklight(0);
    dhtSensor.setup(dht, DHTesp::DHT22);

    Serial.println();
    // Connecting the ESP32 with WiFi:
    Serial.print("Connecting to ");
    Serial.print(ssid);
    WiFi.mode(WIFI_STA);
    WiFi.begin(ssid, password, 6);
    while (WiFi.status() != WL_CONNECTED)
    {

```

```

    delay(500);
    Serial.print(".");
}
Serial.println("");

Serial.print("WiFi connected, IP address: ");
Serial.println(WiFi.localIP());

// Connecting to IBM Cloud:
if (!client.connected())
{
    Serial.print("Reconnecting client to ");
    Serial.println(server);
    while (!client.connect(clientId, authMethod, token))
    {
        Serial.print(".");
        delay(500);
    }

    client.setCallback(callback);
    if (client.subscribe(subTopic))
    {
        Serial.println("Subscription to cmd OK");
    }
    else
    {
        Serial.println("Subscription to cmd FAILED");
    }

    Serial.println("Bluemix connected");
    Serial.println("");
}
}

float readDistanceCM()
{
    digitalWrite(trig, LOW);
    delayMicroseconds(2);
    digitalWrite(trig, HIGH);
    delayMicroseconds(10);
    digitalWrite(trig, LOW);
    int duration = pulseIn(echo, HIGH);
    return duration * 0.034 / 2;
}

```

```
}
```

```
void loop()
```

```
{
```

```
    client.loop();
```

```
    long now = millis();
```

```
    // Temperature:
```

```
    TempAndHumidity data = dhtSensor.getTempAndHumidity();
```

```
    float t = data.temperature;
```

```
    float h = data.humidity;
```

```
    Serial.println("Temperature: " + String(t) + " degrees");
```

```
    Serial.println("Moisture: " + String(h) + " %");
```

```
    // Ultrasonic sensor:
```

```
    float distance = readDistanceCM();
```

```
    Serial.print("Measured distance: ");
```

```
    Serial.println(readDistanceCM());
```

```
    // Soil Moisture:
```

```
    int soil = random(0, 100); // As there is no soil moisture sensor, random  
function is used for it.
```

```
    Serial.println("Soil Moisture: " + String(soil) + "%");
```

```
    // LCD Display:
```

```
    lcd.setBacklight(1);
```

```
    lcd.clear();
```

```
    digitalWrite(b, 0);
```

```
    digitalWrite(g, 0);
```

```
    digitalWrite(r, 0);
```

```
    digitalWrite(y, 0);
```

```
    // Conditions:
```

```
    /*If the temperature is Greater than 30 and less than 40 and also humidity or  
soil moisture is greater than 30 and
```

```
less than 70 then the GREEN light will be turned ON indicating the Normal  
condition */
```

```
    if (t > 30 & t < 40 && h > 30 & h < 70 | soil > 30 & soil < 70)
```

```
    {
```

```
        digitalWrite(g, 1);
```

```
        s.write(90);
```

```

Serial.println("Normal Condition");
Serial.println("Water Partially Flows");
lcd.setCursor(3, 1);
lcd.println("ON Motor");
delay(1000);
lcd.clear();
}

```

*/\*If the temperature is greater than 40 OR the humidity or soil moisture is less than 30, then the RED light will*

*be turned ON indicating the Hot or Low humid condition \*/*

*else if (t > 40 | h < 30 | soil < 30)*

```

{
  digitalWrite(r, 1);
  s.write(180);
  Serial.println("High Temperature or Low humid condition");
  Serial.println("Water Fully Flows");
  lcd.setCursor(3, 1);
  lcd.println("ON Motor");
  delay(1000);
  lcd.clear();
}

```

*/\*If the level of water is MORE in the field it will be indicated by distance sensor for less than*

*10cm and soil moisture is greater than 70, then the YELLOW light will be turned ON indicating the high water level \*/*

*else if (distance<10 & soil> 70)*

```

{
  digitalWrite(y, 1);
  s.write(0);
  Serial.println("Water Does Not Flow");
  Serial.println("Water is Full in the field");
  lcd.setCursor(2, 1);
  lcd.println("Drain the water");
  delay(1000);
  lcd.clear();
}

```

*/\*If the temperature is less than 30 OR the humidity or soil moisture is greater than 70, then the BLUE light will*

*be turned ON indicating the Cool or High humid condition \*/*

*else if (t<30 | h> 70 | soil > 70)*

```

{
    digitalWrite(b, 1);
    s.write(0);
    Serial.println("Cool Temperature or High Humid Condition");
    Serial.println("Water Does Not Flow");
    lcd.setCursor(3, 1);
    lcd.println("OFF Motor");
    delay(1000);
    lcd.clear();
}

```

```

else
{
    digitalWrite(b, 1);
    s.write(0);
    Serial.println("Water Does Not Flow");
}

```

*// Sending payload:*

```

Serial.println("");
if (now - lastMsg > 1000)
{
    lastMsg = now;

```

*// Payload for Parameters:*

```

String payload = "{\"Name\":" + DEVICE_ID + "\"";
payload += "\",\"Temperature\":";
payload += t;
payload += "\",\"Humidity\":";
payload += h;
payload += "\",\"Distance\":";
payload += distance;
payload += "\",\"SoilMoisture\":";
payload += soil;
payload += "\"}";
Serial.print("Sending payload: ");
Serial.println(payload);
Serial.println("");
if (client.publish(pubTopic, (char *)payload.c_str()))
{
    Serial.println("Publish ok for payload");
}
else

```

```

    {
        Serial.println("Publish failed");
    }
}
Serial.println("_____");

lcd.setCursor(1, 0);
lcd.print("Temp: ");
lcd.print(t);
lcd.print(" degree");
lcd.setCursor(1, 1);
lcd.print("Humidity: ");
lcd.print(h);
lcd.print(" %");
lcd.setCursor(1, 2);
lcd.print("Distance: ");
lcd.print(distance);
lcd.print(" cm");
lcd.setCursor(1, 3);
lcd.print("Soil Moisture: ");
lcd.print(soil);
lcd.print(" %");
delay(5000);
lcd.clear();
}

void callback(char *subTopic, byte *payload, unsigned int payloadLength)
{
    Serial.println("_____Callback!!_____");
    Serial.print("Callback invoked for topic:");
    Serial.println(subTopic);
    for (int i = 0; i < payloadLength; i++)
    {
        data3 += (char)payload[i];
    }
    Serial.println("Data:" + data3);
    if (data3 == "motoron")
    {
        Serial.println("Motor is ON");
        digitalWrite(led, 1);
    }
    else
    {

```

```
    Serial.println("Motor is Off");  
    digitalWrite(led, 0);  
}  
data3 = "";  
Serial.println("_____");  
}
```