# GOVERNMENT COLLEGE OF ENGINEERING
## (Formerly IRTT)
## ERODE-638 316

## BONAFIDE CERTIFICATE

Certified that this project titled **"SMART FARMER - IoT ENABLED SMART FARMING APPLICATION"** is the bonafide work of **"CHARULATHA H (731119205005), DEEPIKA R (731119205006), PAVITHRA DEVI V R (731119205032), RAMYA K G (731119205036)"** who carried out the project work under my supervision.

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# CONTENTS :

# SMART FARMER - IoT ENABLED SMART FARMING APPLICATION

## 1. INTRODUCTION

### 1.1 Project Overview

India is a Global agricultural powerhouse which is considered as the key for Human Progress. Farmers are usually involved in watering the crops at scheduled times which requires a lot of human intervention, they involve a high degree of guesswork and can be extremely wasteful. To overcome this, we can use precision farming methodologies. 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. **Automation of watering crops** reduces human intervention.

### 1.2 Purpose

IoT based SMART FARMING SYSTEM is regarded as IoT gadget focusing on Live Monitoring of Environmental data in terms of Temperature, Moisture and other types depending on the sensors integrated with it. The system provides the concept of “Plug & Sense” in which farmers can directly implement smart farming by as such putting the System on the field and getting Live Data feeds on various devices like Smart Phones, Tablets etc. and the data generated via sensors can be easily shared and viewed by agriculture consultants anywhere remotely via Cloud Computing technology integration. The system also enables analysis of various sorts of data via Big Data Analytics from time to time.

## 2. LITERATURE SURVEY

### 2.1 Existing problem

The India is an agricultural country. Nowadays, at regular intervals the lands are manually irrigated by the farmers. There is a chance that the water consumption will be higher or that the time it takes for the water to reach the destination will be longer, resulting in crop dryness. Real-time temperature and humidity monitoring is crucial in many agricultural disciplines. However, the old method of wired detection control is inflexible, resulting in several application limitations. This project achieves irrigation automation as a crucial answer to this problem. This is accomplished with the aid of a microprocessor or microcontroller, which controls the moisture and temperature sensors based on the input provided. Moisture sensors are used in the construction of an automated plant watering system for this purpose. The main aim of our project is to reduce the complexity of supervision and to avoid the continuous monitoring. We can accomplish smart agriculture using our system. This system includes IOT-based agricultural monitoring. The Internet of Things (IOT) is transforming the agriculture business and addressing the enormous difficulties and huge obstacles that farmers confront today in the field. The soil moisture sensor is put into the soil to determine whether the soil is wet or dry, and if the moisture level in the soil is low, the relay unit attached to the motor switch must be monitored on a regular basis. When the soil is dry, it will turn on the motor, and when the soil is moist, it will turn off the motor.

## 2.2 References

1. **TITLE OF THE PAPER** : Internet of Things (IoT) for Smart precision Agriculture and Farming in Rural Area, IEEE
   **AUTHOR** : Nurzaman Ahmed, Debashis De , Senior Member, IEEE, and Md. Iftekhar Hussain, Member, IEEE,
   **METHOD** : The authors have described that with the use of fog computing and WIFI-based long,distance network in IoT, it is possible to connect the agriculture and farming bases situated in rural areas efficiently.

2. **TITLE OF THE PAPER** : An Overview of Internet of Things (IoT)and Data Analytics in agriculture.
   **AUTHOR :** Olakunle Elijah , Student Member, IEEE, Tharek Abdul Rahman, Member,IEEE,Igbafe Orikumhi, Member,IEEE, Chee Yen Leow , Member, IEEE, and MHD Nour Hindia, Member, IEEE,
   **METHOD :** the authors have described several benefits and challenges of IoT have been identifified. They also presented the IoT ecosystem and how the combination of IoT and DA can be enabled in smart agriculture.

3. **TITLE OF THE PAPER** : Internet of Things Monitoring Systemof modern Eco-agriculture based on Cloud Computing.
   **AUTHOR** : Shubo Liu, Liqing Guo, Heather Web, Xiao Yao, XiaoChang.
   **METHOD** : The authors have described an integrated frameworksystem platform incorporating Internet of Things (IoT), cloud computing, data mining and other technologies and proposed a newmodel for itsapplication in field of modern agriculture.

4. **TITLE OF THE PAPER** : Smart Agriculture using IOT.
   **AUTHOR** : Sweksha Goyal,Unnathi Mudra, Prof Sahana Shetty
   **METHOD** : The authors have aimed in making a technology which is completely automated. The paper takes care of all major factors of agriculture i.e. monitoring, irrigation and security. The methodologyused in this system can monitor the humidity, moisture level andcaneven detect motions.

5. **TITLE OF THE PAPER** : IoT based Smart Agriculture, International Journal of Science, Engineering and Technology Research (IJSETR).
   **AUTHOR** : Sidhanth Kamath B,Kiran Kharvi,Mr.Abhir Bhandary,Mr.Jason Elroy Martis.
   **METHOD** : The authors have suggested a low cost IoT enabledsmart agricultural system which can evaluate the farmland and predict whichtype of crop is best for the land based on the data collected fromlocal conditions of that land varying from humidity to soil moisture content.

6. **TITLE OF THE PAPER** : A Model for Smart Agriculture UsingIOT, International Journal of Innovative Technology and ExploringEngineering (IJITEE).
   **AUTHOR** : A.Anusha, A.Guptha, G.Sivanageswar Rao, Ravi Kumar Tenali.
   **METHOD** : The authors have gathered continuous informationof farming generation condition that gives simple access to horticultural offices, for example, alarms through

Short Messaging Service (SMS) andadvices on climate design and crops.

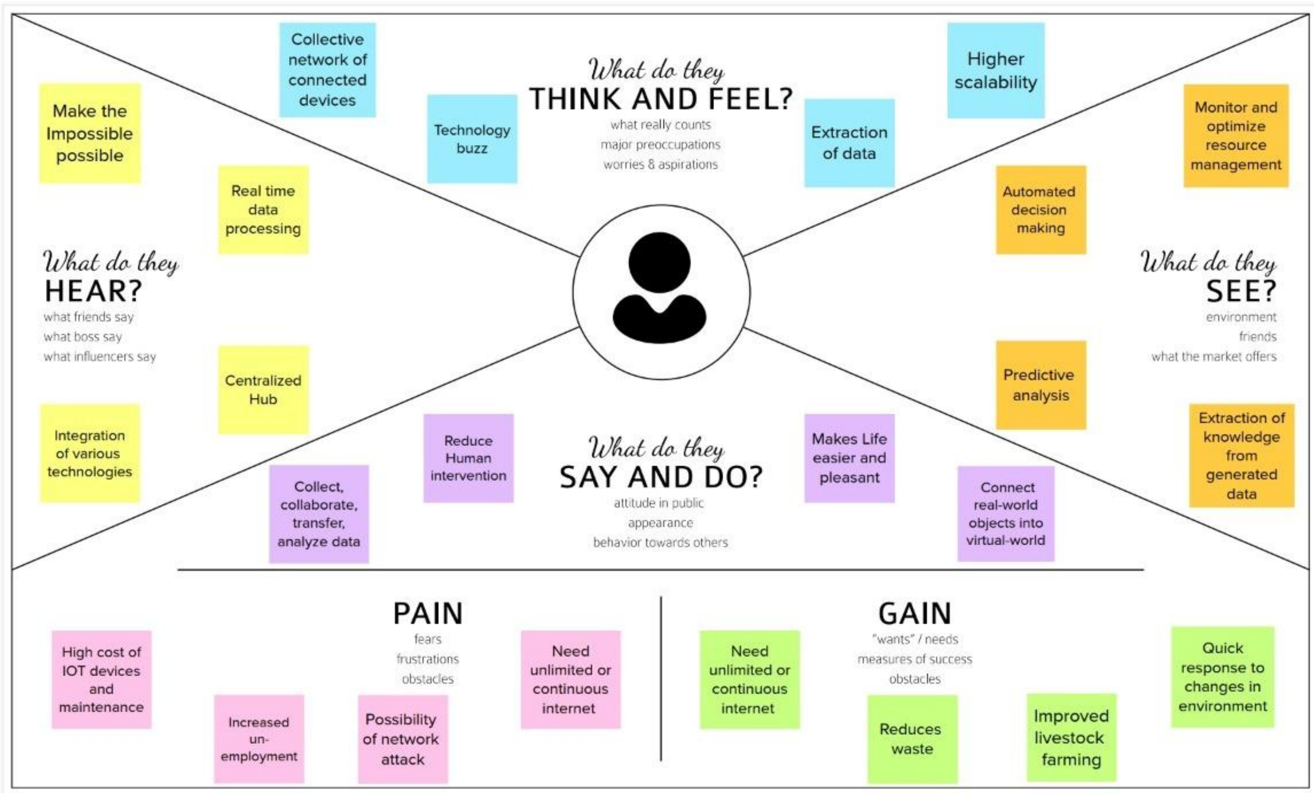
7. **TITLE OF THE PAPER** : IOT Based On Smart Agriculture.
**AUTHOR** : Mr.N.Sivakumar, Mr.P.Thiyagarajan,Ms.R.Sandhiya,
**METHOD** : The authors have proposed a sensor systemwhich monitors and maintains the desired soil moisture content via automatic water supply.

## 2.3 Problem Statement Definition

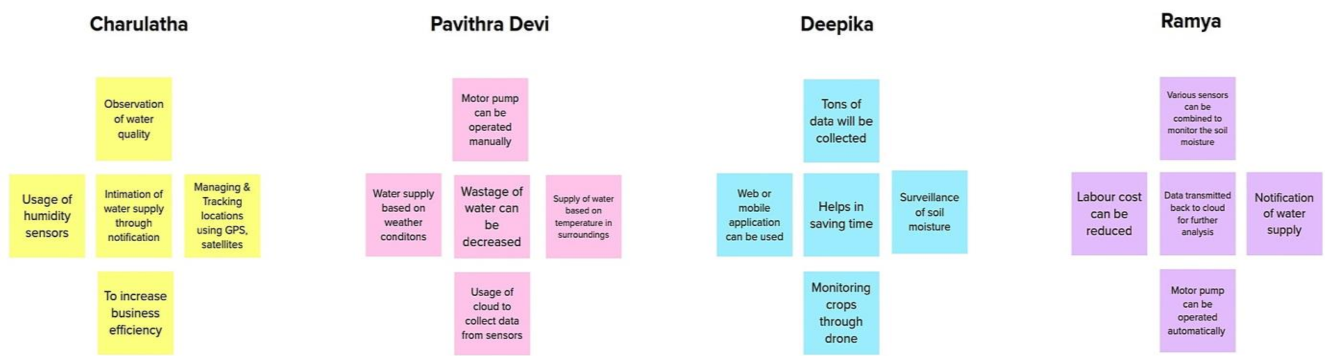
1. **Who does the problem affect?** If the yield gets lower, it affects
   - The farmers who have cultivated the crop
   - People who are dependent on the crop for food
   - Indian Economy - Crop production is one of the most important sources of the income
2. **What are the boundaries of the problem?**
   - The harvest should be good, so that the profit will get improved
   - Want reliable data to water the crops periodically
   - Over or under watering of field may lead to destruction of the crop
   - Drastic climatic changes
3. **What is the issue?**
   - Wrong decisions would be made by the farmer, if the information displayed in dashboard are incorrect. The data collected from the sensors.
4. **When does the issue occur?** The crop yield will be affected if
   - The sensors does not work properly
   - Any damage in the hardware devices
   - Data sparsity problem
5. **Where is the issue occurring?**
   - If they is any malware in the application
   - Internet connection is poor
   - Any damages in the pipes, motor may lead to leakage
6. **Why is it important that we fix the problem?**
   - Reduces the overflow of water
   - Save time
   - Less human intervention

# 3. IDEATION & PROPOSED SOLUTION

## 3.1 Empathy Map Canvas



## 3.2 Ideation & Brainstorming



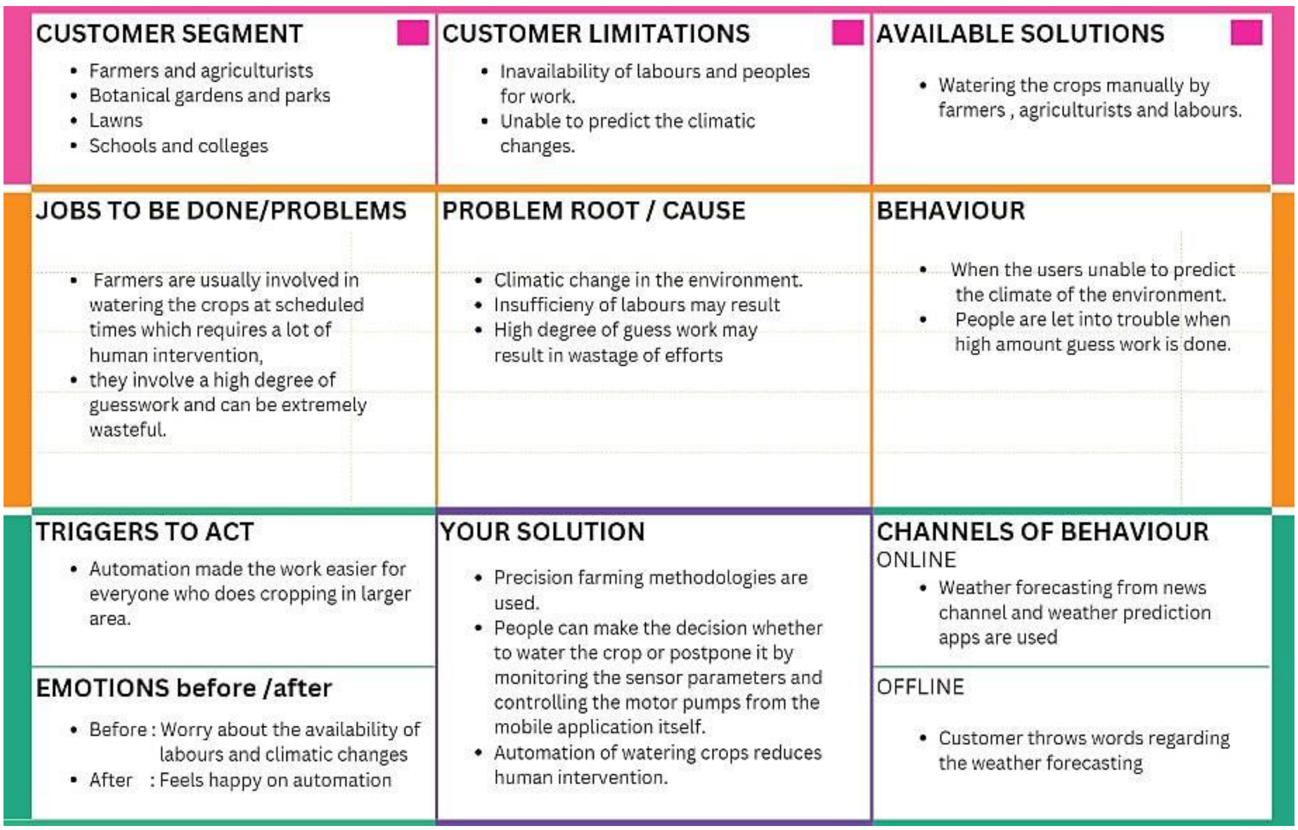


Web or mobile application can be used
Tons of data will be collected
Labour cost can be reduced
Supply of water based on temperature in surroundings
Wastage of water can be decreased
To increase business efficiency
Motor pump can be operated manually
Various sensors can be combined to monitor the soil moisture
Intimation of water supply through notification
Importance
If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?
Feasibility
Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

### 3.3 Proposed Solution

| S.No. | **Parameter** | **Description** |
|---|---|---|
| 1. | Problem Statement (Problem to be solved) | India is a Global agricultural powerhouse which is considered as the key for Human Progress. Farmers are usually involved in watering the crops at scheduled times which requires a lot of human intervention, they involve a high degree of guesswork and can be extremely wasteful. |
| 2. | Idea / Solution description | We can use precision farming methodologies. 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. Automation of watering crops reduces human intervention. |
| 3. | Novelty / Uniqueness | Smart agriculture farming system is a new idea of farming in agriculture, because which uses IOT technology to monitor the crop 24/7 and sends the information to the cloud. This emerging system increases the quality and quantity of agricultural products. IOT technology provides the information about farming fields and then takes action depending on the farmer input. |
| 4. | Social Impact / Customer Satisfaction | Weather forecasts and sensors that measure soil moisture mean watering only when necessary and for the right length of time. |
| 5. | Business Model (Revenue Model) | IOT in business can instruct systems to autonomously execute transactions in supply chains when certain conditions have been met.Increase productivity and reliability in real time environment |
| 6. | Scalability of the Solution | The ability to increase available resources and system capability without the need to go through a major system redesign or implementation. |

## 3.4 Problem Solution Fit



# 4. REQUIREMENT ANALYSIS

## 4.1 Functional requirement

| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task) |
|---|---|---|
| FR-1 | User Registration | Registration through Form<br>Registration through<br>Gmail Registration<br>through Linked In |
| FR-2 | User Confirmation | Confirmation via Email<br>Confirmation via OTP |
| FR-3 | User Profile | Login, User profile |
| FR-4 | Analyse | Data from smart sensors can be analyzed for predictive analysis and automated decision-making. |
| FR-5 | Recommend | Based on the farming the software recommends the automated irrigation practices. |

## 4.2 Non-Functional requirement

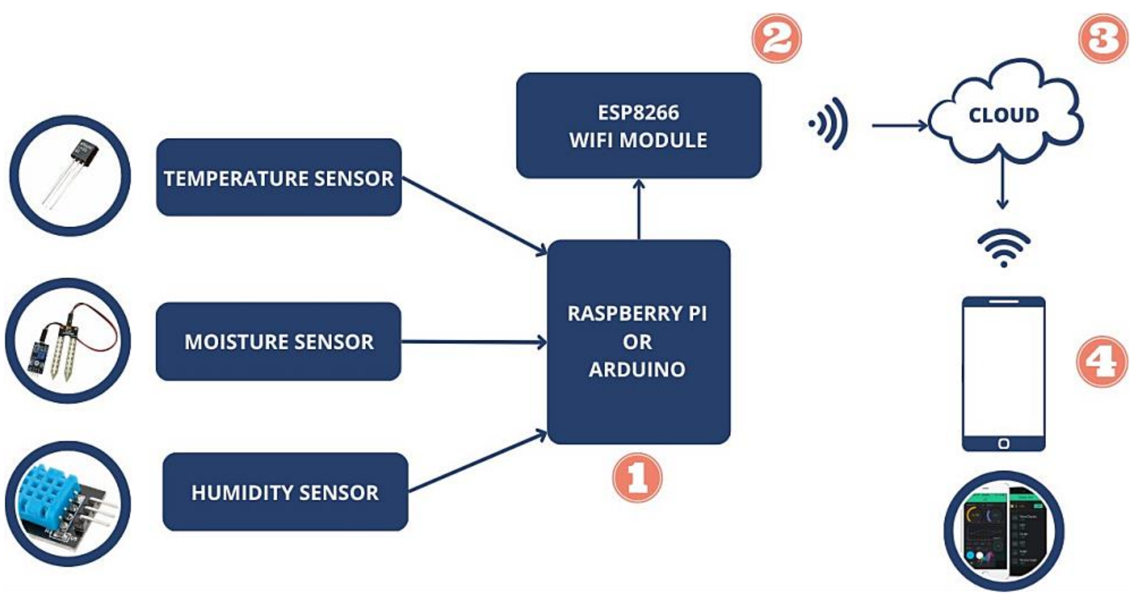
| FR No. | Non-Functional Requirement | Description |
|---|---|---|
| NFR-1 | Usability | End users can monitor and control their connected farm using IOT applications on their smartphones or tablets. |
| NFR-2 | Security | The software keeps the user's information more securely. |
| NFR-3 | Reliability | The smart farm, embedded with IOT systems, could be called a connected farm, which can support a wide range of devices from diverse agricultural device manufactures. |
| NFR-4 | Performance | It is a user-friendly software and have high performance. |
| NFR-5 | Availability | Available for every user, visible for all users and farmer. |
| NFR-6 | Scalability | The proposed precision farming structure allows the implementation of a flexible methodology that can be adopted to different types of crops. |

# 5. PROJECT DESIGN

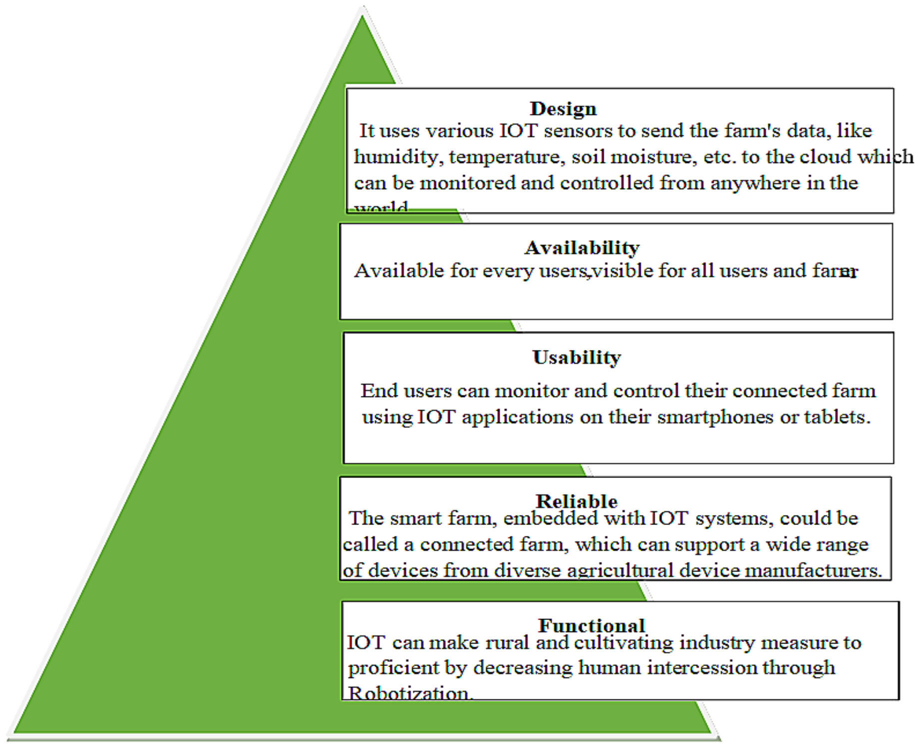
## 5.1 Data Flow Diagrams

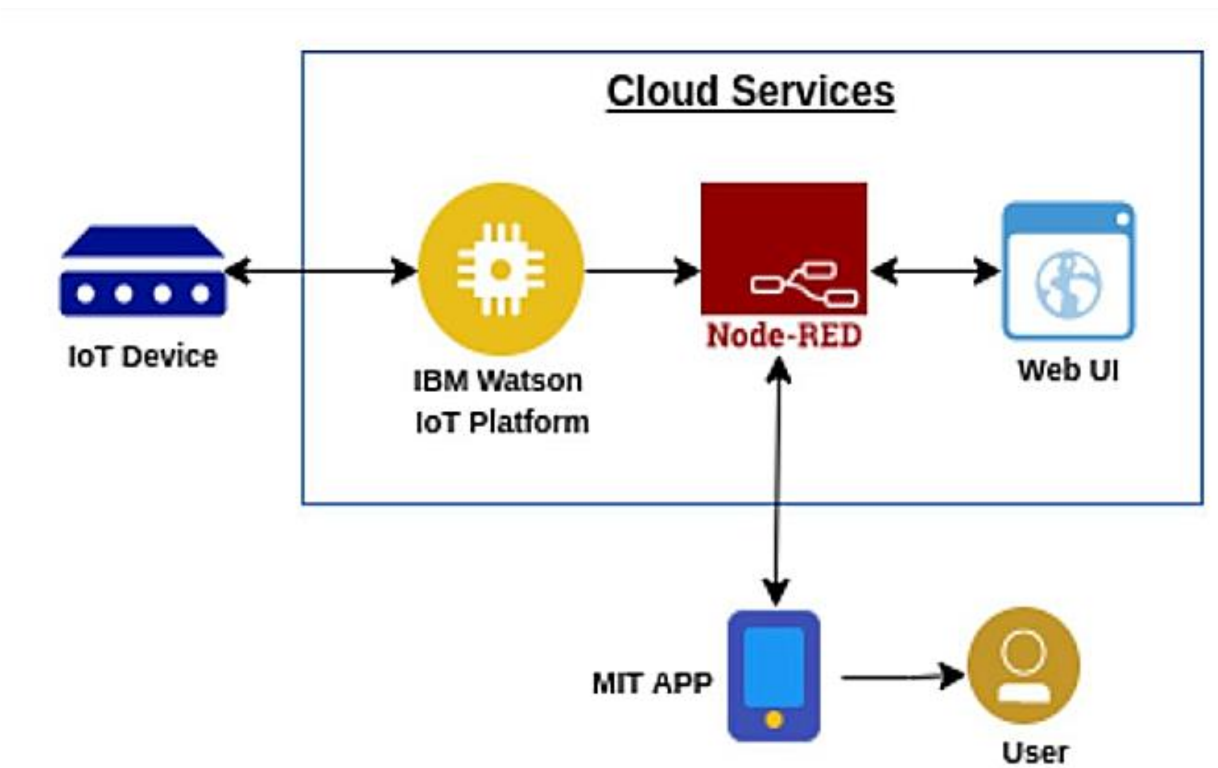
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

1. Get the inputs from different sensors such as Moisture Sensor, Humidity Sensor, Temperature Sensor. Data from the sensors are given as inputs to the microcontroller - Arduino or Raspberry Pi
2. Data are feed into the cloud storage using wi-fi module.
3. MQTT-Message Queuing Telemetry Transport Protocol is used to order data in FIFO fashion.
4. App is Used to create our own to IOT software according to our specifications where we can able to monitor and control the device.



## 5.2 Solution & Technical Architechture



**IOT Device -** IoT devices include computer devices, software, wireless sensors, and actuators

**IBM Watson IoT Platform -** IoT devices include computer devices, software, wireless sensors, and actuators.

**Node-RED -** Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways

**Web UI -** The Web UI is a streamlined Web-based application with a user-friendly interface that allows you to easily manage the NetScreen appliance.

**MIT App -** App Inventor is a cloud-based tool, which means you can build apps right in your web browser.
**User –** User is the one who uses the software.

## 5.3 User Stories

| User Type | Functional Requirement (Epic) | User Story Number | User Story / Task | Acceptance criteria | Priority | Release |
|---|---|---|---|---|---|---|
| Customer (Mobile user) | Registration | USN-1 | As a user, I can register for the application by entering my email, password, and confirming my password. | I can access my account / dashboard | High | Sprint-1 |
| | | USN-2 | As a user, I will receive confirmation email once I have registered for the application | I can receive confirmation email & click confirm | High | Sprint-1 |
| | | USN-3 | As a user, I can register for the application through G-mail | I can receive confirmation email & click confirm to login | Medium | Sprint-1 |
| | Login | USN-4 | As a user, I can log into the application by entering email & password | | High | Sprint-1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Customer (Web user) | Registration | USN-6 | As a user, I can register by entering my email, password, and confirming my password | I can access my account / dashboard | High | Sprint-2 |
| | | USN-7 | As a user, I will receive confirmation email once I have registered for the application | I can receive confirmation email & click confirm | High | Sprint-2 |
| | | USN-8 | As a user, I can register for the application through G-mail | I can receive confirmation email & click confirm to login | Medium | Sprint-2 |
| | Login | USN-9 | As a user, I can log into the application by entering email & password | | High | Sprint-2 |
| | | USN-10 | If I forgot my password or username, I can reset it again through my email | I can receive reset Mail to the registered Email Id | High | Sprint-3 |
| Customer Care Executive | Help | USN-11 | If I have any doubt in using application or web, I can clarify it by clicking Help option in the dashboard. | | High | Sprint-3 |
| Administrator | Feedback | USN-12 | I Can give my feedback about the application and I can post my queries. | I can receive acknowledgement | Low | Sprinit-4 |

# 6. PROJECT PLANNING & SCHEDULING

## 6.1 Sprint planning & Estimation

| Sprint | Functrional Requirement (Epic) | User Story Number | User Story / Task | Story points | Priority | Team members |
|---|---|---|---|---|---|---|
| Sprint 1 | IBM cloud account | USN-1 | IBM cloud account creation | 5 | High | Charulatha H |
| | MIT App Inventor Node-RED | USN-2 | MIT App Account creation Node-RED Account creation | 5 | High | Deepika R |
| | Python IDE | USN-3 | Software installation | 5 | High | Ramya K G |
| | Fast to sms | USN-4 | Fast2sms account creation | 5 | High | Pavithra Devi V R |
| Sprint 2 | IBM Watson Platform | USN-5 | Create IBM Watson platform and a device | 10 | High | Charulatha H<br>Ramya K G |
| | Node-RED Service | USN-6 | Create Node-RED Service | 10 | High | Pavithra Devi V R<br>Deepika R |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sprint 3 | Develop a python code | USN -7 | Build a web application using Node-RED,configure the Node-RED and create API for communicating with a mobile application | 20 | High | Charulatha H<br>Deepika R<br>Pavithra Devi V R<br>Ramya K G |
| Sprint 4 | Develop a mobile application | USN-8 | A mobile application using MIT App inventor which displays all the sensors parameters. | 20 | High | Charulatha H<br>Deepika R<br>Pavithra Devi V R<br>Ramya K G |

## 6.2 Sprint Delivery Schedule

| Sprint | Total story points | Duration | Sprint start date | Sprint end date | Story points | Sprint release date(Actuaal) |
|---|---|---|---|---|---|---|
| Sprint-1 | 20 | 6 Days | 24 OCT 2022 | 29 OCT 2022 | 20 | 29 OCT 2022 |
| Sprint-2 | 20 | 6 Days | 31 OCT 2022 | 05 NOV 2022 | 20 | 05 NOV 2022 |
| Sprint-3 | 20 | 6 Days | 07 NOV 2022 | 12 NOV 2022 | 20 | 12 NOV 2022 |
| Sprint-4 | 20 | 6 Days | 14 NOV 2022 | 19 NOV 2022 | 20 | 19 NOV 2022 |

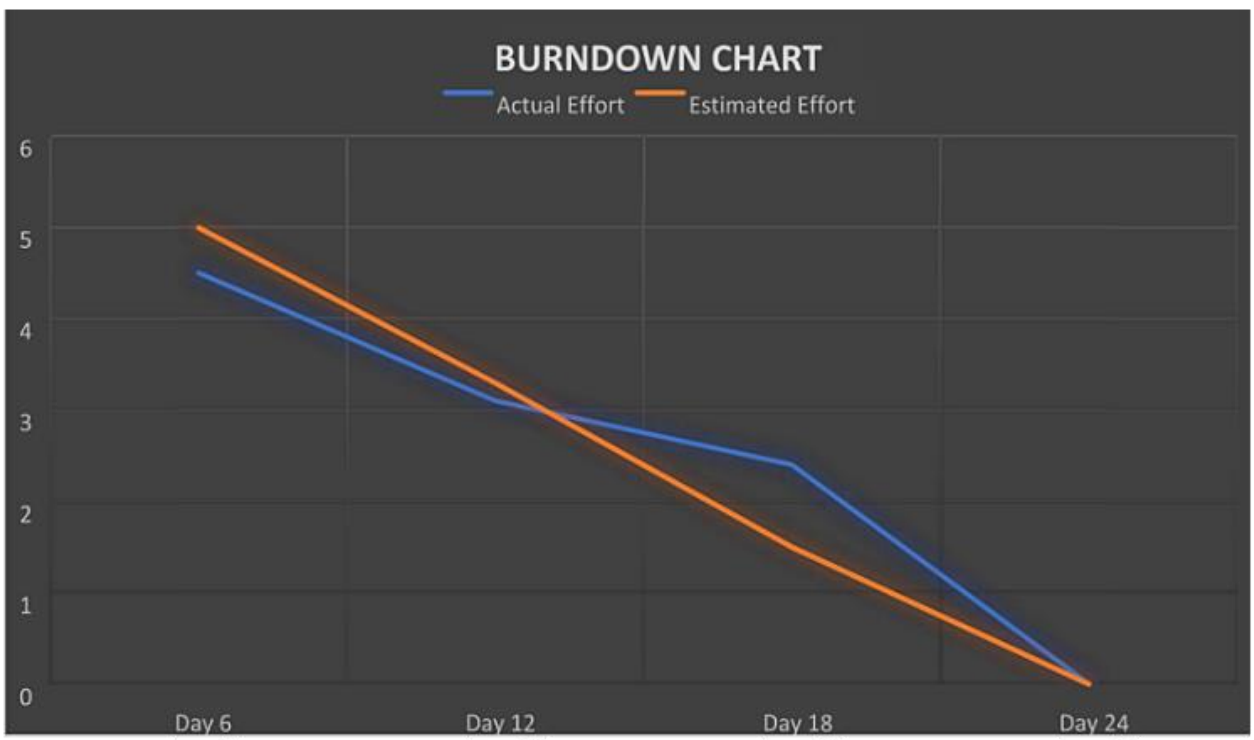
## Velocity:

We have a 24-day sprint duration,and the velocity of the team is 20(points per sprint).Let's calculate the team average velocity(AV) per iteration unit(story points per day).

**AV = Sprint Duration / Velocity =24 / 20 = 1.2**

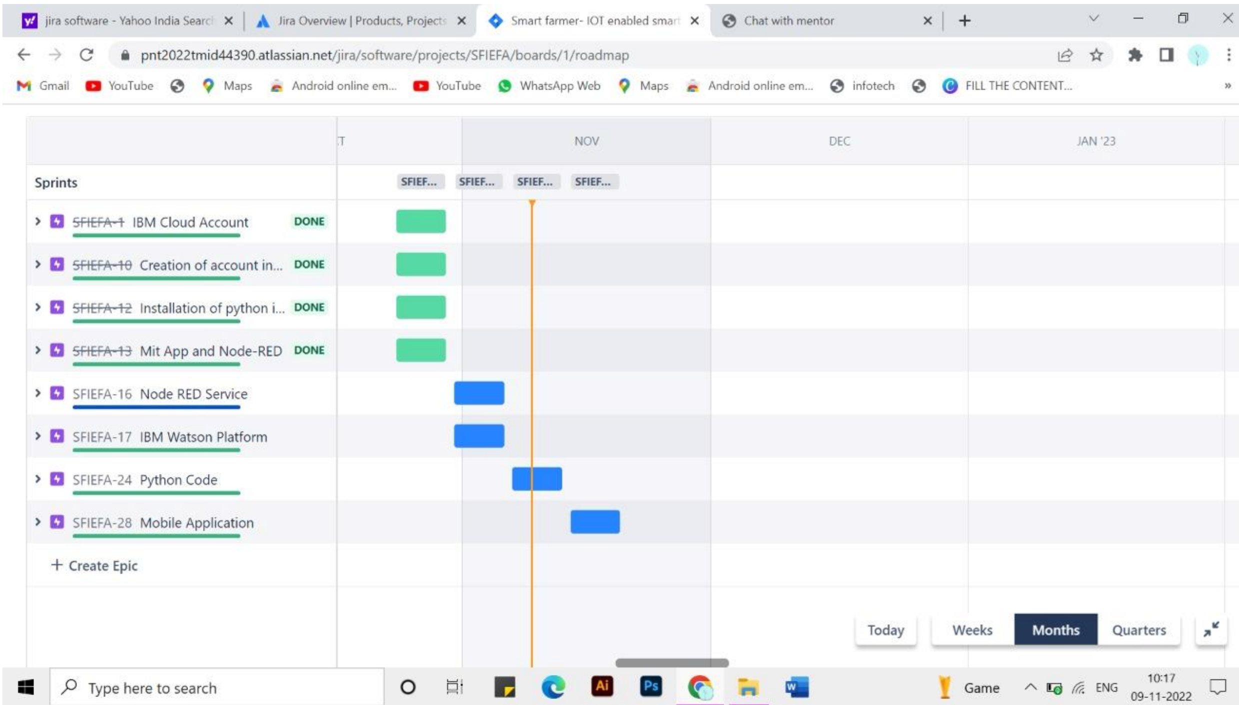
## Burndown Chart:

A burndown chart is a graphical representation of work left to do versus time.It is often used in agile software development methodologies such as Scrum. However,burndown chart can be applied to any project containing measurable progress over time.

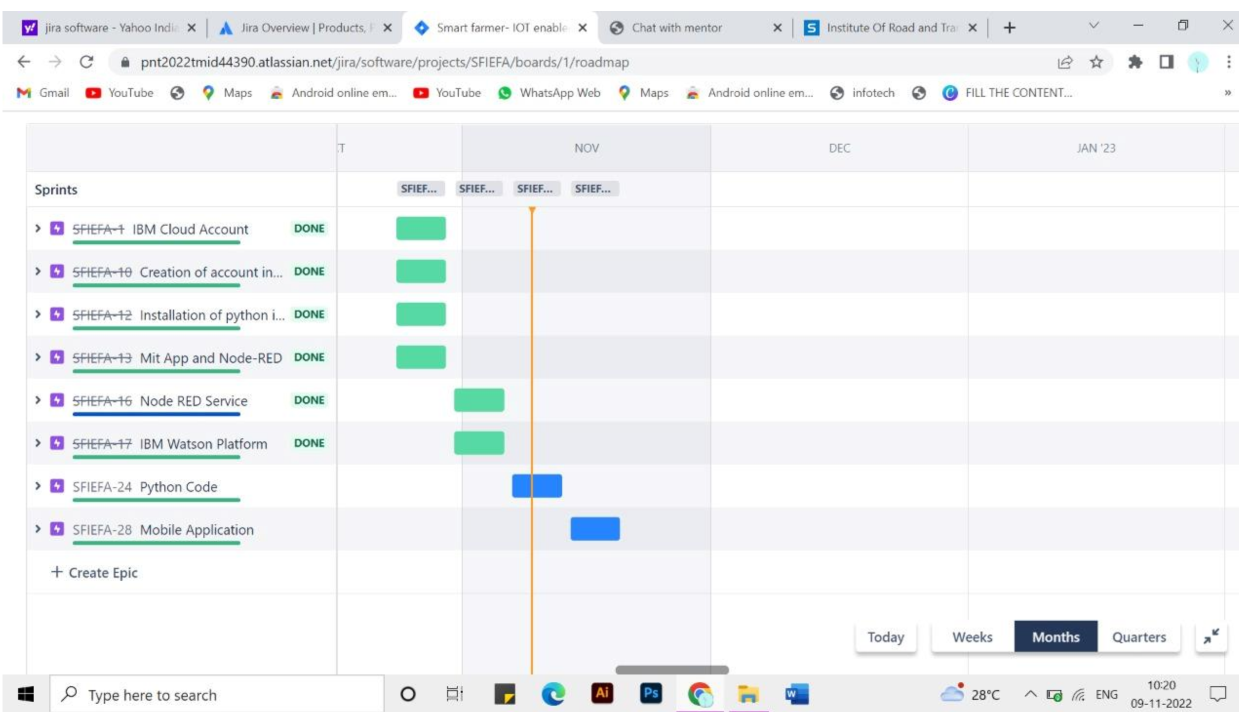


## 6.3 Reports from JIRA

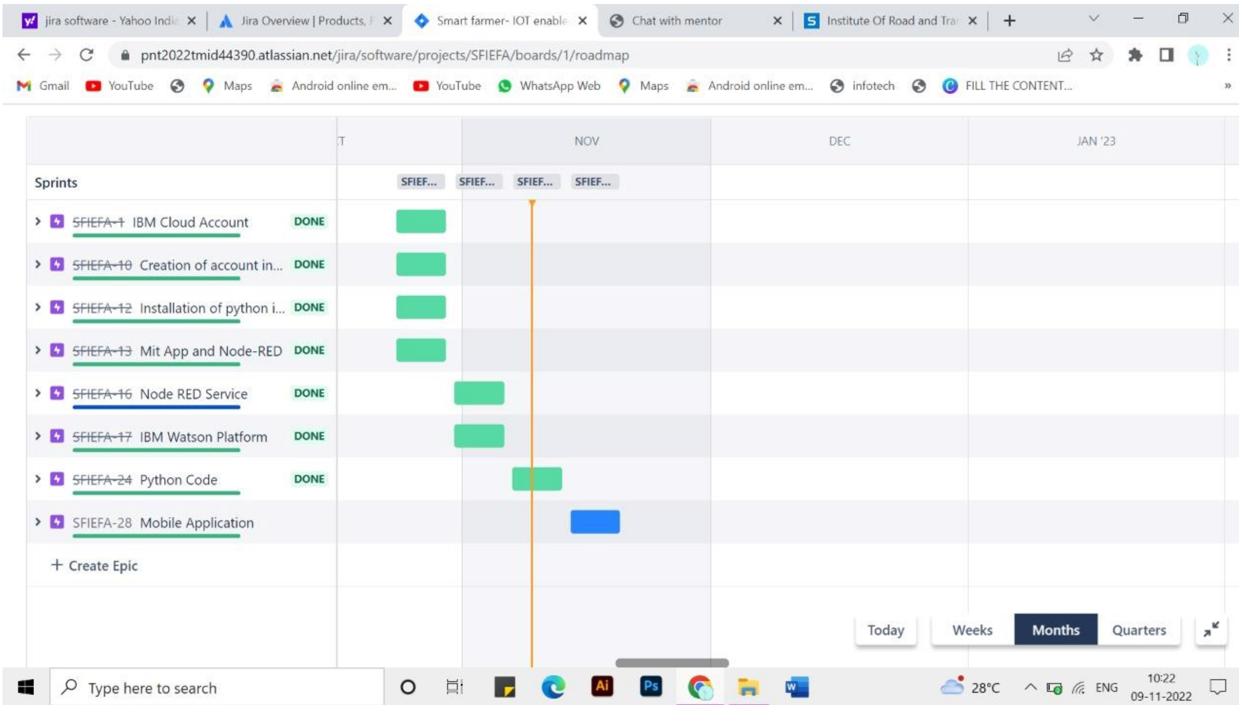
## Sprint 1:



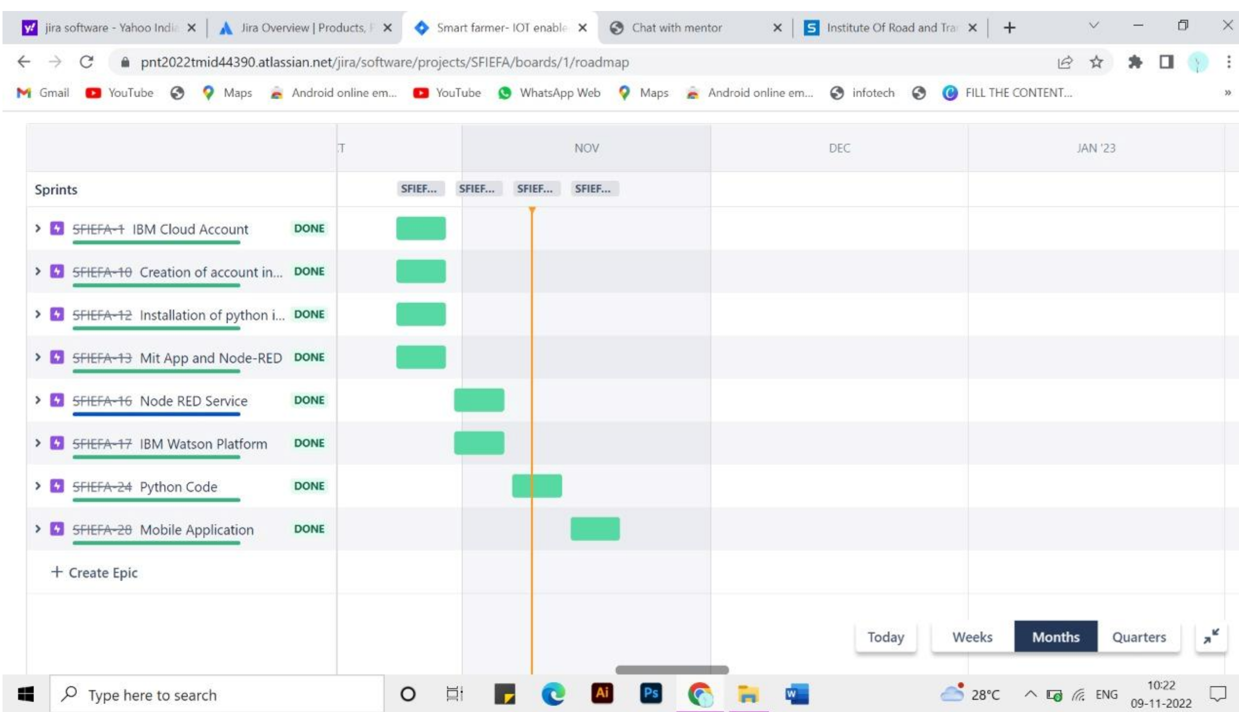

## Sprint 2:



## Sprint 3:




## Sprint 4:



# 7. CODING & SOLUTIONING

## 7.1 Feature 1

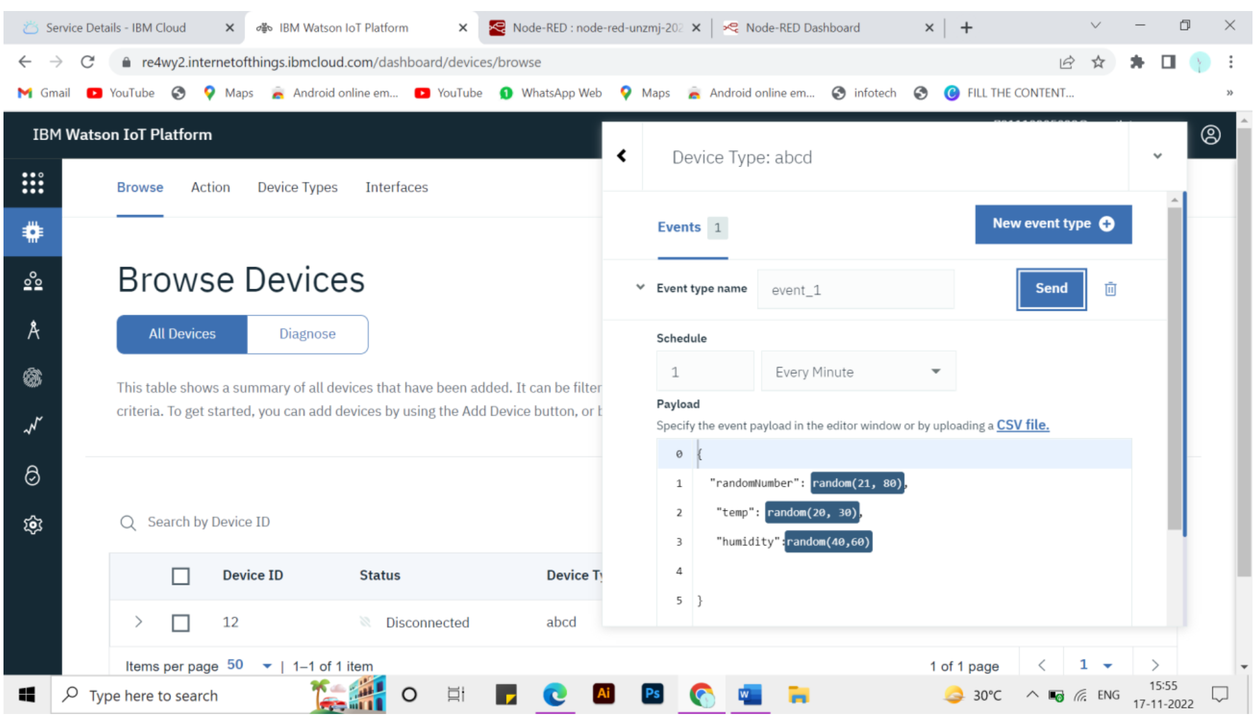
### A Web Application is build which consists of,

- Graphical representation of Humidity, Temperature, Soil Moisture
- Motor ON and Motor OFF buttons

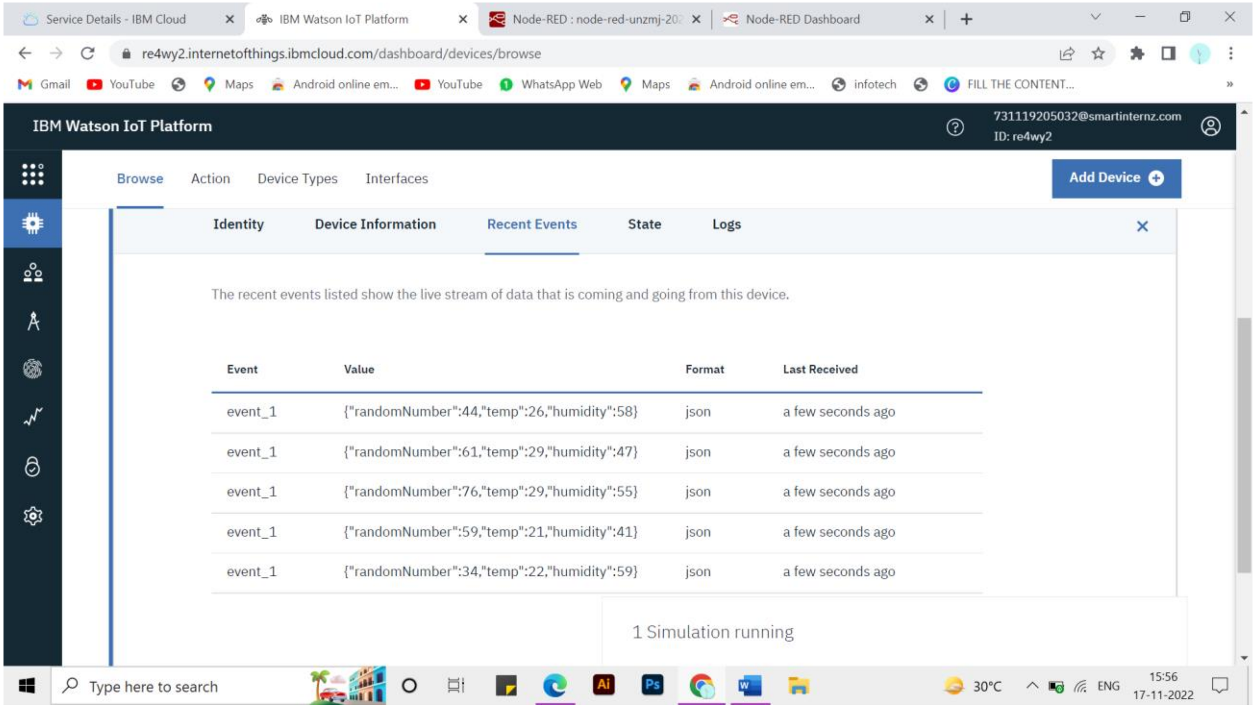
**Step 1**: Generate random values of Humidity, Temperature, Soil Moisture are generated from events in the Watson IOT platform. These sensor values are generated using random functions from the events that is used in the device which was created.

Payloads - Sensors

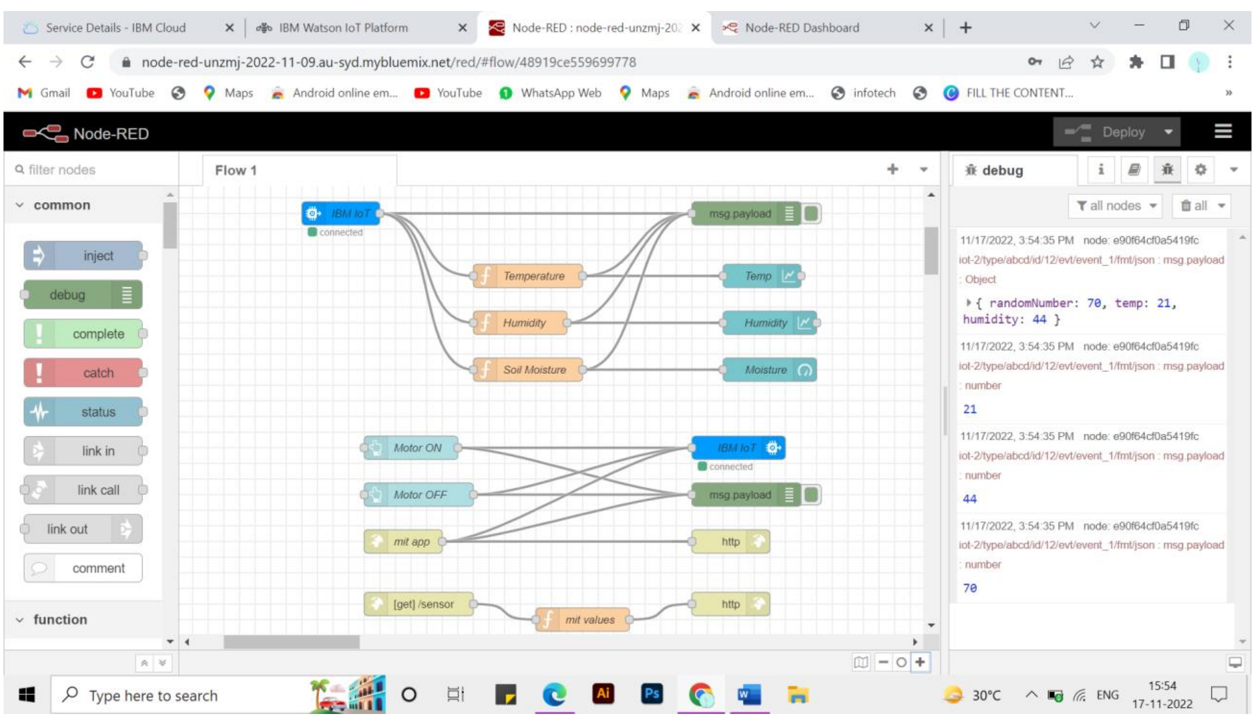
1. RandomNumber = Soil Moisture
2. Temp = Temperature
3. Humidity = Humidity



**Step 2:** The values are generated for every minute as payload from events in the form of **json** format in the recent events of the device created in Watson Platform.




**Step 3:** Node-RED is an editor used to create the flow between the nodes and has to be deployed once the flow has been made. Once deployment is done sensor values can be viewed in debug.

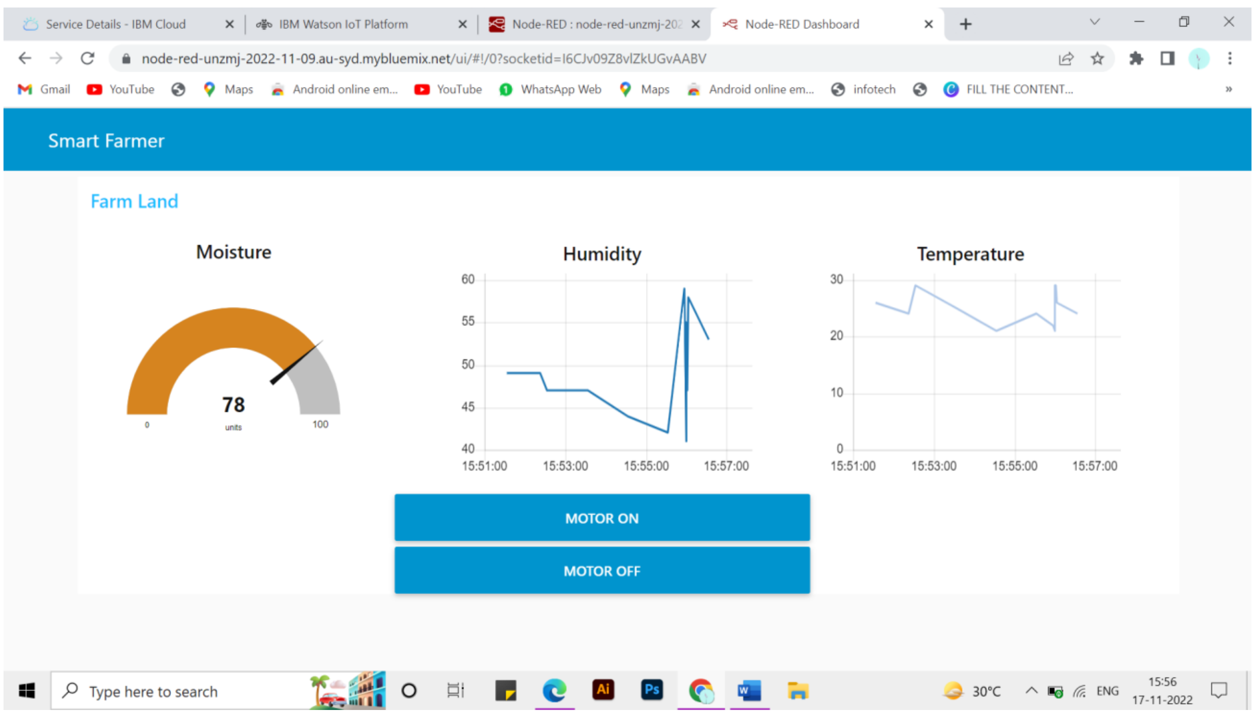


**Step 4:** The **Smart Farmer** dashboard is viewed once the deployment is completed where we can able to view,

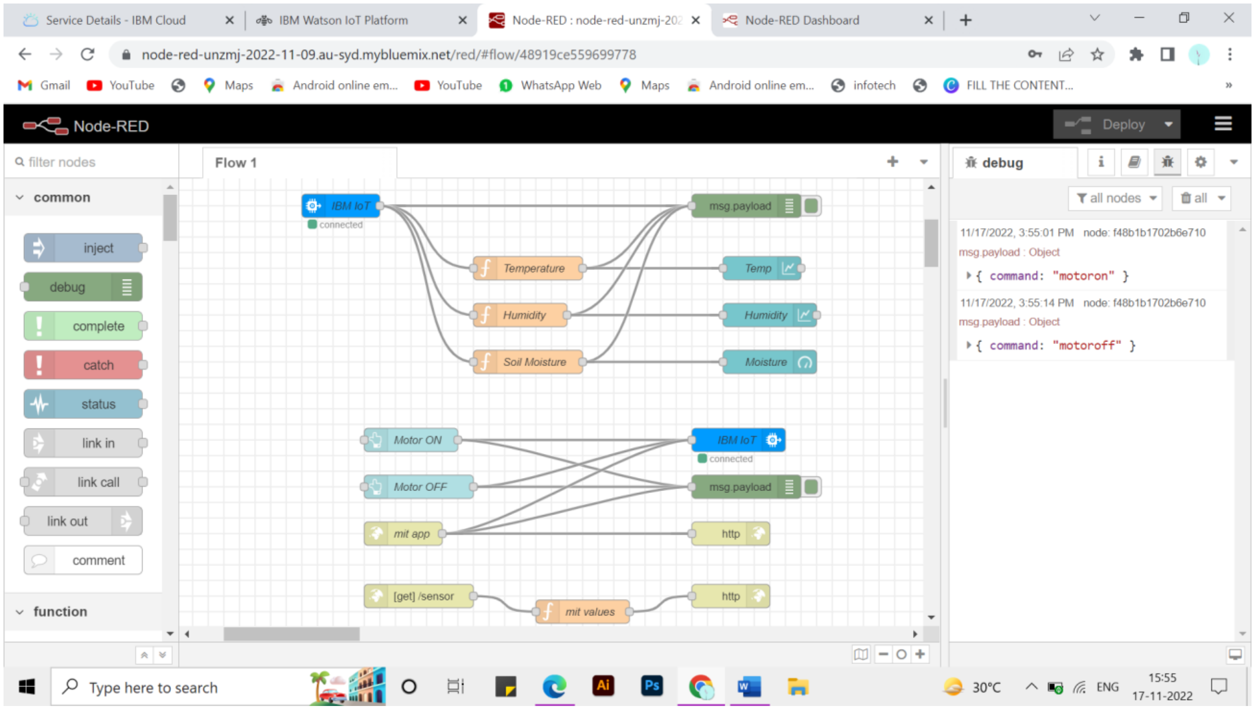
1. Moisture in the form of gauge
2. Temperature and Humidity in the form of graph
3. MOTOR ON and MOTOR OFF buttons

**Details:**

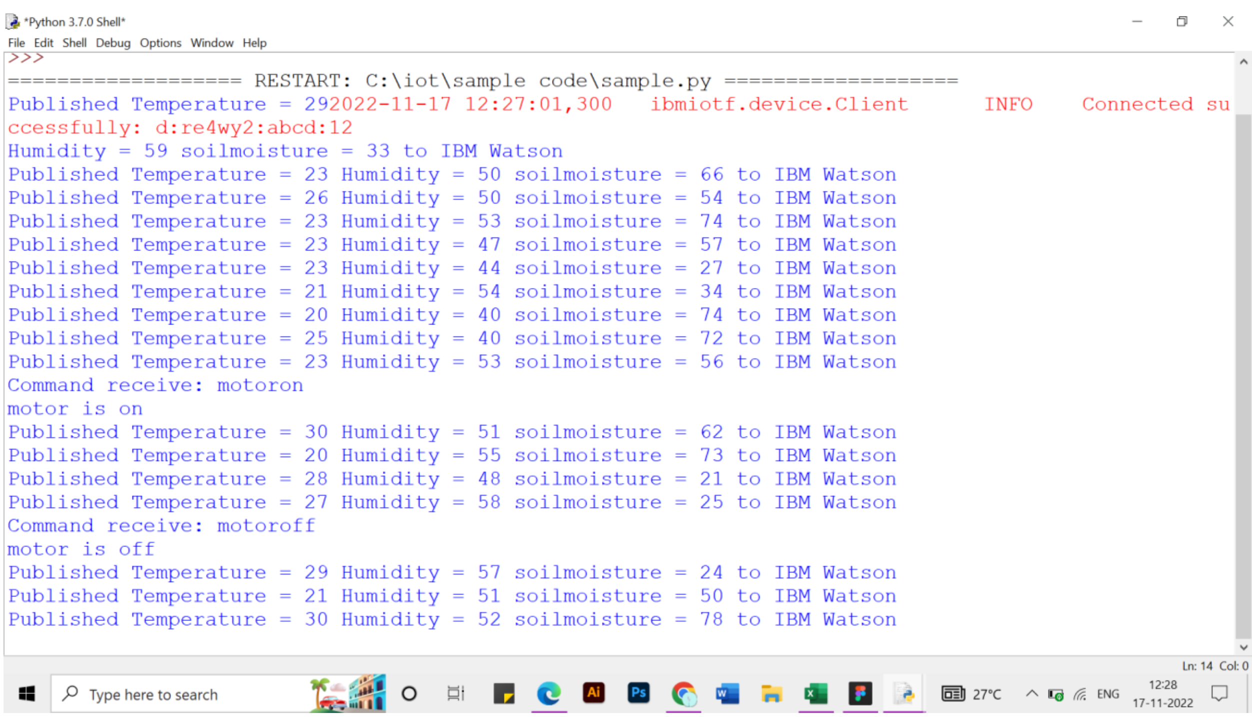
1. Dashboard is named as SMART FARMER
2. Section is named as Farm Land
3. In the section of Farm Land the sensors values are represented and motor control buttons are also given.



**Step 5:** When the **Motor ON** button is clicked the we receive the output as **“motoron”** and **Motor OFF** button is clicked we receive the output as **“motoroff”**. And these output are received in the debug section of the editor.




**Step 6:** The output is also received in the **python code editor** when the buttons are clicked in the dashboard and random values are also generated. Device id is used to connect to IBM Watson.



```
>>>
==================== RESTART: C:\iot\sample code\sample.py ====================
Published Temperature = 292022-11-17 12:27:01,300   ibmiotf.device.Client      INFO     Connected su
ccessfully: d:re4wy2:abcd:12
Humidity = 59 soilmoisture = 33 to IBM Watson
Published Temperature = 23 Humidity = 50 soilmoisture = 66 to IBM Watson
Published Temperature = 26 Humidity = 50 soilmoisture = 54 to IBM Watson
Published Temperature = 23 Humidity = 53 soilmoisture = 74 to IBM Watson
Published Temperature = 23 Humidity = 47 soilmoisture = 57 to IBM Watson
Published Temperature = 23 Humidity = 44 soilmoisture = 27 to IBM Watson
Published Temperature = 21 Humidity = 54 soilmoisture = 34 to IBM Watson
Published Temperature = 20 Humidity = 40 soilmoisture = 74 to IBM Watson
Published Temperature = 25 Humidity = 40 soilmoisture = 72 to IBM Watson
Published Temperature = 23 Humidity = 53 soilmoisture = 56 to IBM Watson
Command receive: motoron
motor is on
Published Temperature = 30 Humidity = 51 soilmoisture = 62 to IBM Watson
Published Temperature = 20 Humidity = 55 soilmoisture = 73 to IBM Watson
Published Temperature = 28 Humidity = 48 soilmoisture = 21 to IBM Watson
Published Temperature = 27 Humidity = 58 soilmoisture = 25 to IBM Watson
Command receive: motoroff
motor is off
Published Temperature = 29 Humidity = 57 soilmoisture = 24 to IBM Watson
Published Temperature = 21 Humidity = 51 soilmoisture = 50 to IBM Watson
Published Temperature = 30 Humidity = 52 soilmoisture = 78 to IBM Watson
```

## 7.2 Feature 2

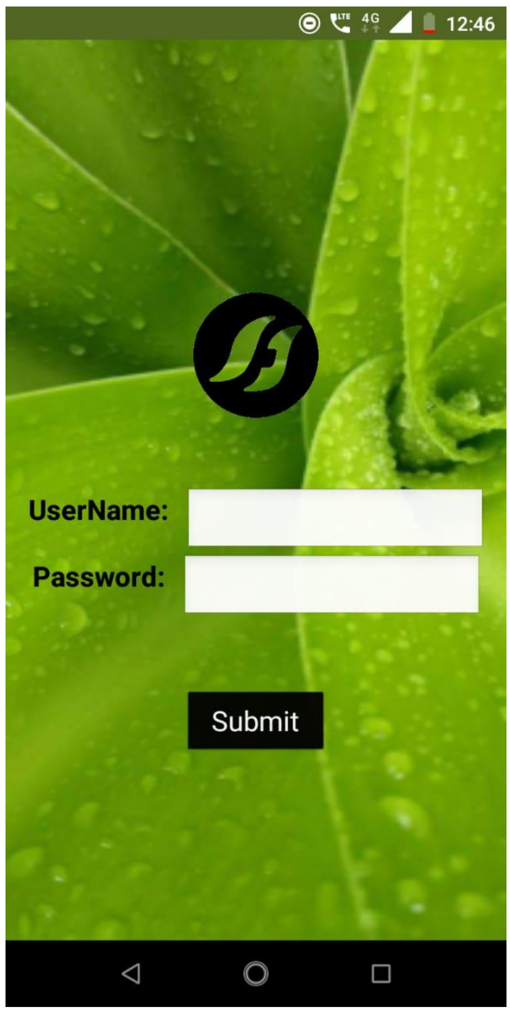
**A mobile application is build which consists of,**

- Values of Humidity, Temperature, Soil Moisture
- Motor ON and Motor OFF buttons

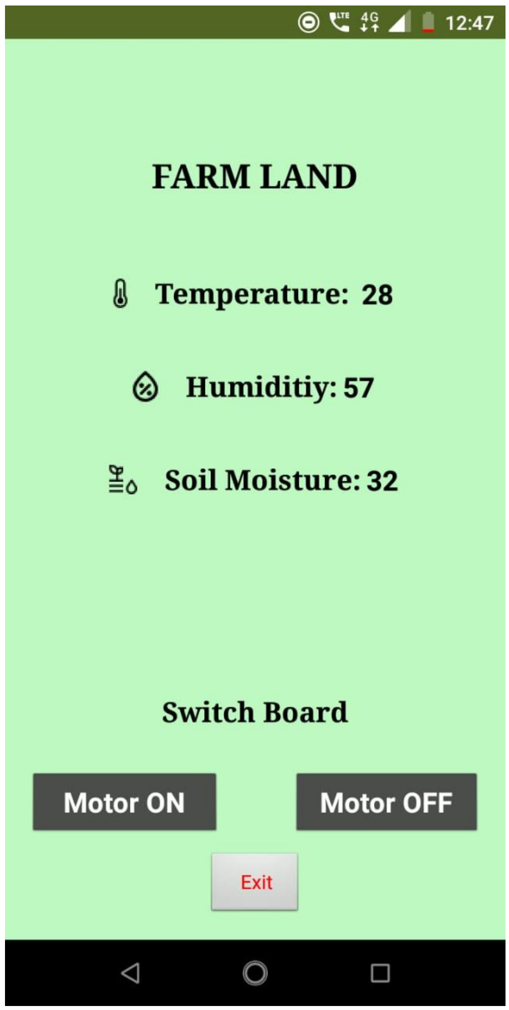
The mobile app allows the user to login and control their farm land by observing the Sensor values received. Motor can be turned ON and OFF manually by the user.

**Step 1:**
Front page of the app be like. (SCREEN 1)

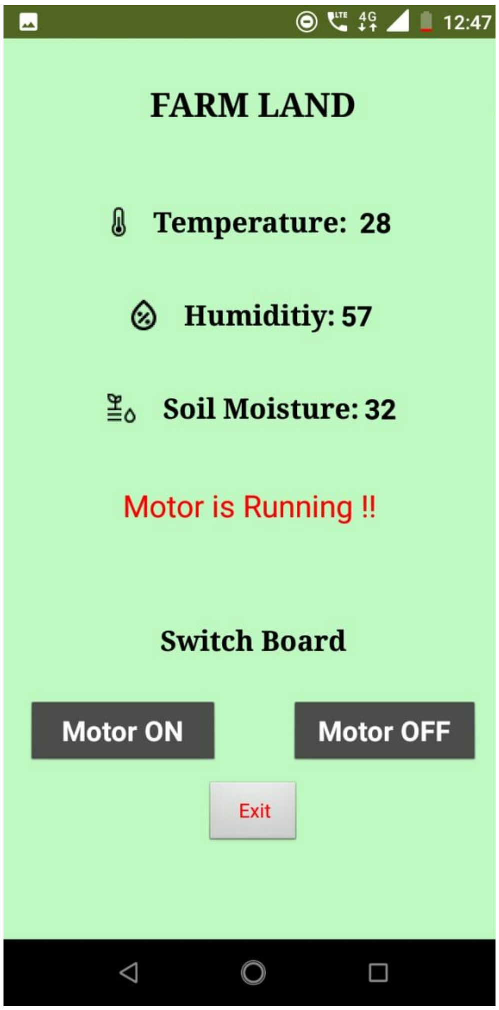
**Step 2:**
The user login to the app by entering the user name and the password. The is configured only for the requested user as the sensor values varies from field to field. (SCREEN 2)

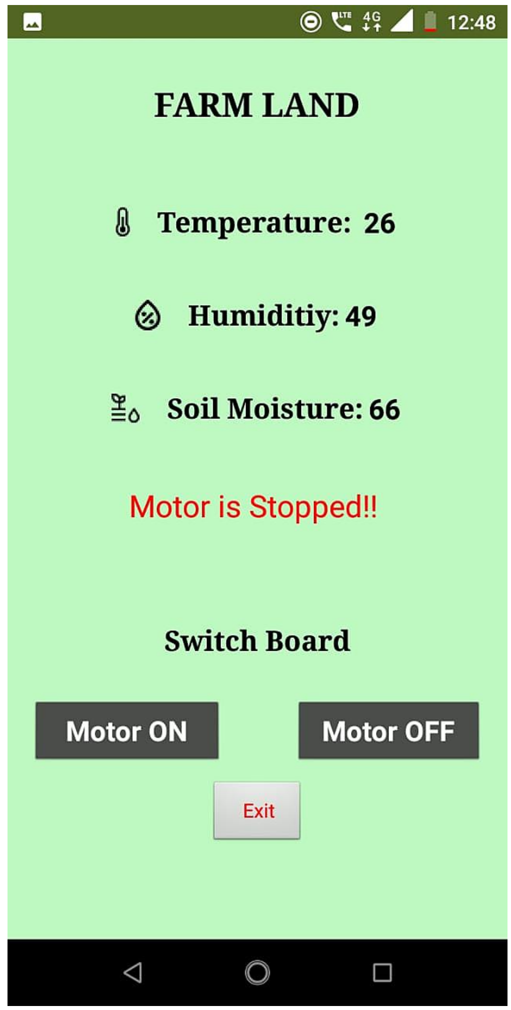


**Step 3:**
Once you login to the app the sensor values of the farm is displayed. And motor can be turned ON and OFF based on the values of the sensor. (SCREEN 3)



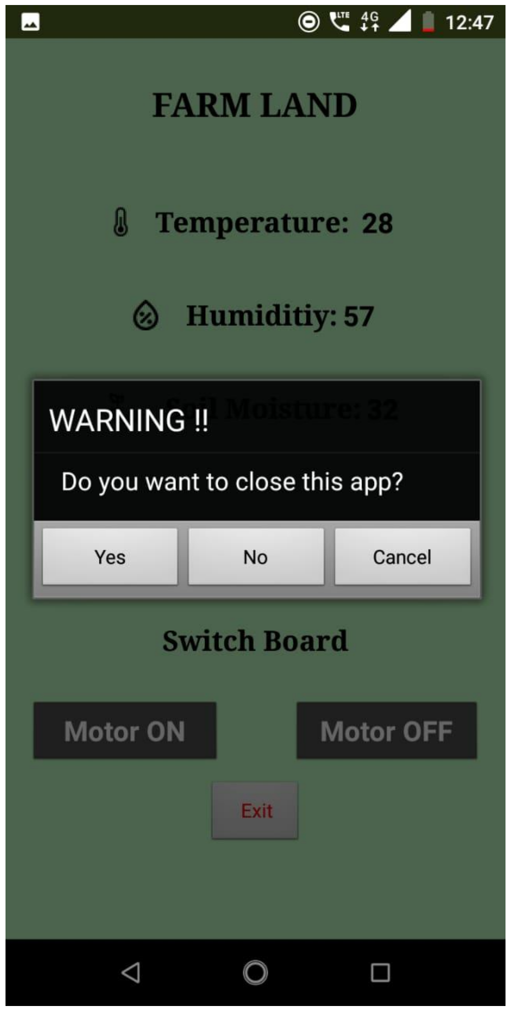
**Step 4:**
The motor has been turned ON and OFF based on the sensor values by clicking the buttons. (SCREEN 3)



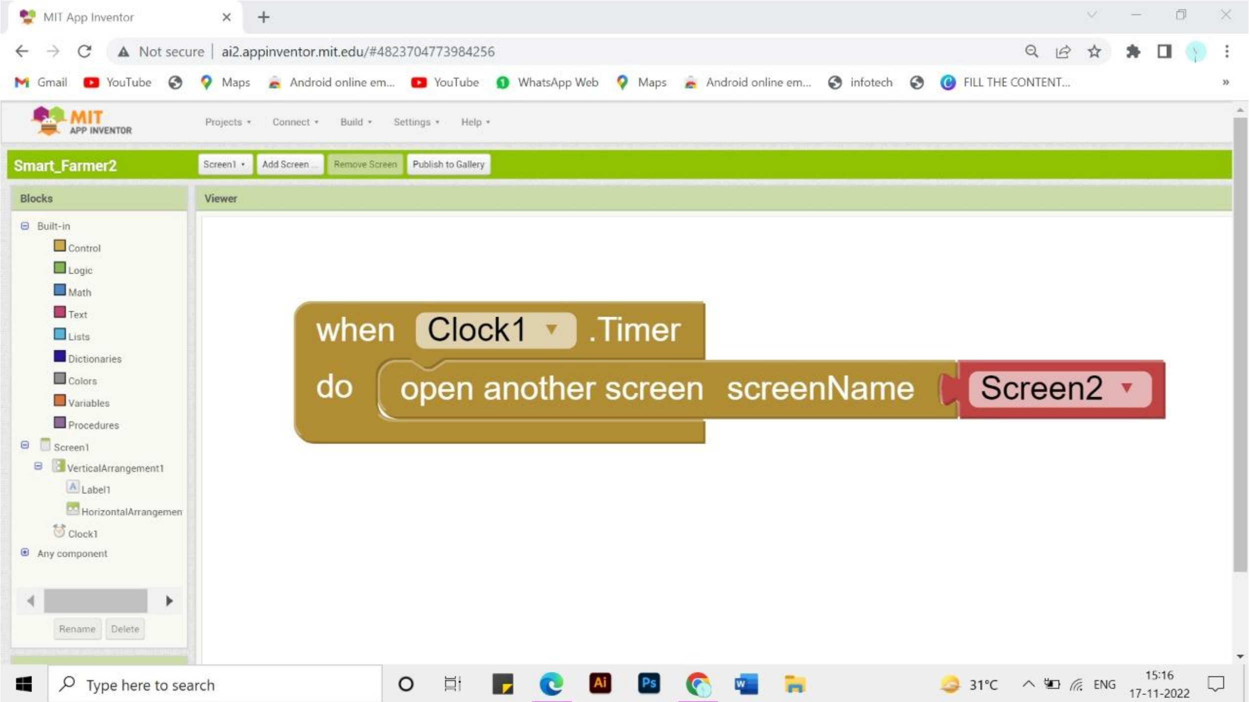
**Step 5:**

Exit button is used to terminate the application. It asks for 3 options Yes, No, Cancel.

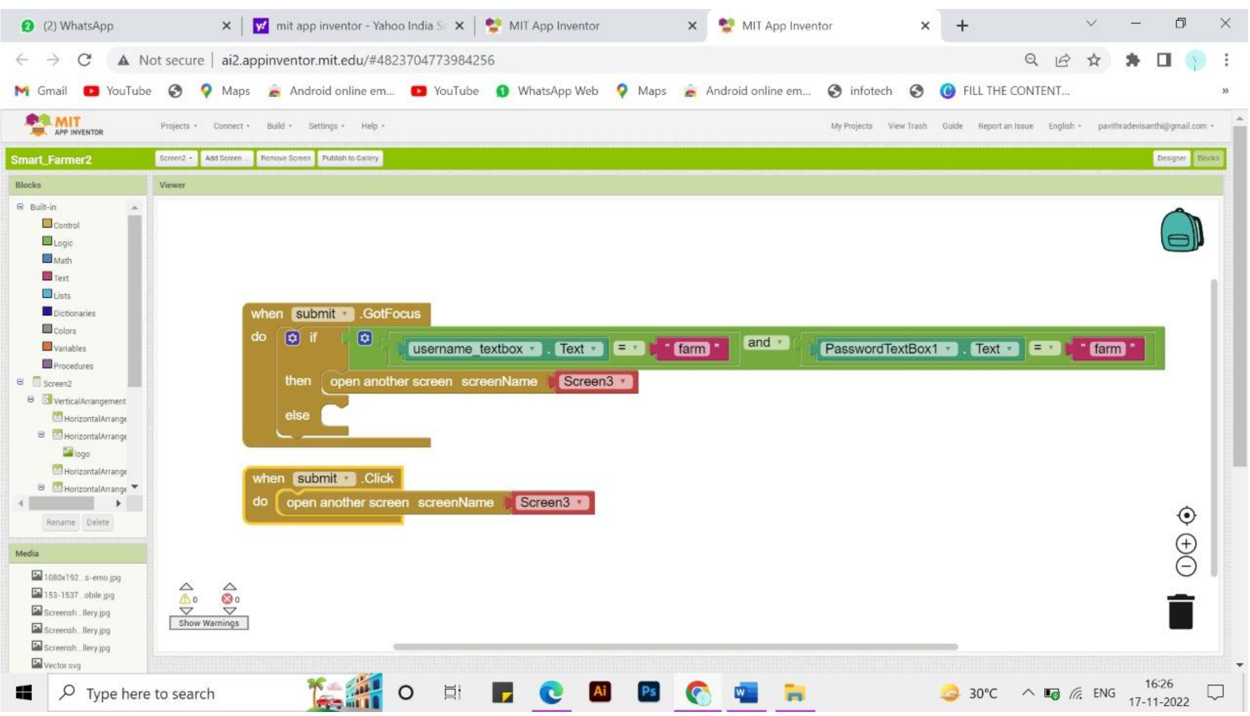


**Block codes of App :**

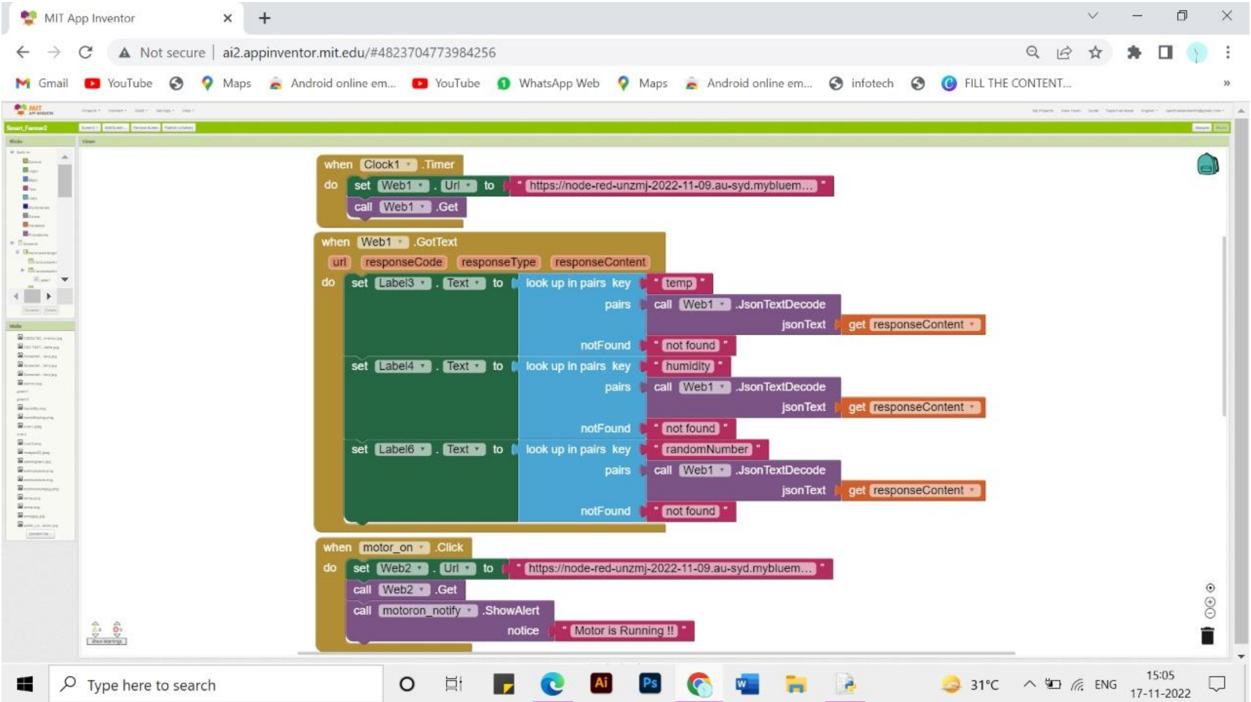
**Screen 1 :**



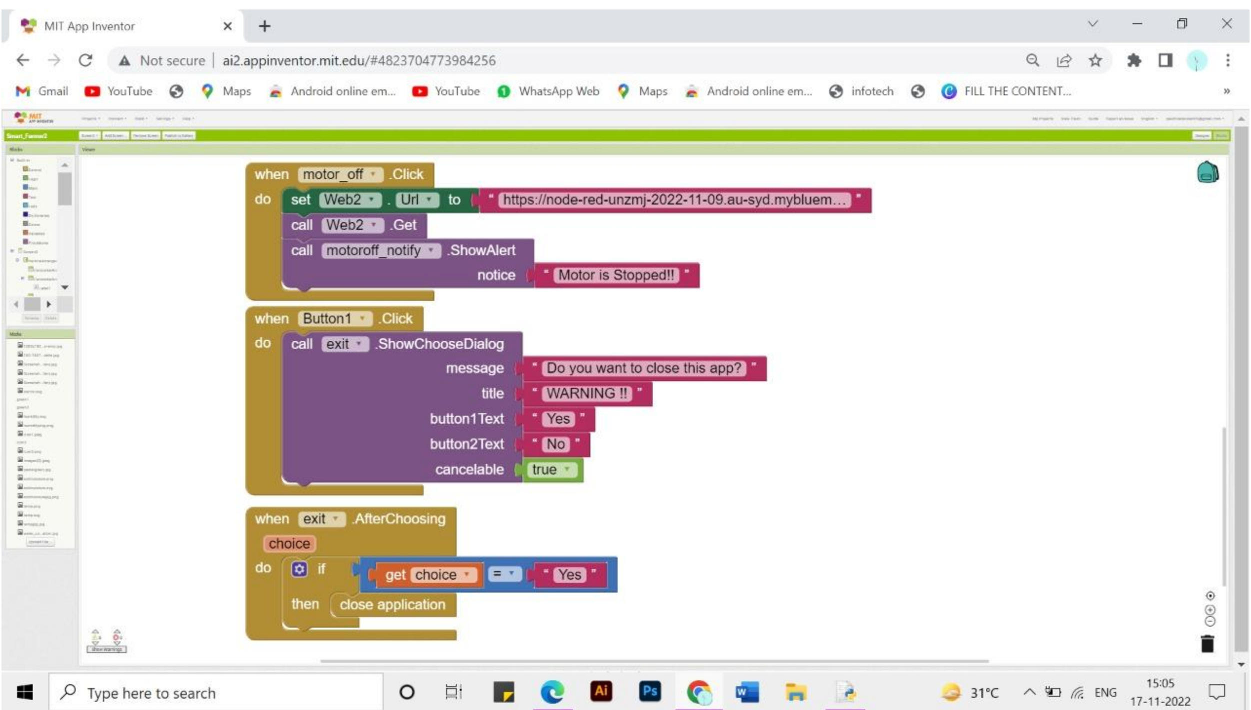

**Screen 2 :**



**Screen 3 :**



when Clock1 .Timer
do set Web1 . Url to "https://node-red-unzmj-2022-11-09.au-syd.mybluem..."
call Web1 .Get
when Web1 .GotText
url responseCode responseType responseContent
do set Label3 . Text to look up in pairs key "temp"
pairs call Web1 .JsonTextDecode
jsonText get responseContent
notFound "not found"
set Label4 . Text to look up in pairs key "humidity"
set Label6 . Text to look up in pairs key "randomNumber"
when motor_on .Click
do set Web2 . Url to "https://node-red-unzmj-2022-11-09.au-syd.mybluem..."
call Web2 .Get
call motoron_notify .ShowAlert
notice "Motor is Running !!"

when motor_off .Click
do set Web2 . Url to "https://node-red-unzmj-2022-11-09.au-syd.mybluem..."
call Web2 .Get
call motoroff_notify .ShowAlert
notice "Motor is Stopped!!"
when Button1 .Click
do call exit .ShowChooseDialog
message "Do you want to close this app?"
title "WARNING !!"
button1Text "Yes"
button2Text "No"
cancelable true
when exit .AfterChoosing
choice
do if get choice = "Yes"
then close application

# 8. TESTING

## 8.1 Test case report

| Test case ID | Feature type | Component | Test scenario | Pre requisite | Steps to execute | Expected result | Actual result | Status | Executed by |
|---|---|---|---|---|---|---|---|---|---|
| Home page_01 | Functional | Home page | Verify user can see the home page. | App should be install on mobile. | The app will enter the home page | Home page should be displayed | Working as expected | Pass | Charulatha H |
| Login page_02 | Functional | Login page | Verify user can view the login page | Go to the login button | 1.Enter username and password 2.Click on login button below the info page 3.Verify login with below UI elements a.Username b.Passsword c.Login button | Application should go to the info page after successfully logging in | Working as expected | Pass | Deepika R |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Login page_ 03 | UI | Login page | Verify user can login into application with valid credentials | The user should be navigated from the home page | 1.Enter valid username In text box 2.Enter valid password in password text box. 3.Click on login button | User should navigate to app info page | Working as expected | Pass | Pavithra Devi V R |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Info page_ 04 | Functional | Info page | Verify user can give the information about the Farmland. | The user should successfully login from the login page. | 1.Enter the info page 2.The user can know about the farmland 3.The user can also exit from the login page. | 1.Application should monitor parameter and exit button. 2.When clicked parameter button the user should navigate to the main page. | Working as expected | Pass | Ramya K G |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Main page_ 05 | Functi onal | Main page | 1.Verify user can monitor the paramet ers from the main page. 2.Verify user can control the motor function through the main page. | The user needs to success fully navigat ed from the info page. | 1.Enter the main page 2.Click on motor control button to control the motor remotely from the mobile. 3.Click on exit button to complete ly exit from the applicati on. | 1.The user can able to view the parameters of the field remotely from anywhere. 2.User can also control the motor remotely from anywhere to regulate water in fields. | Worki ng as expect ed | Pass | Charulatha H Deepika R Pavithra Devi V R Ramya K G |

## 8.2 User Acceptance Testing

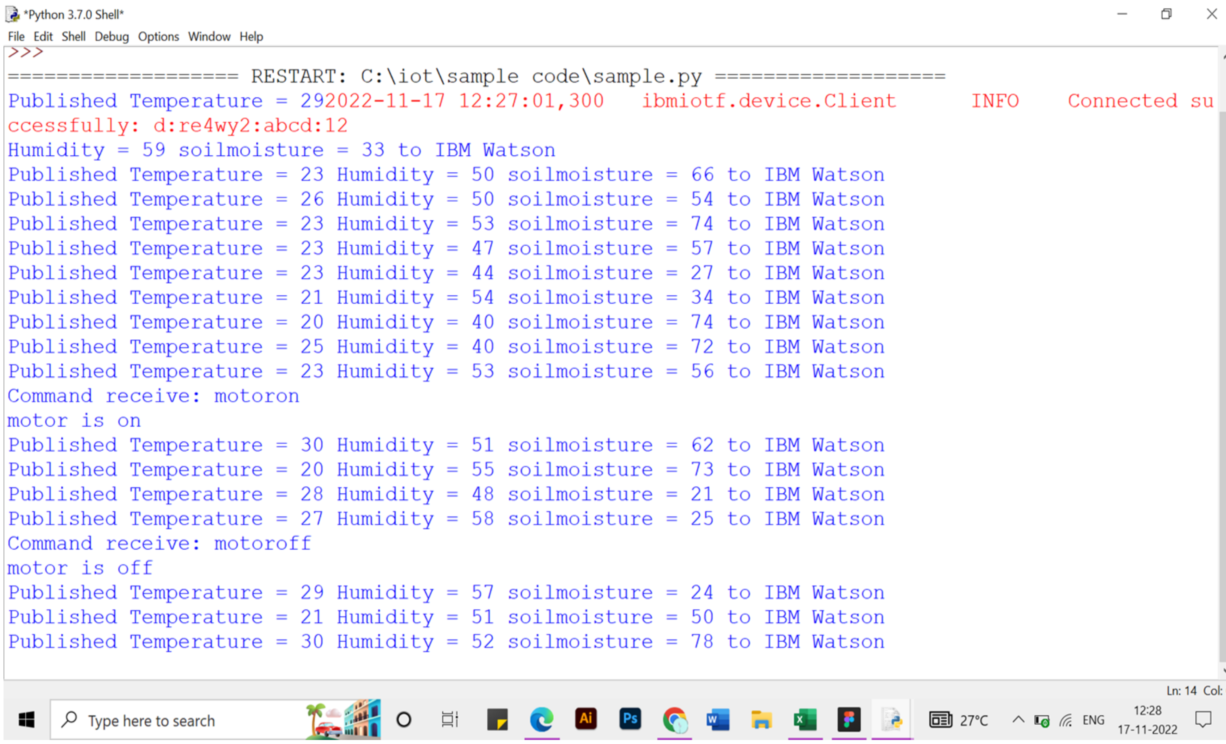
| Resolution | Severity 1 | Severity 2 | Severity 3 | Severity 4 | Sub Total |
|---|---|---|---|---|---|
| By Design | 3 | 0 | 0 | 0 | **3** |
| Duplicate | 0 | 0 | 0 | 0 | **0** |
| External | 4 | 0 | 2 | 0 | **6** |
| Fixed | 7 | 1 | 2 | 0 | **10** |
| Not reproduced | 4 | 1 | 0 | 0 | **5** |
| Skipped | 1 | 0 | 0 | 0 | **1** |
| Won’t Fix | 0 | 0 | 0 | 0 | **0** |
| Totals | **19** | **2** | **4** | **0** | **25** |

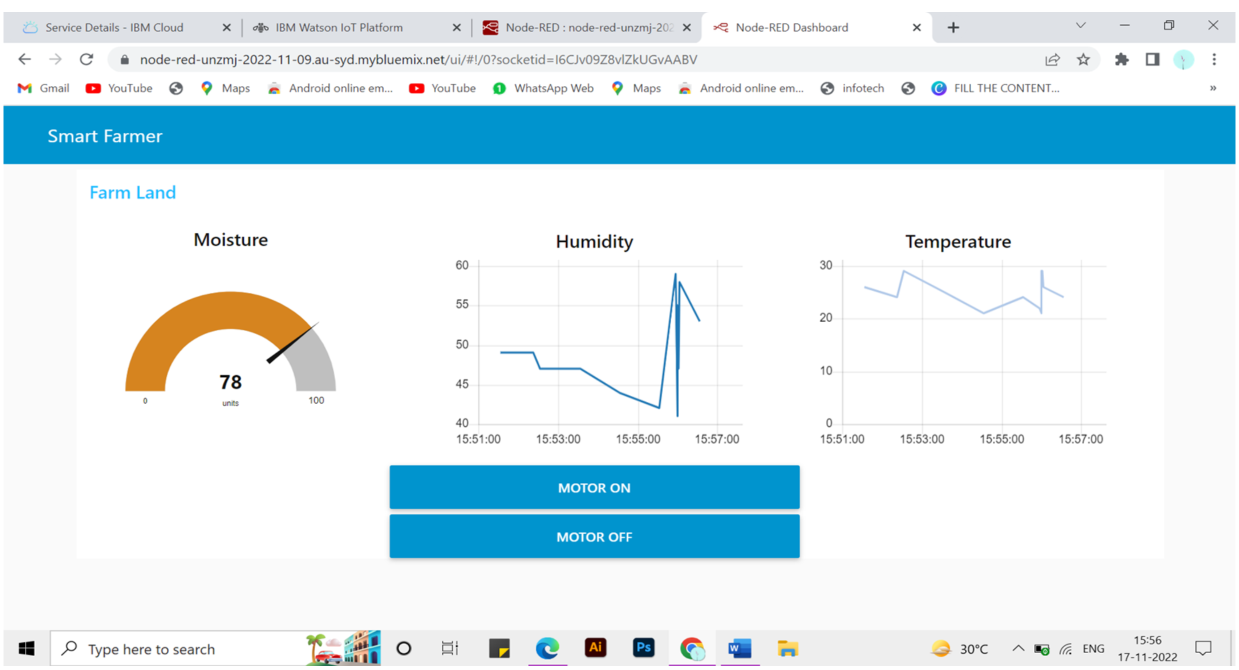
| Section | Total Cases | Not Tested | Fail | Pass |
|---|---|---|---|---|
| Temperature and Humidity Sensor | 25 | 0 | 0 | 25 |
| Soil Moisture | 10 | 0 | 0 | 10 |
| Transmission of data to IBM Cloud | 3 | 0 | 1 | 2 |
| User login in Mobile Application | 10 | 0 | 0 | 10 |
| Accessing the Parameters in Mobile App | 15 | 0 | 2 | 13 |
| Controlling the Motor from the Mobile App | 5 | 0 | 0 | 5 |
| Viewing the parameters in the Node RED | 5 | 0 | 0 | 5 |
| Controlling the Motor from Node RED | 3 | 0 | 0 | 3 |

# 9. RESULTS

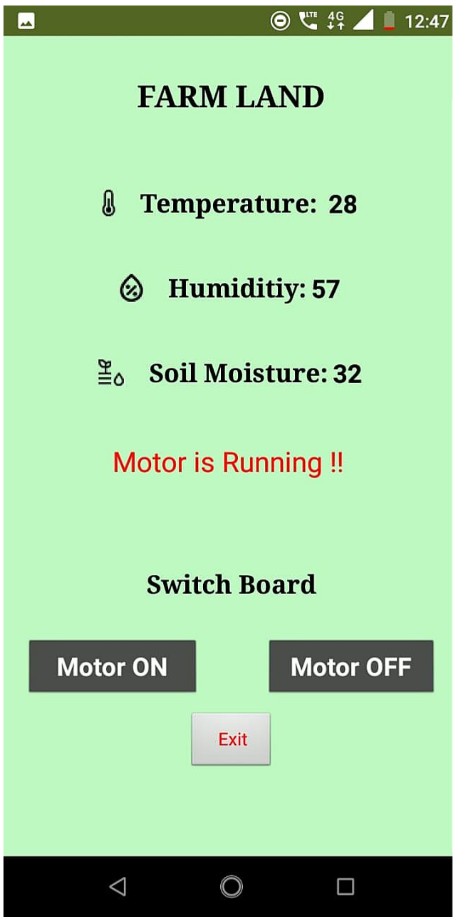
## 9.1 Performance metrices

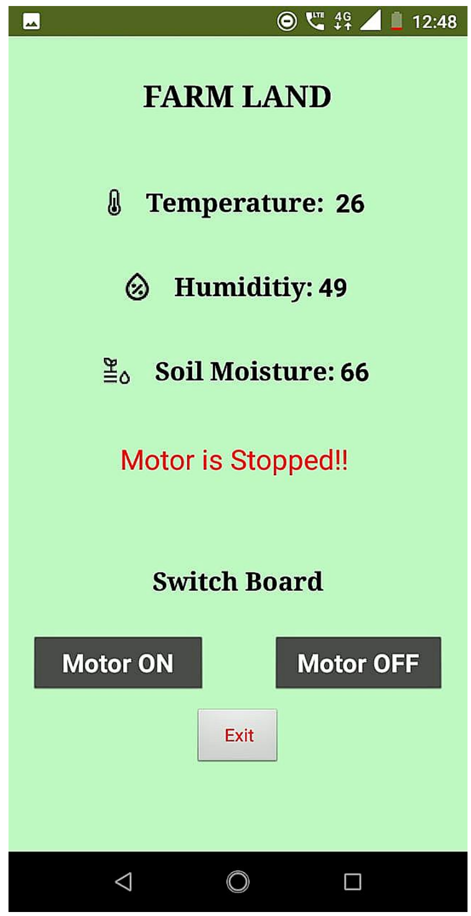
### WEB APPLICATION



# MOBILE APPLICATION



# 10 ADVANTAGES & DISADVANTAGES

## Advantages:

1. Precision farming methodologies are used.
2.People 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.
3.Automation of watering crops reduces human intervention.
Automation made the work easier for everyone who does cropping in larger are used.

4.Tons of data can be collected via smart agricultural sensors.
5.Cost management and Waste reduction.
6.Lower production risk due to better control over the internal process.
7.Process automation provides increased business efficiency.
8.Enhanced product volume and quality.

## Disadvantages:

1.Internet Connectivity is mandatory.
2.Security risk in relation to data and fraud.

# 11. CONCLUSION

So after knowing about some IOT applications in agriculture, we can say that it is definitely revolutionize the agriculture industry in a few years. IOT has been applied in several areas of agriculture. A lot of research is underway to ensure more IOT devices are used to make the managing of farms easier and increase productivity. IOT is allowing farmers to easily obtain data that is useful in many ways such as decision making. With the increasing demand for food due to the rapid population increase, we expect more IOT applications in the next few years.The system uses information from soil moisture sensors to irrigate the soil to avoid the damage of crops due to over irrigation or under irrigation. The project provided us with an opportunity to study the existing systems, along with their features and drawbacks. Future work includes the usage of the application in the native languages. Also giving notifications in native audio format to assist the farmers.

# 12. FUTURE SCOPE

The future scope of IOT is bright and varied, and it is only a matter of time before the above applications of the technology are realized.
The project will be enchaned with extra sensors and crops will be monitored with drones. As a result, farmers and associated brands can easily monitor the field conditions from anywhere remotely without any hassle.

# 13. APPENDIX

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2.Bhasha, S. J., & Hussain, S. M. Agricultural field monitoring and automation using PIC16F877A microcontroller and GSM. international Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume,

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## SOURCE CODE

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
#IBM Watson Device Credentials
organization = "re4wy2" #replace with org ID
deviceType = "abcd"
deviceId = "12"
authMethod = "token"
authToken = "12345678"
#Receives Command fro Node-RED
def myCommandCallback(cmd): #gets data from ibm cloud to python
print("Command receive: %s" % cmd.data['command'])
status=cmd.data['command']
if status=="motoron":
print("motor is on")
elif status=="motoroff":
print ("motor is off")
else :
print("please send proper command")
try:
deviceOptions = {"org": organization, "type": deviceType, "id":
deviceId, "auth-method":authMethod, "auth-token":authToken}
deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
print("Caught exception connecting device: %s" %str(e))
Sys.exit()
#Connect and send a datapoint
deviceCli.connect()
```

```
while True:
#Get sensor data from DHT11
temp=random.randint(20,30)
humidity=random.randint(40,60)
randomNumber=random.randint(21,80)data = {'temp':temp, 'humidity':humidity,
'randomNumber':randomNumber}
#print data
def myOnPublishCallback():
print("Published Temperature = %s" % temp, "Humidity = %s" %
humidity, "soilmoisture = %s" % randomNumber, "to IBM Watson")
success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish = myOnPublishCallback())
if not success:
print("NOT CONNECTED TO IoTF")
time.sleep(5)
deviceCli.commandCallback = myCommandCallback
#disconect the device and application from the cloud
deviceCli.disconnect()
```

## GITHUB LINK

**https://github.com/IBM-EPBL/IBM-Project-1371-1658386275**

## PROJECT DEMO LINK

**https://drive.google.com/file/d/1y_Re5kOXalesdpnT1UJveuoQ9OLC-q3H/view?usp=drivesdk**

**https://youtu.be/MWrWFIxhgwU**

## APPLICATION LINK

**https://node-red-unzmj-2022-11-09.au-syd.mybluemix.net/ui/#!/0?socketid=1iQ8MyJ0AuMtOSj2AABb**

**https://drive.google.com/file/d/1rmFHvNbXLdPe7pkef0KsA700ZEdYZdqu/view?usp=drivesdk**