

**SMARTFARMER- IOT ENABLED SMART FARMING APPLICATION**

**PROJECT REPORT**

**Submitted by**

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**COIMBATORE – 641 202**

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**ABSTARCT**

**ABSTRACT**

In every country agriculture is done from ages which are considered to be science and also art of cultivating plants. In day today life, technology is updating and it is also necessary to trend up agriculture too. IoT plays a key role in smart agriculture. Internets of Things (IoT) sensors are used to provide necessary information about agriculture fields. The main advantage of IoT is to monitor the agriculture by using the wireless sensor networks and collect the data from different sensors which are deployed at various no des and send by wireless protocol. By using IoT system the smart agriculture is powered by NodeMCU. It includes the humidity sensor, temperature sensor, moisture sensor and DC motor. This system starts to check the humidity and moisture level. The sensors are used to sense the level of water and if the level is below the range then the system automatically stars watering. According to the change in temperature level the sensor does its job. IoT also shows the information of humidity, moisture level by including date and time. The temperature level based on type of crops cultivated can also be adjusted.

Keywords: IoT, Soil, Moisture and Temperature sensors, Relay, Wi-Fi module ESP32 DH11, ThingSpeak.

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**CHAPTER 1**

**INTRODUCTION**

**CHAPTER 1**

**1. INTRODUCTION**

**1.1 PROJECT OVERVIEW**

IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, Temperature, humidity using some sensors. Farmers can monitor all the sensor parameters by using a web or mobile application even if the farmer is not near his field. Watering the crop is one of the important tasks for the farmers. They can make the decision whether to water the crop or postpone it by monitoring the sensor parameters and controlling the motor pumps from the mobile application itself.

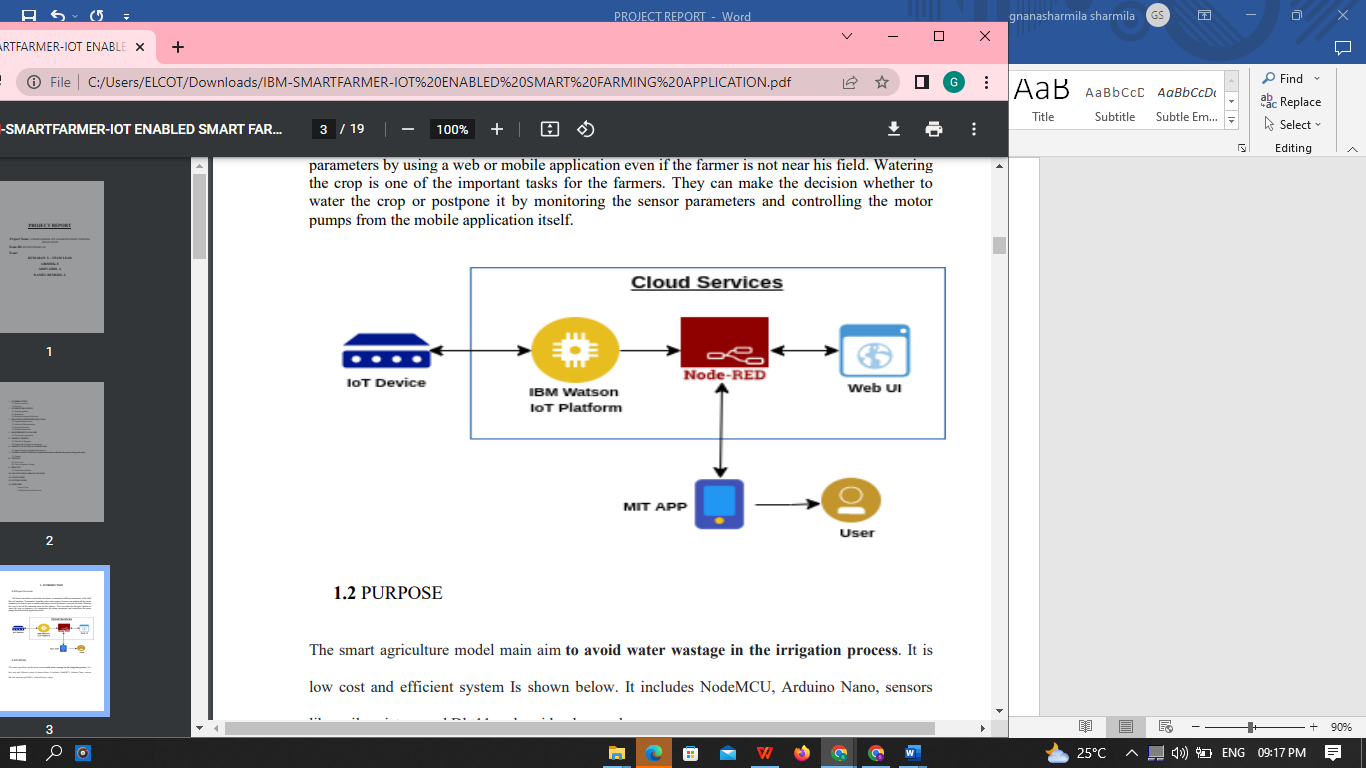
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FIGURE 1.1 PROJECT OVERVIEW

**1.2 PURPOSE**

The smart agriculture model main aim to avoid water wastage in the irrigation process. It is low cost and efficient system Is shown below. It includes Node MCU, Arduino Nano, sensors like soil moisture and Dht11, solenoid valves, relays.

**CHAPTER 2**

**IDEATION**

**CHAPTER 2**

**IDEATION**

Watering crops is the most important practice and one of the labor intensive tasks in daily farming operation. It is difficult for farmers to predict suitable quantity of water at the appropriate time.

Inefficient use of water leads to excessive water consumption dedicated to plants. Moreover, farmers sometimes cannot predict a suitable level of water consumption.

This project proposes the development of IOT enabled smart farming capable of detecting loss of moisture in soil using the soil moisture sensor. The proposed model consists of three stages: Firstly, sensing the land’s moisture levels. Second stage is the determination of its status: dry or wet. The last and third stage is Motor control.

**2.1 LITERATURE REVIEW**

An IOT Based Crop-field monitoring an irrigation automation system describes how to monitor a crop field. A system is developed by using sensors and according to the decision from a server based on sensed data, the irrigation system is automated. Through wireless transmission the sensed data is forwarded to web server database. If the irrigation is automated then the moisture and temperature fields are decreased below the potential range. The user can monitor and control the system remotely with the help of application which provides a web interface to user [1].

By smart Agriculture monitoring system and one of the oldest ways in agriculture is the manual method of checking the parameters. In this method farmers by themselves verify all the parameter and calculate the reading [2].

The system focuses on developing devices and tool to manage, display and alert the users using the advantages of a wireless sensor network system. It aims at making agriculture smart using automation and IoT technologies [3].

The cloud computing devices are used at the end of the system that can create a whole computing system from sensors to tools that observe data from agriculture field. It proposes a novel methodology for smart farming by including a smart sensing system and smart irrigator system through wireless communication technology [4].

This system is cheap at cost for installation. Here one can access and also control the agriculture system in laptop, cell phone or a computer [5].

**2.2 EXISTING PRODUCT**

The challenges of a smart agriculture system include the integration of these sensors and tying the sensor data to the analytics driving automation and response activities.

When integrated, the use of data analytics can reduce the overall cost of agriculture and contribute to higher production from the same amount of area through precise control of water, fertilizer and light. Smart methods allow for farming on smaller and more distributed lands through remote monitoring, whether indoor or outdoor.

To successfully deploy a smart agriculture system, consider setting up a communications network that can integrate a limited number of sensors across a large area of farmland.

This will require third-party network provisioning or setting up a private network consisting of access points and uplinks to a private backhaul network, which channels all the data traffic to centralized monitoring software or an analytics head-end system.

• It is not a secure system.

• There is no motion detection for protection of agriculture field.

• Automation is not available.

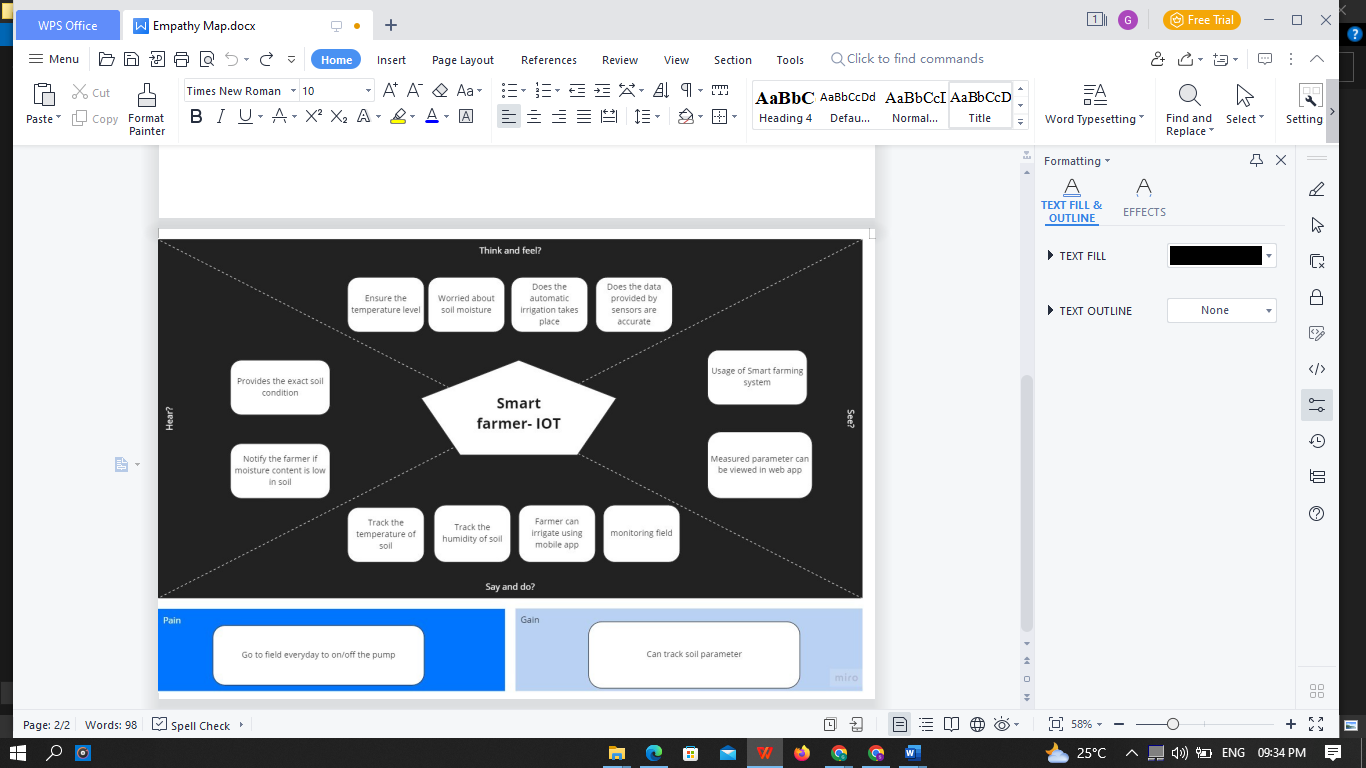
**2.3 PROBLEM STATEMENT**

The soil moisture sensor measures wetness content in the soil. The Arduino UNO microcontroller used to receive input from a various sensors and it can be controlled automatically.

When soil moisture sensor goes low the water pump will be on and it exceeds defined levels of the water motor will turn off automatically. We can constantly monitor the growth of a crop using ultrasonic sensor.

PIR sensor detects the motion or unusual movement in the agricultural land. This device his very helpful to the former to monitor and control environmental parameters at their field. The farmers did not go to their field, they can remotely monitor and control using cloud.

**2.4 EMAPATHY MAP**



2.1 EMPATHY MAP

**2.5 IDEATION & BRAINSTORMING**

Introduction on Internet of Things (IoT), application of IoT in agricultural field to improve the yield and quality by reducing the cost is provided. The sensors which are used in the architecture are discussed briefly and the process of transmission of data from the agriculture field to the central system is explained. The proposed system advantages are included. In addition, open research issues, challenges, and future of IoT in agricultural field are highlighted. The concept is basically developed on an idea, where there are numerous things or objects - such as Arduino, sensors, GSM models, LCD display, etc., that are connected with the Internet. Each of the objects has a different address and is able to interact with other items. The things or objects co-operate with each other to reach a common goal.

We are going to construct a smart agricultural monitoring system which can collect crucial agricultural data and send it to an IoT platform called Thingspeak in real time where the data can be logged and analyzed. The logged data on Thingspeak is in graphical format, a botanist or a reasonably knowledged farmer can analyze the data (from anywhere in the world) to make sensible changes in the supplied resources (to crops) to obtain high quality yield.

**CHAPTER 3**

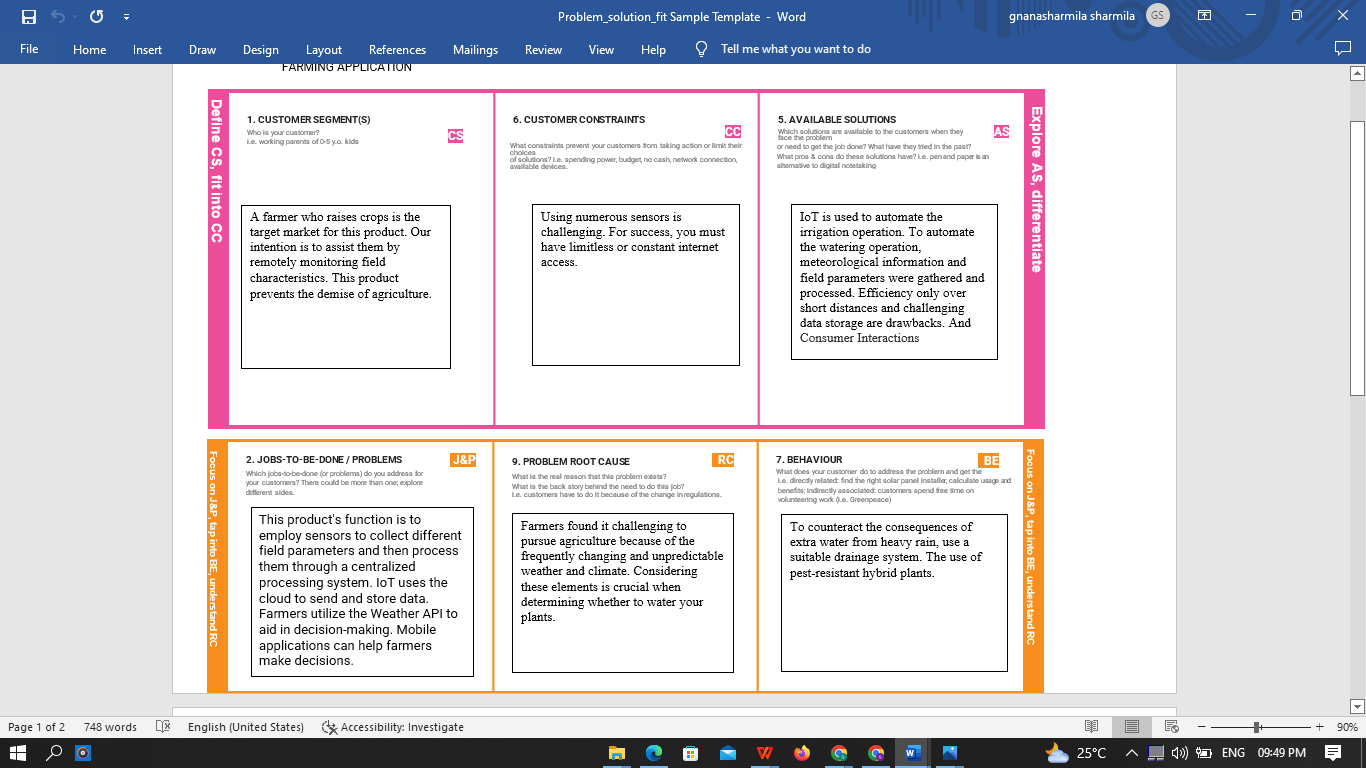
**PROPOSED SOLUTION**

**CHAPTER 3**

**PROPOSED SOLUTION**

|  |  |  |
| --- | --- | --- |
| **S.No.** | **Parameter** | **Description** |
|  | Problem Statement (Problem to be solved) | * Farmers must wait on the field until the water completely covers the soil before they can irrigate the area whole farm field. * Lack of Information, High Adoption, Cost, Security Concerns, etc. are the Biggest Challenges for IoT in the Agricultural Sector. |
| 2. | Idea / Solution description | * The Data collected by sensors, In terms of humidity, temperature, moisture, and dew detections help in determining the weather pattern in Farms. So cultivation is done for suitable crops. * Similar to precision agriculture, smart farming techniques let farmers keep better track of their crops and maintain the appropriate humidity levels. |
| 3. | Novelty / Uniqueness | * It helps the farmer to operate the motor from anywhere. |
| 4. | Social Impact / Customer Satisfaction | * It saves a lot of time, lowers the salaries paid to farm labourers, and can strengthen customer connections by improving the consumer experience overall. |
| 5. | Business Model (Revenue Model) | * Based on user requirements |
| 6. | Scalability of the Solution | * To increase the capacity, for example, the number of technology devices such as sensors and actuators, while enabling timely analysis. |

**3.1 PROBLEM SOLUTION FIT**



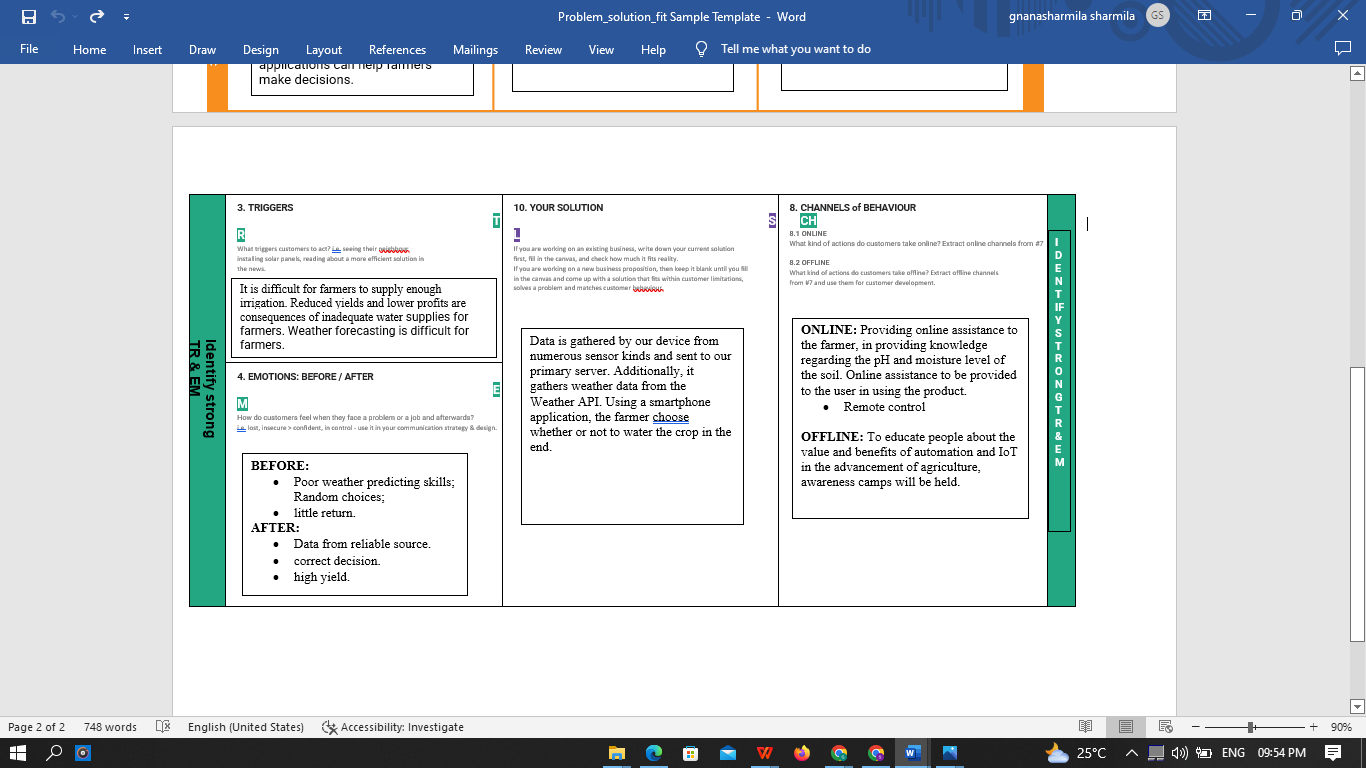


FIGURE 3.1 PROBLEM SOLUTION FIT TABLE

**3.2 PROBLEM ARCHITECURE**

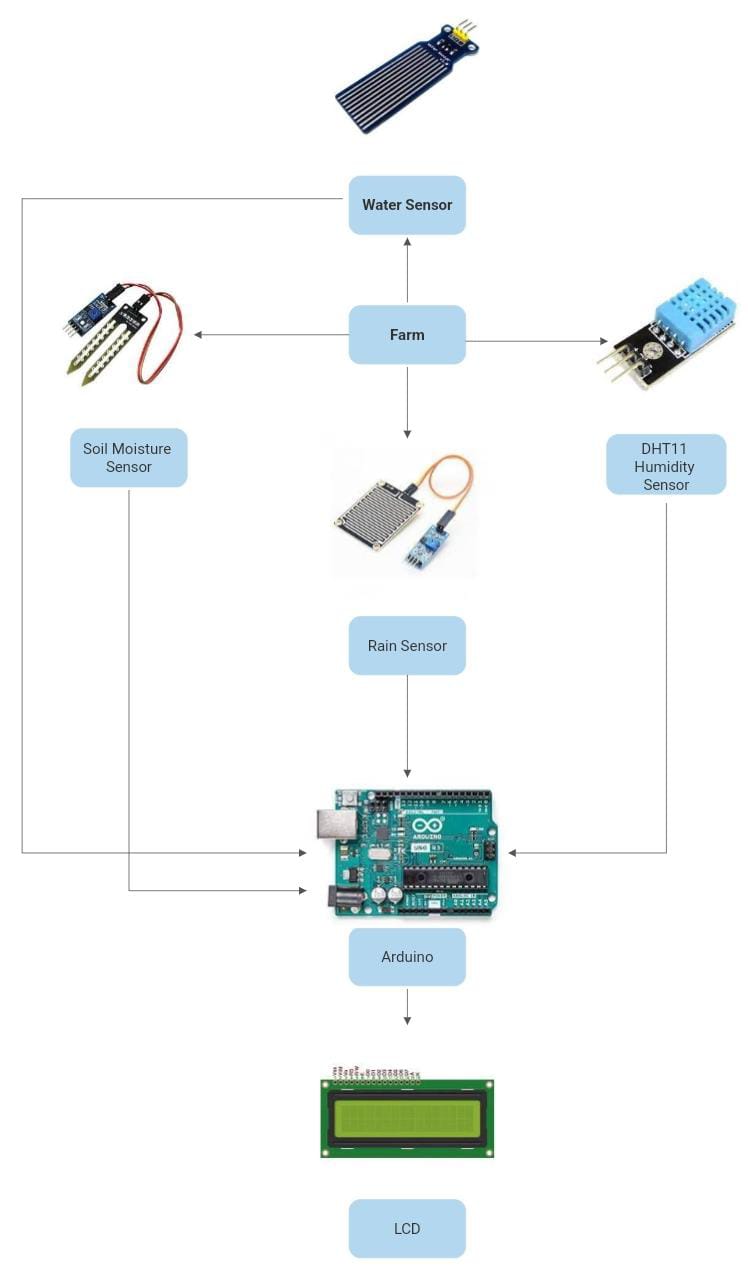


FIGURE 3.2 PROBLEM ARCHITECURE DIAGRAM

**CHAPTER 4**

**REQUIREMENT ANALYSIS**

**CHAPTER 4**

**REQUIREMENT ANALYSIS**

**4.1 FUNCTIONAL REQUIREMENT**

|  |  |  |
| --- | --- | --- |
| **FR No.** | **Functional Requirement (Epic)** | **Sub Requirement (Story / Sub-Task)** |
| FR-1 | User Registration | * Registration through Form * Registration through Gmail * Registration through LinkedIN |
| FR-2 | User Confirmation | * Confirmation via Email * Confirmation via OTP |
| FR-3 | Activate the system. | * Check Credentials Check * Roles of Access. |
| FR-4 | Manage Modules | * User permission. * Manage system admin * Manage User Roles |
| FR-5 | Check whether details | * Temperature details * Humidity details |
| FR-6 | Log out or sign out | * Exit |

FIGURE 4.1 FUNCTIONAL REQUIREMENT TABLE

**CHAPTER 5**

**PROJECT DESIGN**

**CHAPTER 5**

**PROJECT DESIGN**

**5.1 CUSTOMER JOURNEY**

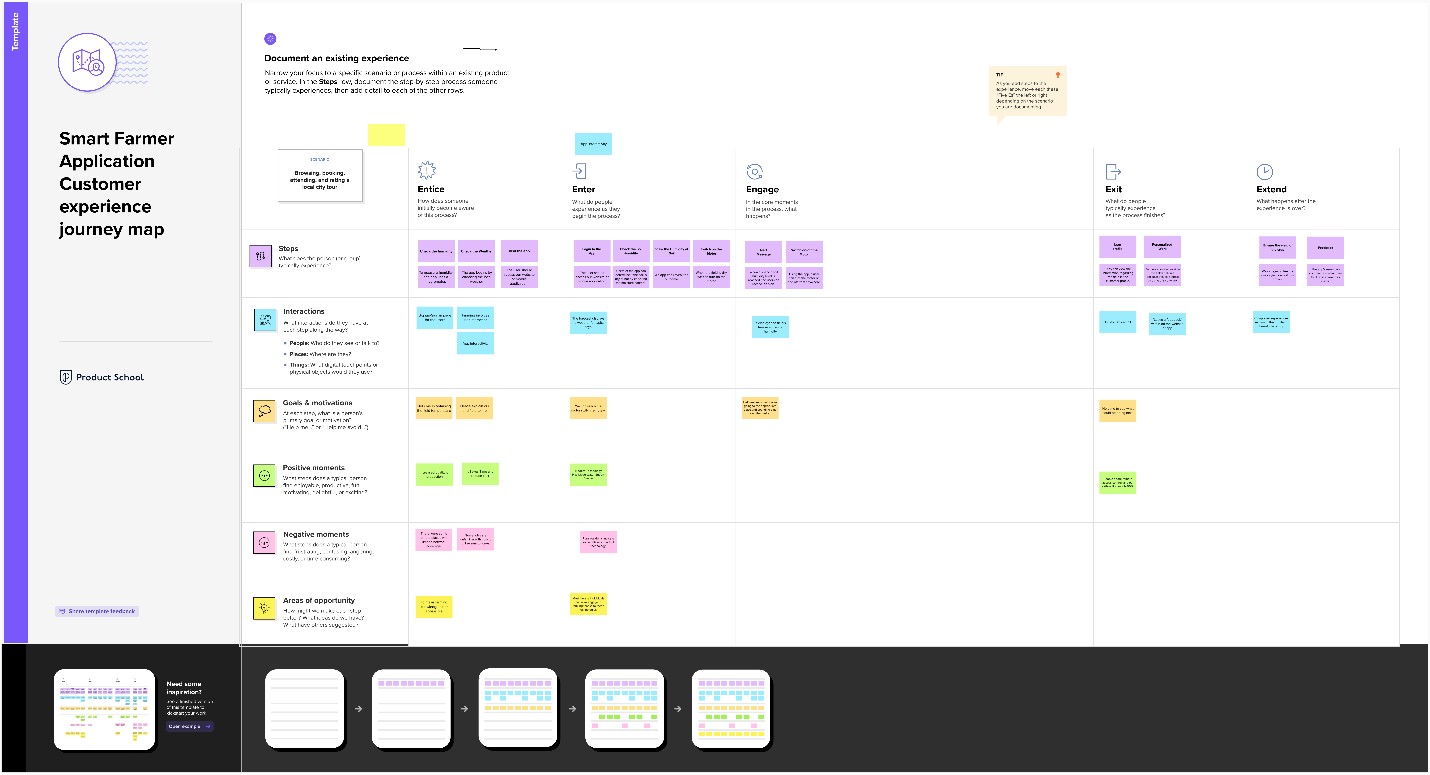


FIGURE 5.1 CUSTOMER JOURNEY MAP

**5.2 DATA FLOW DIAGRAM**

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

• The different soil parameters temperature, soil moistures and then humidity are sensed using different sensors and obtained value is stored in the IBM cloud.

• Arduino UNO is used as a processing Unit that process the data obtained from the sensors and whether data from the weather API.

• NODE-RED is used as a programming tool to write the hardware, software, and APIs. The MQTT protocol is followed for the communication.

• All the collected data are provided to the user through a mobile application that was developed using the MIT app inventor. The user could plan through an app, weather to water the crop or not depending upon the sensor values. By using the app they can remotely operate to the motor switch.

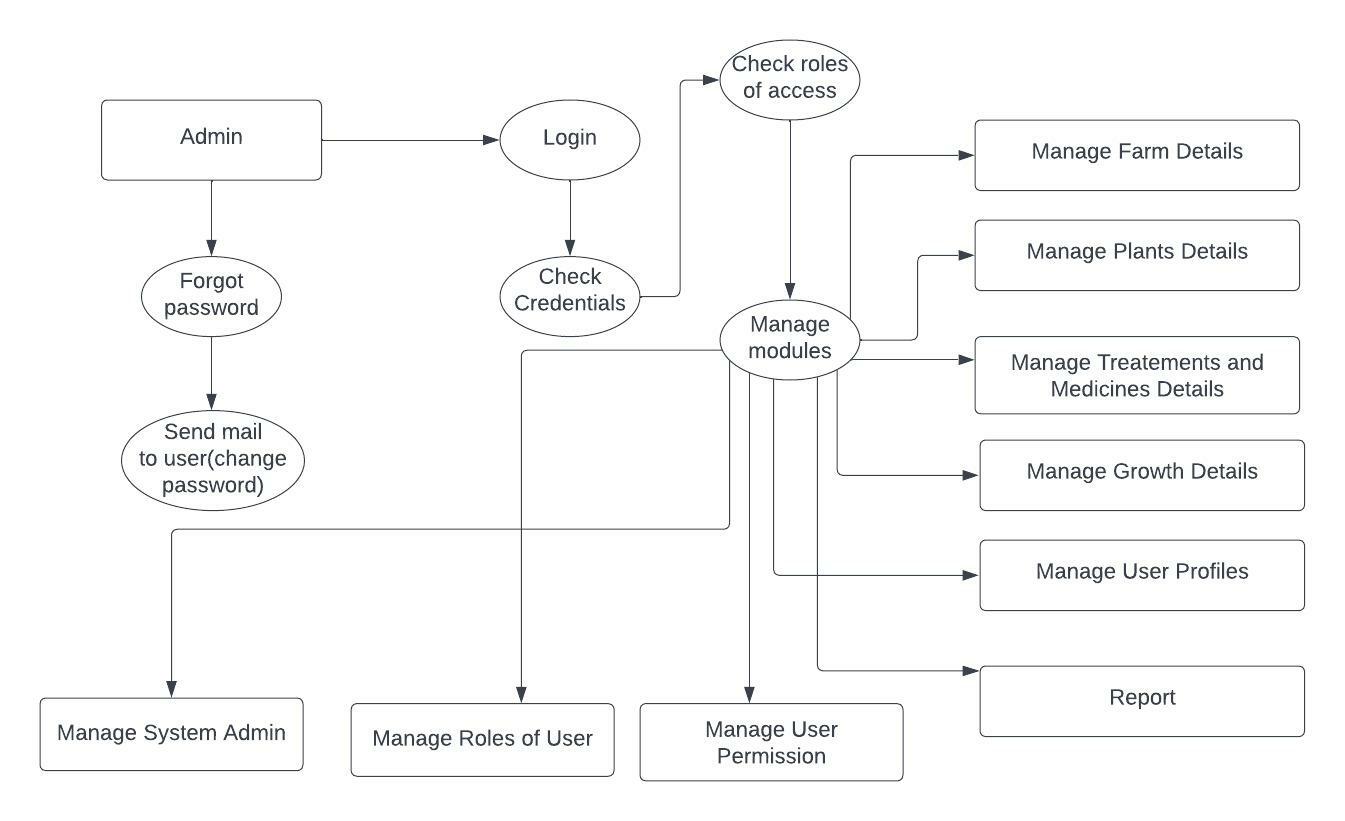


FIGURE 5.2 DATA FLOW DIAGRAM

**5.3 TECHNICAL ARCHITECURE**

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2 Guidelines:

• The different soil parameters temperature, soil moistures and then humidity are sensed using different sensors and obtained value is stored in the IBM cloud.

• Arduino UNO is used as a processing Unit that process the data obtained from the sensors and whether data from the weather API.

• NODE-RED is used as a programming tool to write the hardware, software, and APIs. The MQTT protocol is followed for the communication.

• All the collected data are provided to the user through a mobile application that was developed using the MIT app inventor. The user could decide through an app, weather to water the crop or not depending upon the sensor values. By using the app, they can remotely operate the motor switch.

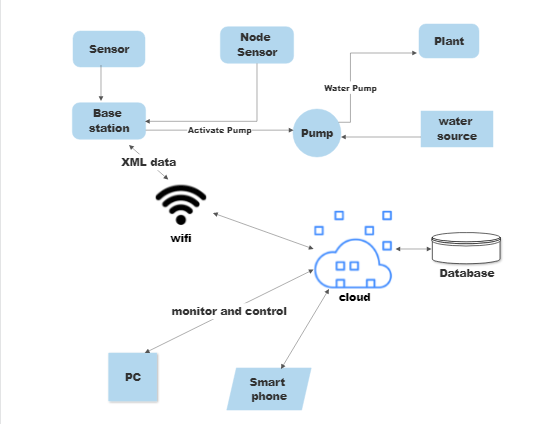


FIGURE 5.3 TECHNICAL ARCHITECURE DIAGRAM

**CHAPTER 6**

**PROJECT PLANNING & SCHEDULINGCHAPTER 6**

**CHAPTER 6**

**PROJECT PLANNING & SCHEDULING**

**6.1 SPRINT DELIVERY PLAN**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sprint** | **Functional Requirement (Epic)** | **User Story Number** | **User**  **Story/Task** | **Story Points** | **Priority** | **Team**  **Member** |
| **Sprint-1** | Registration  (Farmer Mobile User) | UNS-1 | As a user, I can register for the application by entering my email, password, and confirming my  password. | 2 | High | N.Sriram(Leader) |
| **Sprint-1** | Login | UNS-2 | As a user, I will receive confirmation email once I have registered  For the application | 1 | High | N.Sriram(Leader) |
| **Sprint-1** | Registration (Farmer Mobile User) | UNS-1 | As a user, I can register for the application by entering my email, password, and confirming my  password. | 2 | High | T.Gnanasharmila |
| **Sprint-1** | Login | UNS-2 | As a user, I will receive confirmation email once I have registered  for the application | 1 | High | Dhananjayan Balu |
| **Sprint-2** | User Interface | UNS-3 | As a user, I can register for the application through facebook | 3 | Low | Arivananthan.AS |
| **Sprint-1** | Data Visualization | UNS-4 | As a user, I can register  for the application through GMAIL | 2 | Medium | Dhananjayan Balu |
| **Sprint-3** | Registration (Farmer -Web User) | USN - 1 | As a user, I can log into the application by entering email and  password | 3 | High | T.Gnanasharmila |
| **Sprint - 2** | Login | USN - 2 | As a registered user, I need to easily login log into my registered account via the web page in minimum time | 3 | High | N.Sriram(Leader) |
| **Sprint - 4** | Web UI | USN - 3 | As a user, I need to have a friendly user interface to easily view and access the resources | 3 | Medium | T.Gnanasharmila |
| **Sprint - 1** | Registration (Chemical Manufacturer - Web user) | USN - 1 | As a new user, I want to first register using my organization email and create a password for  the account. | 2 | High | Arivananthan.AS |
| **Sprint - 4** | Login | USN - 2 | As a registered user, I need to easily log in using the registered account via the web  page. | 3 | High | Dhananjayan Balu |
| **Sprint - 3** | Web UI | USN - 3 | As a user, I need to have a user friendly interface to easily view and access the resources. | 3 | Medium | Arivananthan.AS |
| **Sprint - 1** | Registration (Mobile User) | USN - 1 | As a user, I want to first register using my email and create a password  for the account. | 1 | High | Dhananjayan Balu |
| **Sprint - 1** | Login | USN - 2 | As a registered user, I  need to easily log in to the application. | 2 | Low | N.Sriram(Leader) |

FIGURE 6.1 SPRINT DELIVERY PLAN TABLE

**CHAPTER 7**

**CODING & SOLUTIONING**

**CHAPTER 7**

**CODING & SOLUTIONING**

**7.1 FEATURES**

import wiotp.sdk.device

import time

import os

import datetime

import random

myConfig = {

"identity": {

"orgId": "0ooi4r",

"typeId": "Device0",

"deviceId": "262605"

},

"auth": {

"token": "098765432"

}

}

client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)

client.connect()

def myCommandCallback(cmd):

print("Message received from IBM IOT platform: %s" % cmd.data['command'])

m=cmd.data['command']

if(m=="motoron"):

print("Motor is switched on")

elif(m=="motoroff"):

print("Motor is switched off")

print(" ")

while True:

soil=ramdom.randint(0,100)

temp=ramdom.randint(-20,125)

hum=ramdom.randint(0,100)

myData={'soil moisture': soil, 'temperature':temp, 'humidity':hum}

clint.publishEvent(eventId="status", msgFormat="json",data=myData, qos=0,onPublish=None)

print("Published data Successfully: %s", myData)

time.sleep(2)

client.commandCallback = myCommandCallback

client.disconnect()

**CHAPTER 8**

**TESTING**

**CHAPTER 8**

**TESTING**

**8.1 TEST CASES**

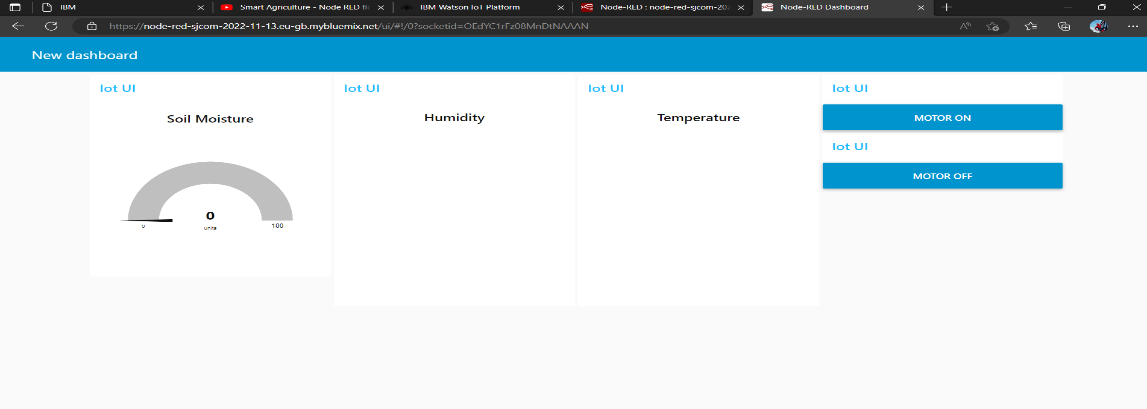


FIGURE 8.1 TEST CASE

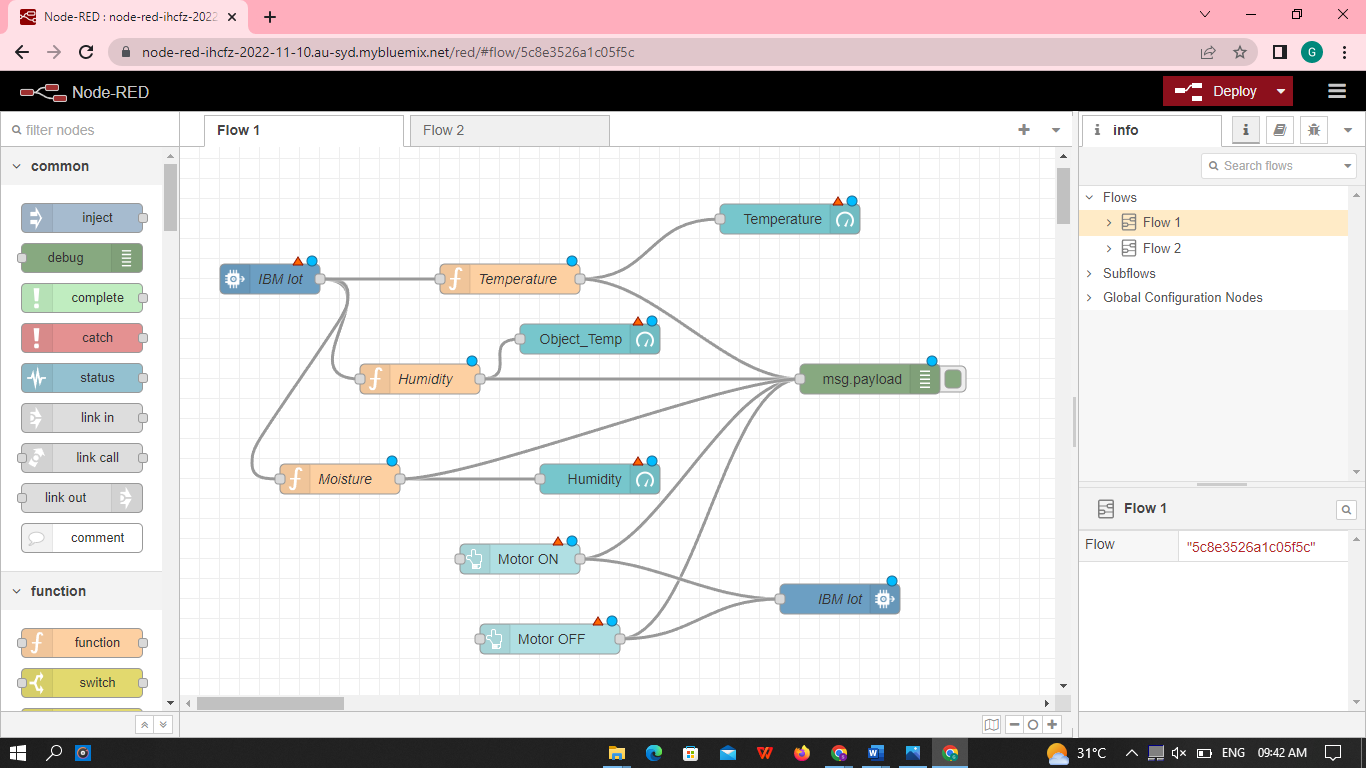
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FIGURE 8.2 NODE-RED USING FLOW DIAGRAM 1

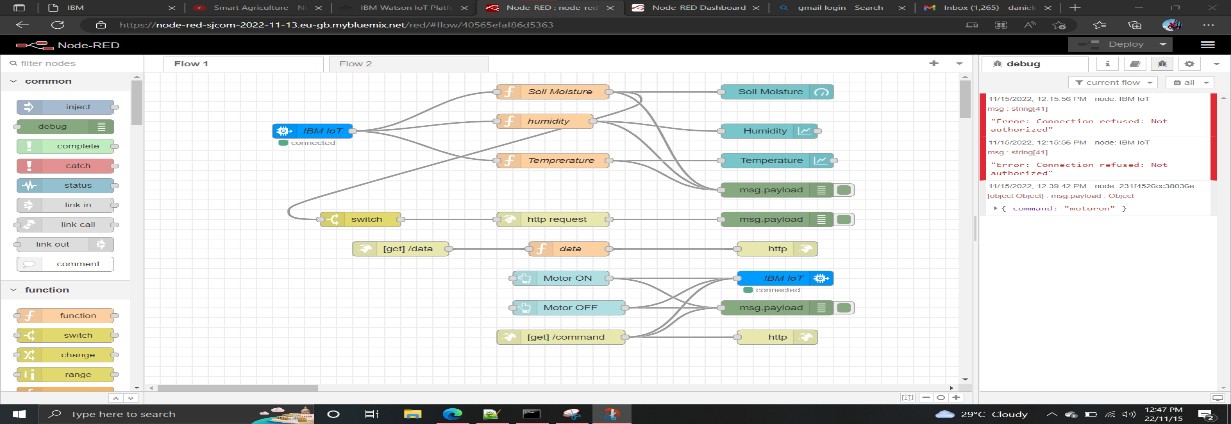


FIGURE 8.3 NODE RED USING FLOW DIAGRAM 2

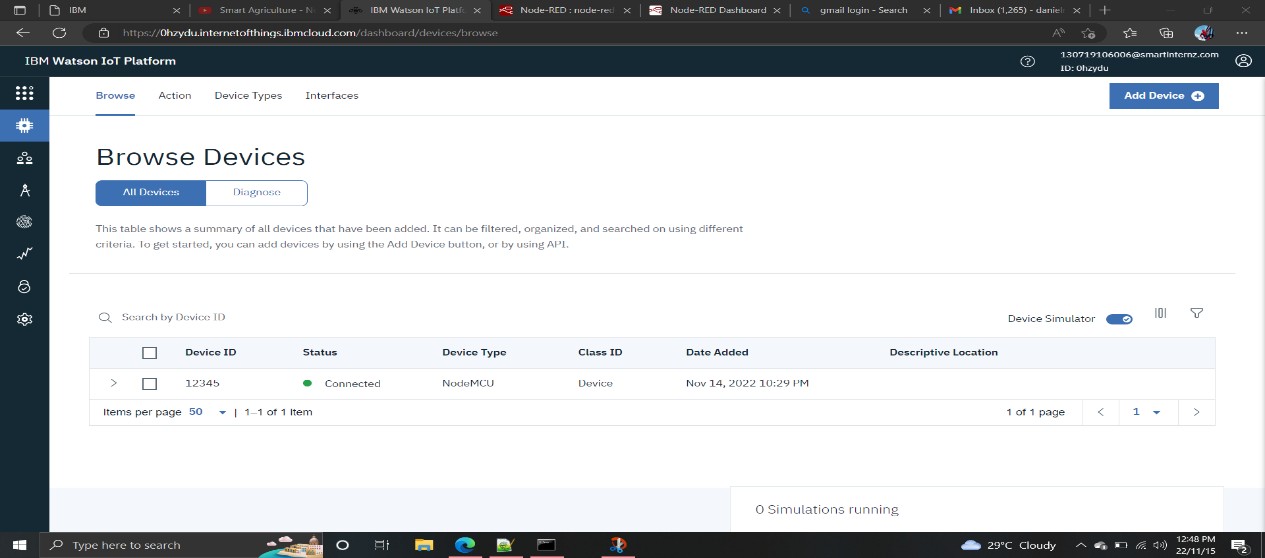


FIGURE 8.4 IOT WASTON CONNECTED-TEST

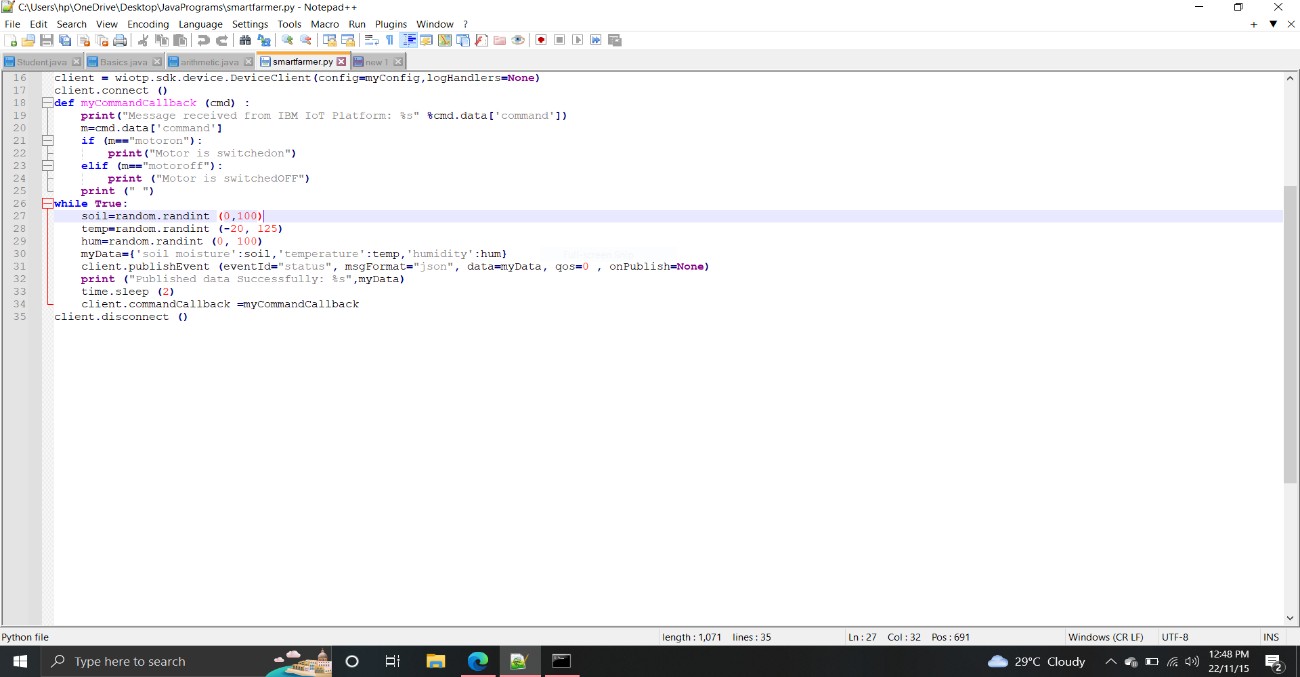


FIGURE 8.5 CODING TSET CASE

**8.2 USER ACCEPTANCE TESTING**

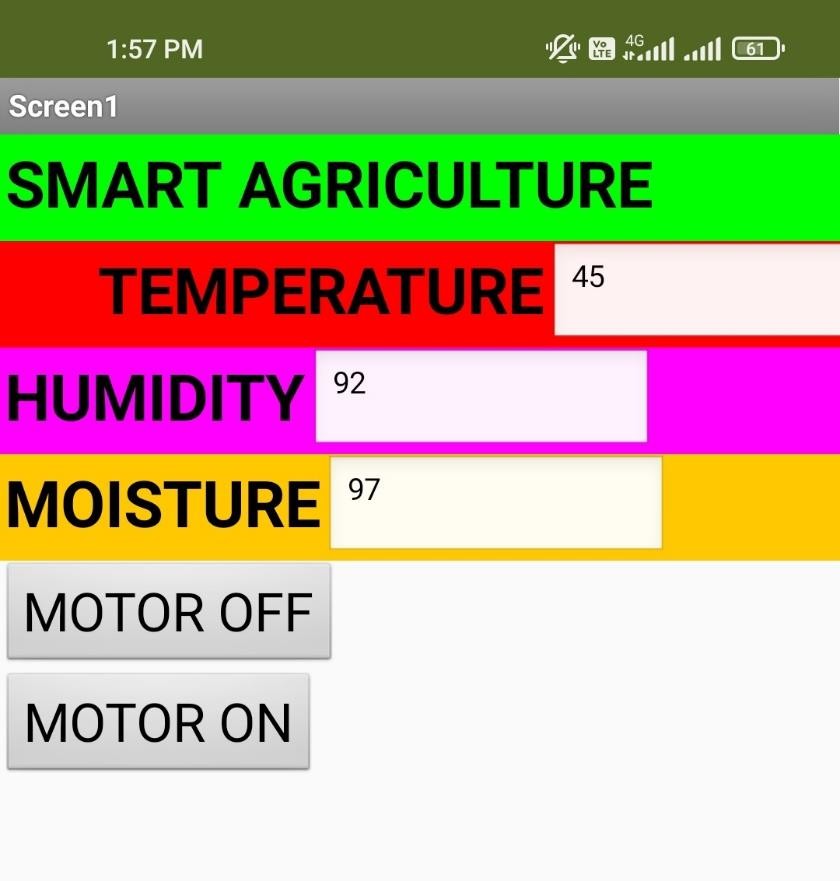
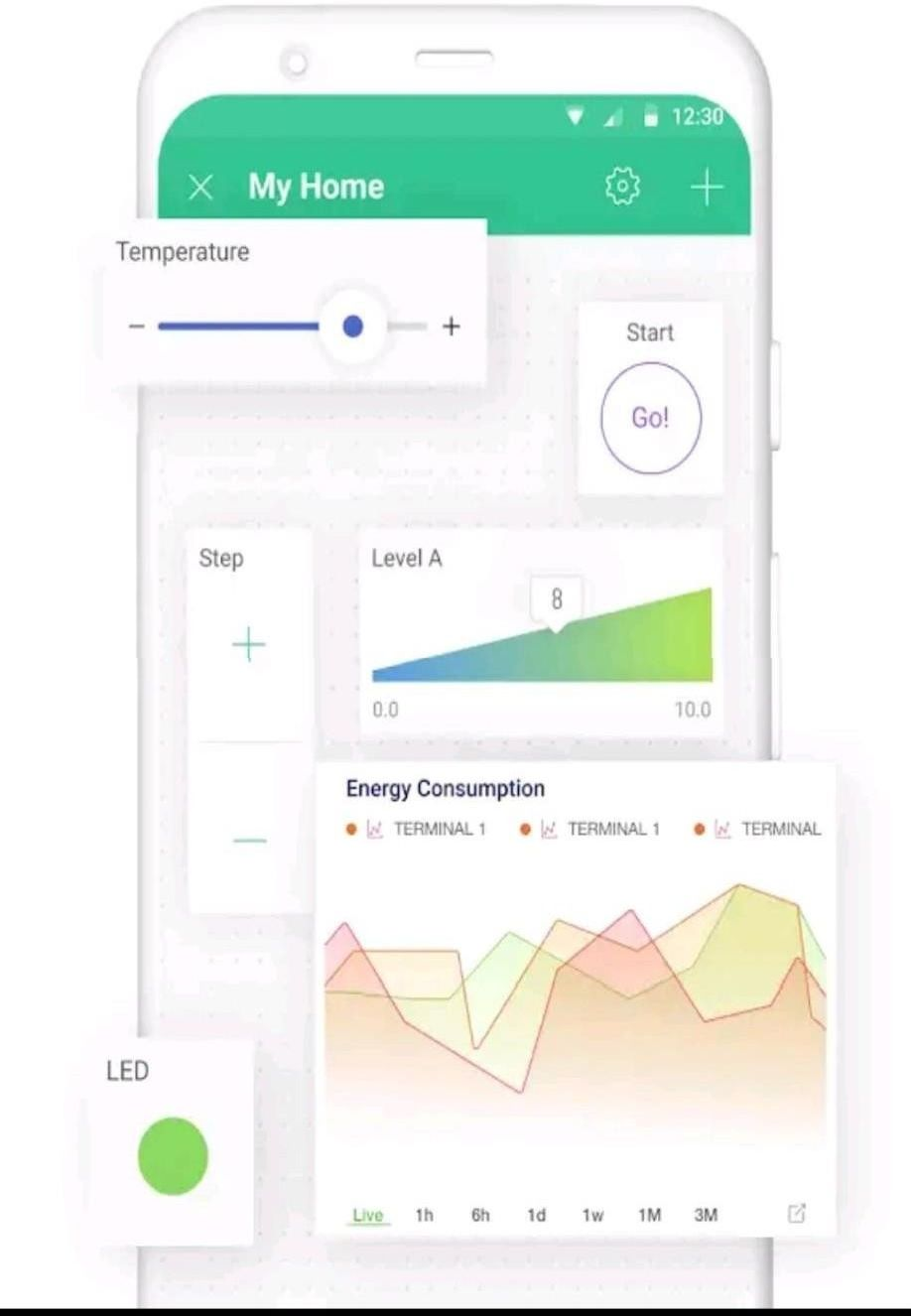


FIGURE 8.6 USER ACCEPTANCE TESTING



**CHAPTER 9**

**RESULTS**

**CHAPTER 9**

**RESULTS**

**9.1 PERFORMANCE METRICS**

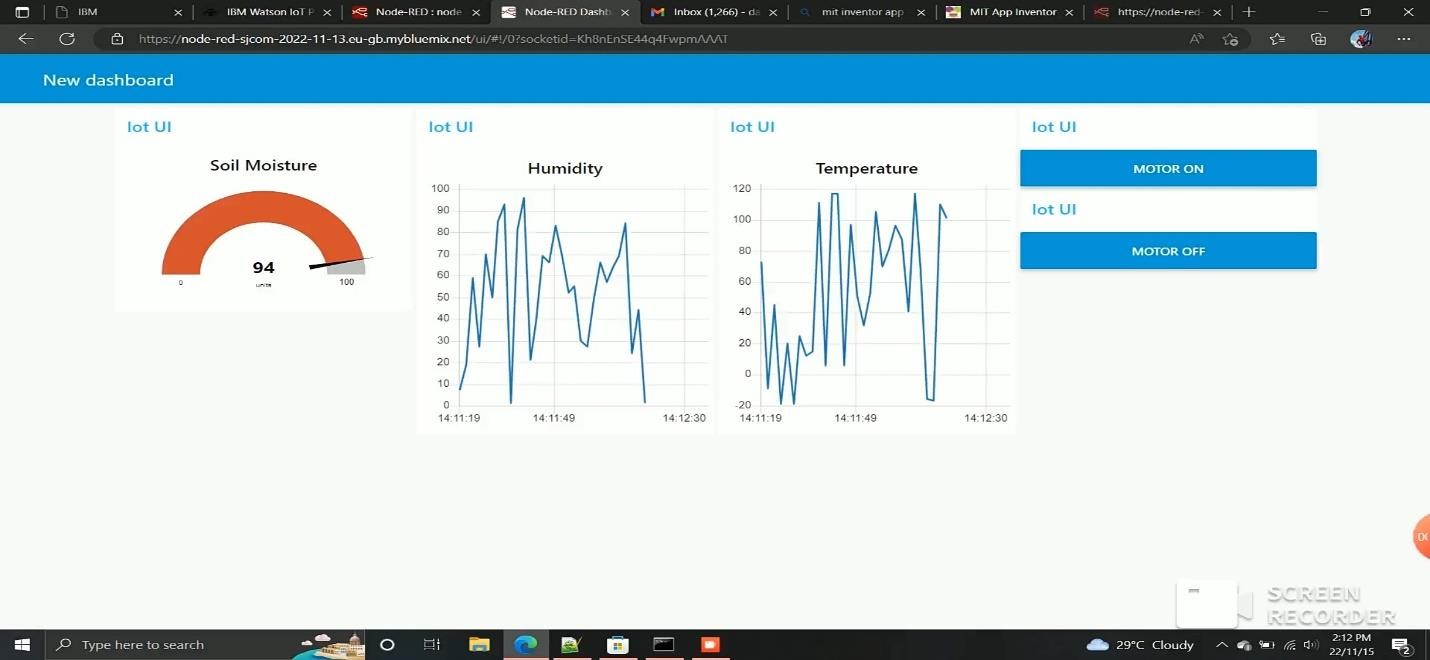


FIGURE 9.1 RESULT OF PERFORMANCE MATRICS

**CHAPTER 10**

**CONCLUSION & FUTURE SCOPE**

**CHAPTER 10**

**CONCLUSION**

Farmers can benefit greatly from an IoT-based smart agriculture system. As a result of the lack of irrigation, agriculture suffers. Climate factors such as humidity, temperature, and moisture can be adjusted dependent on the local environmental variables. This technology also detects animal invasions, which are a major cause of crop loss. This technology aids in the scheduling of irrigation based on present data from the field and records from a climate source. It helps in deciding the farmer to whether to do irrigation or not to do. Continuous internet connectivity is required for continuous monitoring of data from sensors. This also can be overcome by using GSM unit as an alternative of mobile app. By GSM, SMS can be sent to farmers phone.

**FUTURE SCOPE**

In the current project we have implemented the project that can protect and maintain the the crop. In this project the farmer monitor and control the field remotely. In future we can add or update few more things to this project .

• We can create few more models of the same project ,so that the farmer can have information of a entire.

• We can update the this project by using solar power mechanism. So that the power supply from electric poles can be replaced with solar panels. It reduces the power line cost. It will be a one time investment. We can add solar fencing technology to this project.

• We can use GSM technology to this project so that the farmers can get the information directly to his home through SMS. This helps the farmer to get information if there is a internet issues.

• We can add camera feature so that the farmer can monitor his field in real time. This helps in avoiding thefts.

**CHAPTER 11**

**APPENDIX**

**CHAPTER 11**

**APPENDIX**

**SOURCE CODE:**

import wiotp.sdk.device

import time

import os

import datetime

import random

myConfig = {

"identity": {

"orgId": "0ooi4r",

"typeId": "Device0",

"deviceId": "262605"

},

"auth": {

"token": "098765432"

}

}

client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)

client.connect()

def myCommandCallback(cmd):

print("Message received from IBM IOT platform: %s" % cmd.data['command'])

m=cmd.data['command']

if(m=="motoron"):

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elif(m=="motoroff"):

print("Motor is switched off")

print(" ")

while True:

soil=ramdom.randint(0,100)

temp=ramdom.randint(-20,125)

hum=ramdom.randint(0,100)

myData={'soil moisture': soil, 'temperature':temp, 'humidity':hum}

clint.publishEvent(eventId="status", msgFormat="json",data=myData, qos=0,onPublish=None)

print("Published data Successfully: %s", myData)

time.sleep(2)

client.commandCallback = myCommandCallback

client.disconnect()

**11.1 SOURCE CODE GITHUB**

<https://github.com/IBM-EPBL/IBM-Project-7188-1658849691>

**11.2 PROJECT DEMO LINK**

[https://drive.google.com/file/d/1k\_FVs7qAx\_zAwNr5kZtd-BpHKNBHI185/view?usp=drivesdk](https://drive.google.com/file/d/1k_FVs7qAx_zAwNr5kZtd-BpHKNBHI185/view?usp=drivesdk%20)

**CHAPTER12**

**REFERNCE**

**CHAPTER12**

**REFERNCE**

[1] ISSN No:-2456-2165 Volume 4, Issue 2 Feb – 2019: "Solars' Energy: - A safe and reliable, eco-friendly and sustainable Clean Energy Option for Future India: - A Review."

[2] Universal Paper of advanced science and science and exploration technology. [2] GRD Journals- Global Research and Development Journal for Engineering | Volume 4 | Issue 3 | February (2019) ISSN: 2455-5703 “Design and Implementation of an Advanced Security System for Farm Protection from Wild Animals”.

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