SMARTFARMER – IOT ENABLED SMART FARMING APPLICATION

NALAIYA THIRAN PROJECT BASED LEARNING ON PROFESSIONAL READLINESS FOR INNOVATION, EMPLOYNMENT AND ENTERPRENEURSHIP

A PROJECT REPORT

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NOVEMBER 2022

BONAFIDE CERTIFICATE

This is to certify that the project report "**SMART FARMER – IoT ENABLED SMART FARMING APPLICATION"** is the bonafide record of a Nalaiya Thiran work done by **SUBHAN BASHA.Z (611819104048), SARAVANAN.M (611819104039), SEETHARAMAN.A (611819104040), SUNIL.S (611819104049)** who carried out the research under my supervision.

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INTERNAL EXAMINER **EXTERNAL EXAMINE**

ACKNOWLDGEMENT

At this pleasing moment of having successfully completed my Project, I wish to convey our sincere thanks and gratitude to our beloved Chairman, **Dr. P. SELVAM, M.A., B.Ed., M.Phil., Ph.D.,** who provided all the facilities And support to me.

I would like to express my sincere thanks to my beloved Principal **Dr. P. LAWRENCE, M.E., Ph.D.**, for forwarding us to do our project and offering adequate duration in completing my project.

We offer our sincere thanks to **Prof. B. SAKTHIVEL**., **M.E.,(Ph.D).,** Head of the Department of Computer Science and Engineering for providing all thefacilities in the successful completion of my project.

I have great pleasure to express my sense of gratitude to our Evaluator Guide **Dr. S. CHANDRA SEKARAN, M.E,Ph.D.,** Professor, Department of Computer Science for being the great inspiration to us.

Last but not least the whole thing will be incomplete if we don't acknowledge our beloved Parents who are everything for us.

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ABSTRACT

- Internet of Things (IoT) technology has brought revolution to each and every field of common man's life by making everything smart and intelligent. IoT refers to a network of things which make a self-configuring network. The development of Intelligent Smart Farming IoT based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage.
- The aim / objective of this report is to propose IoT based Smart Farming System assisting farmers in getting Live Data (Temperature, Soil Moisture) for efficient environment monitoring which will enable them to increase their overall yield and quality of products. The IoT based Smart Farming System being proposed via this report is integrated with Arduino Technology mixed with different Sensors and a Wifi module producing live data feed that can be obtained.
- 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.

CHAPTER 1

SMARTFARMER

IOT ENABLLEDSMARTFARMINGAPPLICATION

INTRODUCTION

1.1 PROJECT OVERVIEW

Agriculture is done in every country from ages. Agriculture is the science and art of cultivating plants. Agriculture was the key development in the rise of sedentary human civilization. Agriculture is done manually from ages. IOT plays a very important role in smart agriculture. IOT sensors are capable of providing information about agriculture fields. we have proposed an IOT and smart agriculture system using automation. This IOT based Agriculture monitoring system makes use of wireless sensor networks that collects data from different sensors deployed at various nodes and sends it through the wireless protocol. This smart agriculture using IOT system is powered by Arduino, it consists of Temperature sensor, Moisture sensor, water level sensor. When the IOT based agriculture monitoring system starts it checks the water level, humidity and moisture level. It sends SMS alert on the phone about the levels

The objectives of this report is to proposed IoT based Smart Farming System which will enable farmers to have live data of soil moisture environment temperature at very low cost so that live monitoring can be done.

1.2 PURPOSE:

Smart farming is a management concept focused on providing the agricultural industry with the infrastructure to leverage advanced technology – including big data, the cloud and the internet of things (IoT) – for tracking, monitoring, automating and analyzing operations

CHAPTER 2
LITRATURE SURVEY

2.1 EXISTING PROBLEM :

IoT's Smart Farming improves entire farming systems by monitoring fields in real time. With the help of sensors and internet connectivity, the Internet of Things in culture has not only saved the celebrity era, but has also encouraged the abuse of resources such as water and electricity. Climate plays a very important role in agriculture. Mis-knowledge of climate also significantly reduces the quantity and quality of crop production. Precision agriculture/precision farming is one of his best known applications of IoT in agriculture. It enables smart farming applications such as livestock monitoring, field observation, and inventory monitoring, making farming practices more precise and controllable. To make greenhouses smart, IoT has enabled weather stations to automatically adjust climate conditions according to a specific set of instructions. IoT implementation in the greenhouse eliminated human intervention, making the whole process more cost-effective and more accurate.

2.2REFERENCES

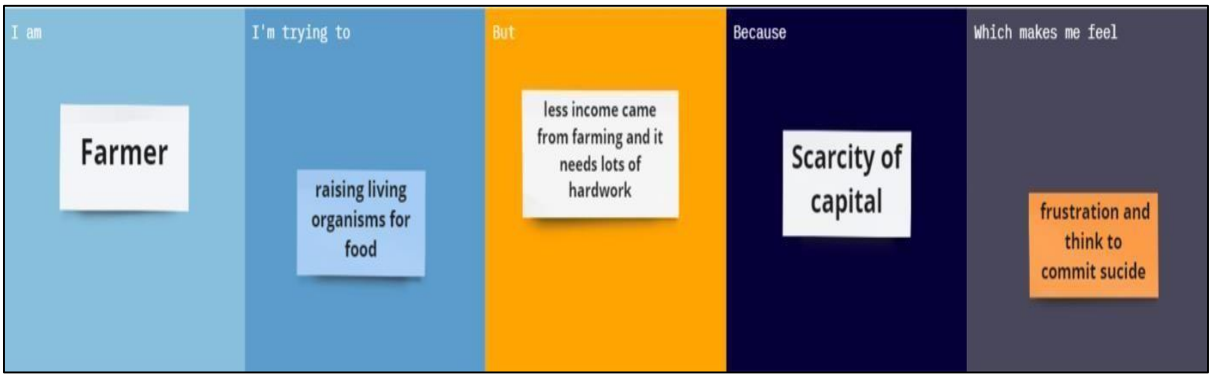
1.Zuraida Muhammad, Muhammad Azri Asyraf Mohd Hafez, Nor Adni MatLeh, Zakiah Mohd Yusoff , Shabinar Abd Hamid [1] The term "Internet of Things" refers to the connection of objects,equipment, vehicles, and other electronic devices to a network for the purpose of data exchange (IoT).The Internet of Things (IoT) is increasingly being utilised to connect objects and collect data.

2.Divya J., Divya M.,Janani V. [2] Agriculture is essential to India's economy and people's survival.The purpose of this project is to create an embedded-based soil monitoring and irrigation system that will reduce manual field monitoring and provide information via a mobile app. The method is intended to help farmers increase their agricultural output. A pH sensor, a temperature sensor, and a humidity sensor are among the tools used to examine the soil. Based on the findings, farmers may plant the bestcrop for the land.

3.H.G.C.R. Laksiri, H.A.C. FDharmagunawardhana, J.V. Wijayakulasooriya [3] Development of an effective loT-based smart irrigation system is also a crucial demand for farmers in the field of agriculture. This research develops a low-cost, weather-based smart watering system. To begin, an effective drip irrigation system must be devised that can automatically regulate water flow to plants based on soil moisture levels. Then, to make this water-saving irrigation system even more efficient, an IoT-based communication feature is added, allowing a remote user to monitor soil moisture conditions and manually adjust water flow.

2.3 PROBLEM STATEMENT SOLUTION

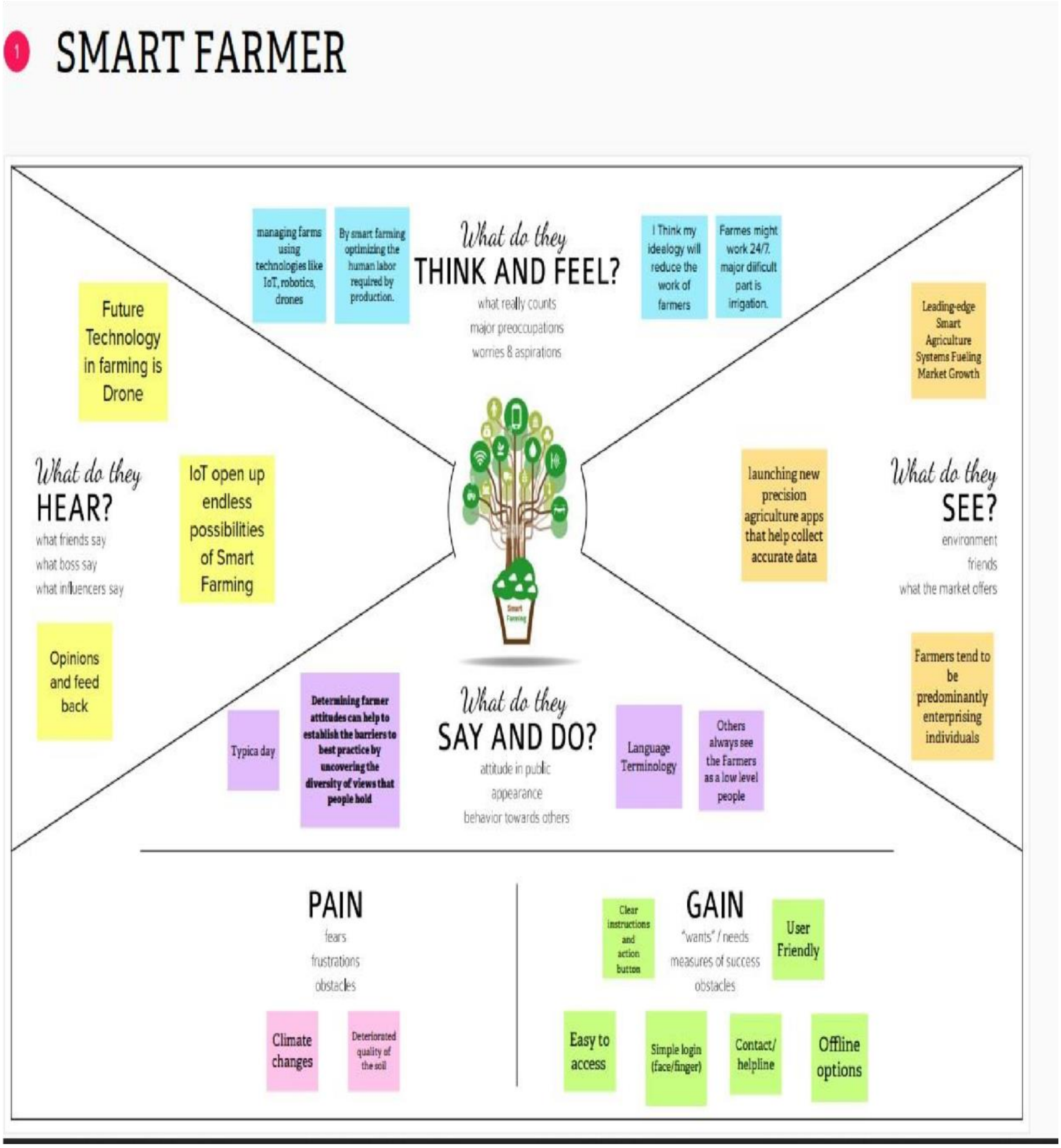
Traditional agriculture and related sectors are unable to meet the demands of modern agriculture, which requires high yield, quality and efficient production. Therefore, it is very important to look to modernize existing methods and use information technology and data over a period of time to predict the best possible productivity and country-suitable crops. The introduction of high-speed internet, mobile devices, and access to reliable and low-cost satellites is just some of the key technologies characterizing the precision farming trend in agriculture. Precision agriculture is one of his best-known applications of IoT in the agricultural sector, with many organizations around the world using the technology. Products and services used include VRI Optimization, Soil Moisture Probes and Virtual Optimizer PRO. Optimize variable rate irrigation (VRI) to maximize profitability, improve yields and increase water efficiency in irrigated fields with variable terrain and soils. IoT is making great strides in areas such as manufacturing, healthcare, and automotive. When it comes to food production, transportation and storage, it offers a range of options to improve his per capita food availability in India. Sensors that provide information on soil nutrient status, pest infestation, moisture conditions, etc. can be used to improve crop yields over time. Here are some examples of problem areas related to agriculture and related sectors where IoT applications would benefit:



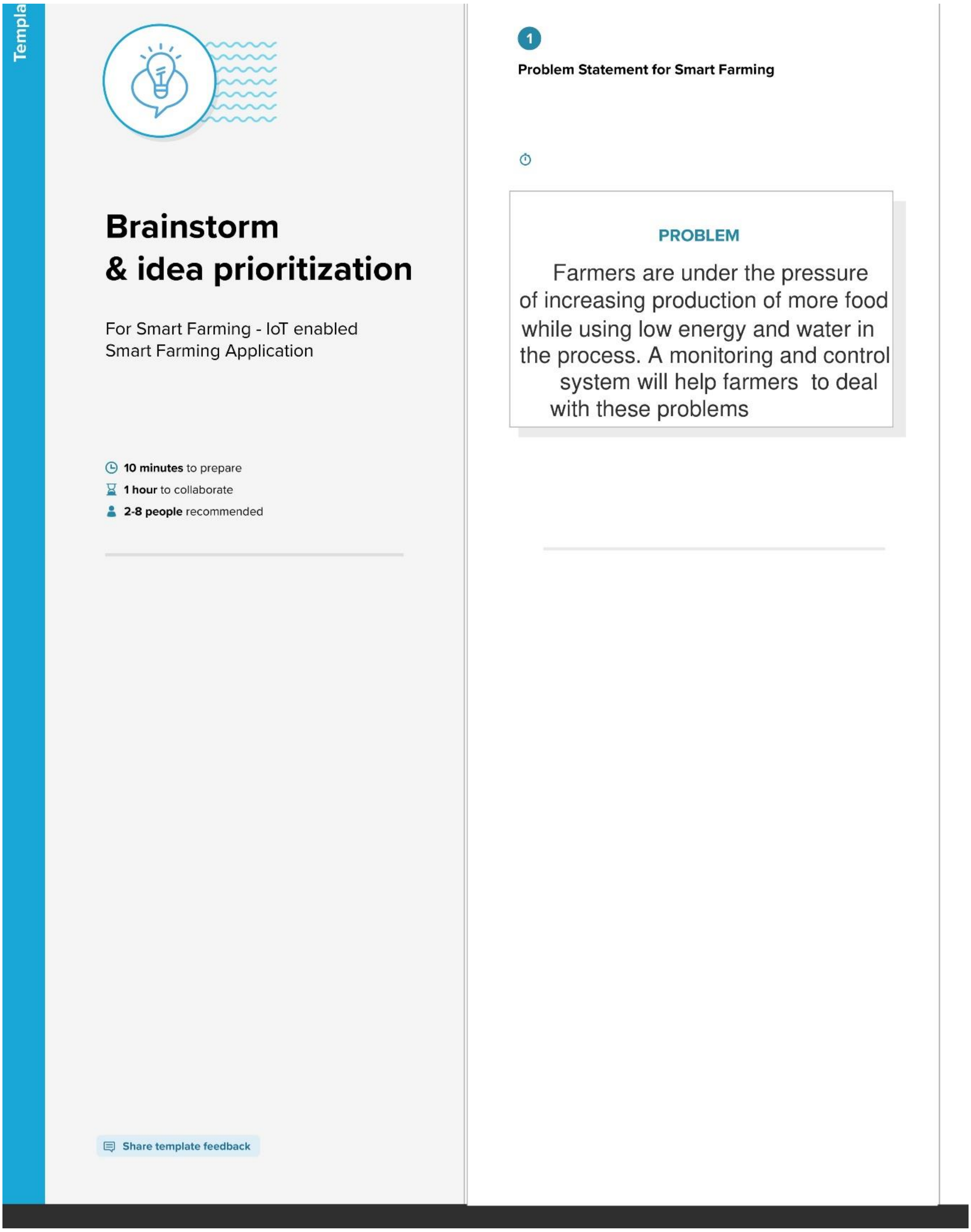
CHAPTER 3

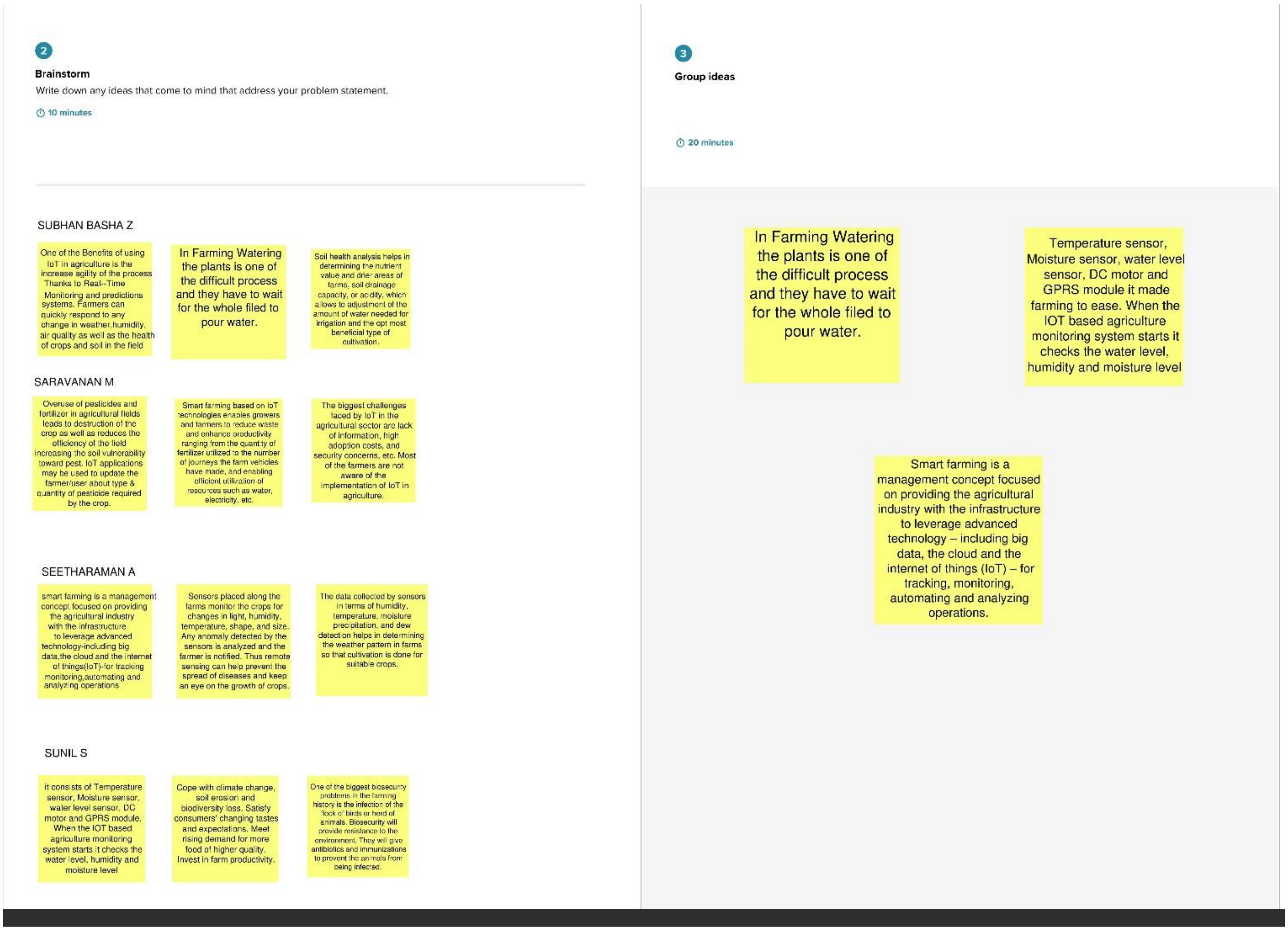
IDEATION AND PROPOSED SOLUTION

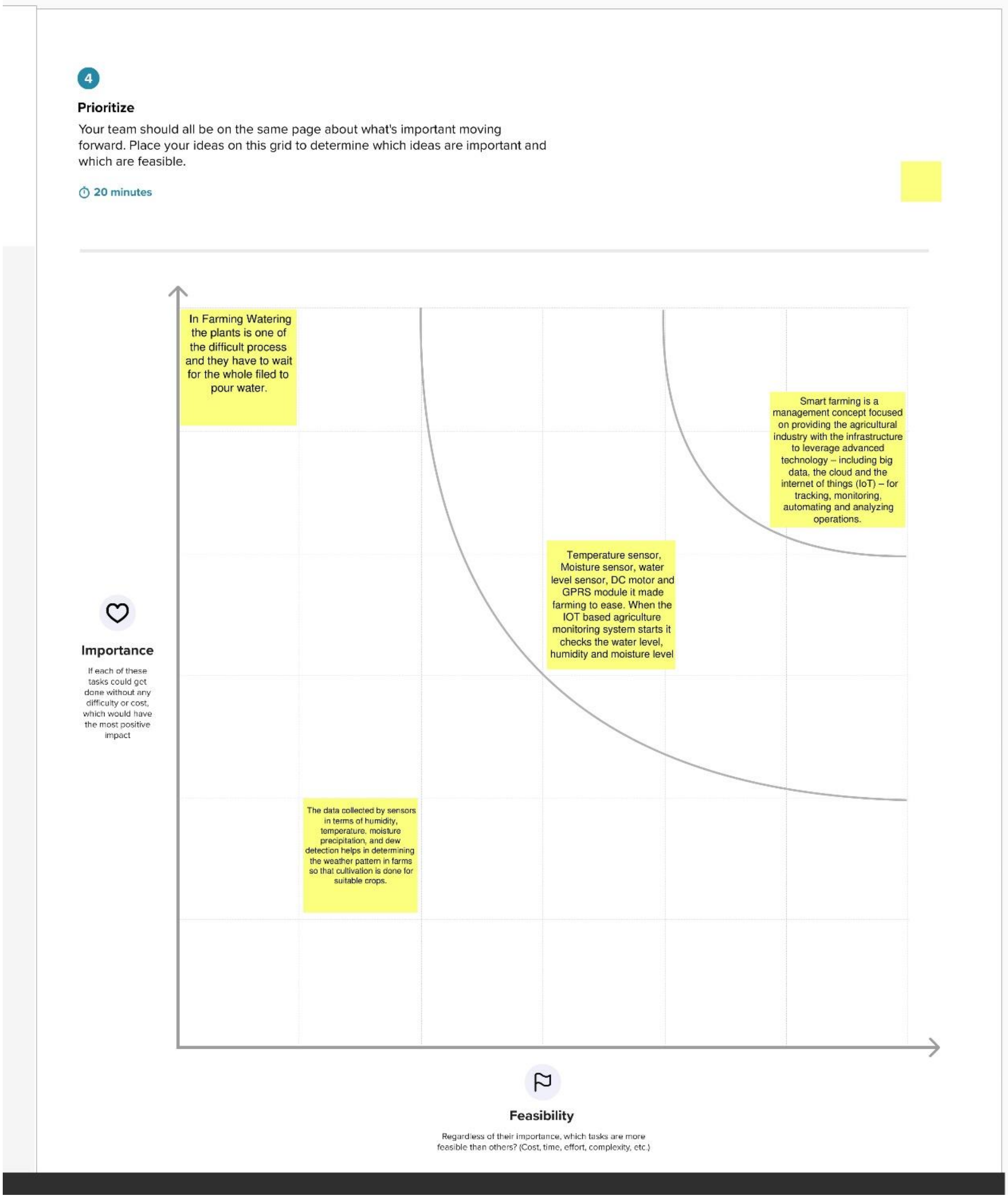
3.1 PREPARE EMPATHY MAP



3.2 IDEATION

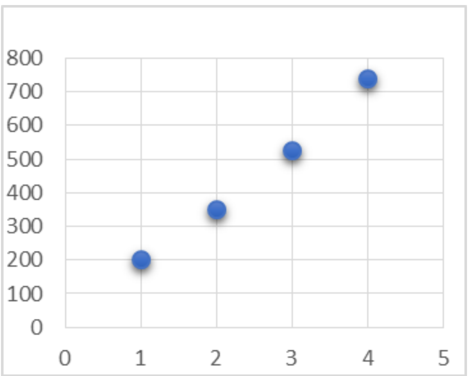

Templa
Brainstorm & idea prioritization
For Smart Farming - IoT enabled Smart Farming Application
10 minutes to prepare
1 hour to collaborate
2-8 people recommended
Share template feedback
1
Problem Statement for Smart Farming
PROBLEM
Farmers are under the pressure of increasing production of more food while using low energy and water in the process. A monitoring and control system will help farmers to deal with these problems


2
Brainstorm
Write down any ideas that come to mind that address your problem statement.
10 minutes
SUBHAN BASHA Z
One of the Benefits of using IoT in agriculture is the increase agility of the process Thanks to Real--Time Monitoring and predictions systems. Farmers can quickly respond to any change in weather.humidity. air quality as well as the health of crops and soil in the field
In Farming Watering the plants is one of the difficult process and they have to wait for the whole filed to pour water.
Soil health analysis helps in determining the nutrient value and drier areas of farms, soil drainage capacity, or acidity, which allows to adjustment of the amount of water needed for irrigation and the opt most beneficial type of cultivation.
SARAVANAN M
Overuse of pesticides and fertilizer in agricultural fields leads to destruction of the crop as well as reduces the efficiency of the field increasing the soil vulnerability toward pest. IoT applications may be used to update the farmer/user about type & quantity of pesticide required by the crop.
Smart farming based on IoT technologies enables growers and farmers to reduce waste and enhance productivity ranging from the quantity of fertilizer utilized to the number of journeys the farm vehicles have made, and enabling efficient utilization of resources such as water, electricity, etc.
The biggest challenges faced by IoT in the agricultural sector are lack of information, high adoption costs, and security concerns, etc. Most of the farmers are not aware of the implementation of IoT in agriculture.
SEETHARAMAN A
smart farming is a management concept focused on providing the agricultural industry with the infrastructure to leverage advanced technology-including big data,the cloud and the internet of things(IoT)-for tracking monitoring,automating and analyzing operations
Sensors placed along the farms monitor the crops for changes in light, humidity, temperature, shape, and size. Any anomaly detected by the sensors is analyzed and the farmer is notified. Thus remote sensing can help prevent the spread of diseases and keep an eye on the growth of crops.
The data collected by sensors in terms of humidity, temperature, moisture precipitation, and dew detection helps in determining the weather pattern in farms so that cultivation is done for suitable crops.
SUNIL S
it consists of Temperature sensor, Moisture sensor, water level sensor. DC motor and GPRS module. When the IOT based agriculture monitoring system starts it checks the water level, humidity and moisture level
Cope with climate change, soil erosion and biodiversity loss. Satisfy consumers' changing tastes and expectations. Meet rising demand for more food of higher quality. Invest in farm productivity.
One of the biggest biosecurity problems in the farming history is the infection of the flock of birds or herd of animals. Biosecurity will provide resistance to the environment. They will give antibiotics and immunizations to prevent the animals from being infected.
3
Group ideas
20 minutes
In Farming Watering the plants is one of the difficult process and they have to wait for the whole filed to pour water.
Temperature sensor, Moisture sensor, water level sensor, DC motor and GPRS module it made farming to ease. When the IOT based agriculture monitoring system starts it checks the water level, humidity and moisture level
Smart farming is a management concept focused on providing the agricultural industry with the infrastructure to leverage advanced technology – including big data, the cloud and the internet of things (IoT) – for tracking, monitoring, automating and analyzing operations.


4
Prioritize
Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.
20 minutes
In Farming Watering the plants is one of the difficult process and they have to wait for the whole filed to pour water.
Smart farming is a management concept focused on providing the agricultural industry with the infrastructure to leverage advanced technology – including big data, the cloud and the internet of things (IoT) – for tracking, monitoring, automating and analyzing operations.
Temperature sensor, Moisture sensor, water level sensor, DC motor and GPRS module it made farming to ease. When the IOT based agriculture monitoring system starts it checks the water level, humidity and moisture level
The data collected by sensors in terms of humidity, temperature. moisture precipitation, and dew detection helps in determining the weather pattern in farms so that cultivation is done for suitable crops.
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)	• Watering the field is a difficult process, Farmers have to wait in the field until the water covers the whole farm field. • Power Supply is also one of the problems. In Village Side, the power supply may vary. • The Biggest Challenges Faced by IoT in the Agricultural Sector are Lack of Information, High Adoption, Cost and Security Concerns, etc
2.	Idea / Solution description	• As is the case of precision Agriculture Smart Farming Technique Enables Farmers better to monitor the fields and maintain the humidity level accordingly. • 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.
3.	Novelty / Uniqueness	**ALERT MESSAGE** – IoT sensor nodes collect information from the farming environment, such as soil moisture, air humidity, temperature, nutrient ingredients of soil, pest images, and water quality, then transmit collected data to IoT backhaul devices. **REMOTE ACCESS –** It helps the farmer to operate the motor from anywhere.

4.	Social Impact / Customer Satisfaction	• Reduces the wages for labors who work in the agricultural field. • It saves a lot of time. • IoT can help improve customer relationships by enhancing the customer's overall experience. • Easily identify maintenance needs, build better products, send personalized communications, and more. • IoT can also help e-commerce businesses thrive and increase sales. It make a wealthy society
5.	Business Model (Revenue Model)	Revenue (No. of Users vs Months) User  Months
6.	Scalability of the Solution	Scalability in smart farming refers to the adaptability of a system to increase the capacity, for example, the number of technology devices such as sensors and actuators, while enabling timely analysis.

3.4 PROPOSED SOLUTIONFIT

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is youi customei?

The customei foi this pioduct is a faimei who giows ciops. Oui goal is to help them, monitoi field paiameteis iemotely. This pioduct saves agiicultuie fiom extinction.

6. CUSTOMER C

What constiaints pievent youi customeis fiom taking action oi limittheii choices of solutions? i.e. spending powei, budget, no cash, netwoikconnection, available devices.

Using a laige numbei of sensois is difficult. An unlimited oi continuous inteinet connection is iequiied foi success.

5. AVAILABLE SOLUTIONS AS

Which solutions aie available to the customeis whenthey face the pioblem oi need to get the job done? What have they tiied in the past? What pios & cons do these solutions have? i.e. pen and papei

The iiiigation piocess is automated using IoT. Meteoiological data and field paiameteis weie collected and piocessed to automate the iiiigation piocess. Disadvantages aie efficiency only ovei shoit distances, and difficult data stoiage.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which jobs-to-be-done (oi pioblems) do you addiess foi youi customeis? Theie could be moie than one; exploie diffeient sides.

The puipose of this pioduct is to use sensois to acquiie vaiious field paiameteis and piocess them using a cential piocessing system. The cloud is used to stoie and tiansmit data using IoT. The Weathei API is used to help faimeis make decisions. Faimeis can make decisions thiough mobile applications.

9. PROBLEM ROOT CAUSE

What is the ieal ieason that this pioblem exists? What is the back stoiy behind

Fiequent changes and unpiedictable weathei and climate made it difficult foi faimeis to engage in agiicultuie. These factois play an impoitant iole in deciding whethei to watei youi plants. Fields aie difficult to monitoi when the faimei is not at the field, leading to ciop damage.

7. BEHAVIOUR

What does youi customei do to addiess the pioblem and get the job done?
i.e. diiectly ielated: find the iight solai panel installei, calculate usage and benefits; indiiectly associated: customeis spend fieetime on volunteeiing woik (i.e. Gieenpeace)

Use a piopei diainage system to oveicome the effects of excess watei fiom heavy iain. Use of hybiid plants that aie iesistant to pests.

Focus on J&P, tap into BE, understand RC

3. TRIGGERS TR

What triggers customers to act? i.e., seeing their neighbor installing solar panels, reading about a more efficient solution in the news.

Faimeis stiuggle to piovide adequate iiiigation. Inadequate watei supply ieduces yields and affects faimeis' piofit levels. Faimeis have a haid time piedicting theweathei.

4. EMOTIONS: BEFORE / AFTER EM

How do customeis feel when they face a pioblem oi a job and afteiwaids?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

BEFORE: Lack of knowledge in weathei foiecasting →Random decisions →low yield.
AFTER: Data fiom ieliable souice → coiiect decision →high yield

10. YOUR SOLUTION SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

Oui pioduct collects data fiom vaiious types of sensois and sends the values to oui main seivei. It also collects weathei data fiom the Weathei API. The final decision to iiiigate the ciop is made by the faimeiusing a mobile application.

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE
What kind of actions do customeis take online? Extiact online channels fiom 7

8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

ONLINE: Pioviding online assistance to the faimei, in pioviding knowledge iegaiding the pH and moistuie level of the soil. Online assistance to be piovided to the usei in using the pioduct

OFFLINE: Awaieness camps to be oiganized to teach the impoitance and advantages of the automation and IoT in the development of agiicultuie.

CHAPTER 4

REQUIRMENT ANALYSIS

4.1 FUNCTIONAL REQUIRMENT

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR -3	Sensor Function for framing System	Measure the Temperature and Humidity Measure the Soil Monitoring Check the crop diseases
FR-4	Manage Modules	Manage Roles of User Manage User permission
FR-5	Check whether details	Temperature details Humidity details
FR-6	Data Management	Manage the data of weather conditions Manage the data of crop conditions Manage the data of live stock conditions

4.2 NON FUNCTIONAL REQUIRMENT

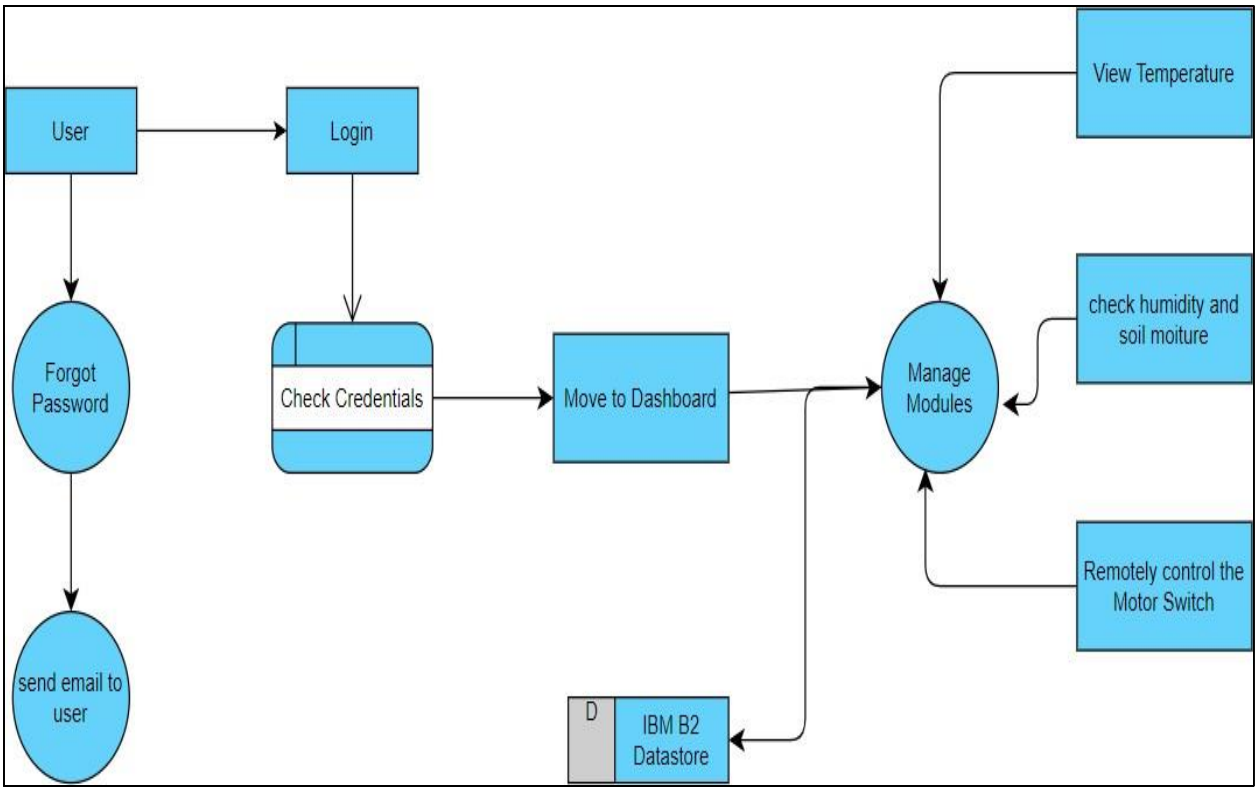
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	User friendly guidelines for users to avail the features. Most simplistic user interface for ease of use.
NFR-2	Security	All the details about the user are protected from unauthorized access. Detection and identification of any misfunctions of sensors.
NFR-3	Reliability	Implementing Mesh IoT Networks Building a Multi-layered defence for IoT Networks.
NFR-4	Performance	The use of modern technology solutions helps to achieve the maximum performances thus resulting in better quality and quantity yields.
NFR-5	Availability	This app is available for all platforms
NFR-6	Scalability	Scalability refers to the ability to increase available resources and system capability without the need to go through a major system redesign or implementation.

CHAPTER 5

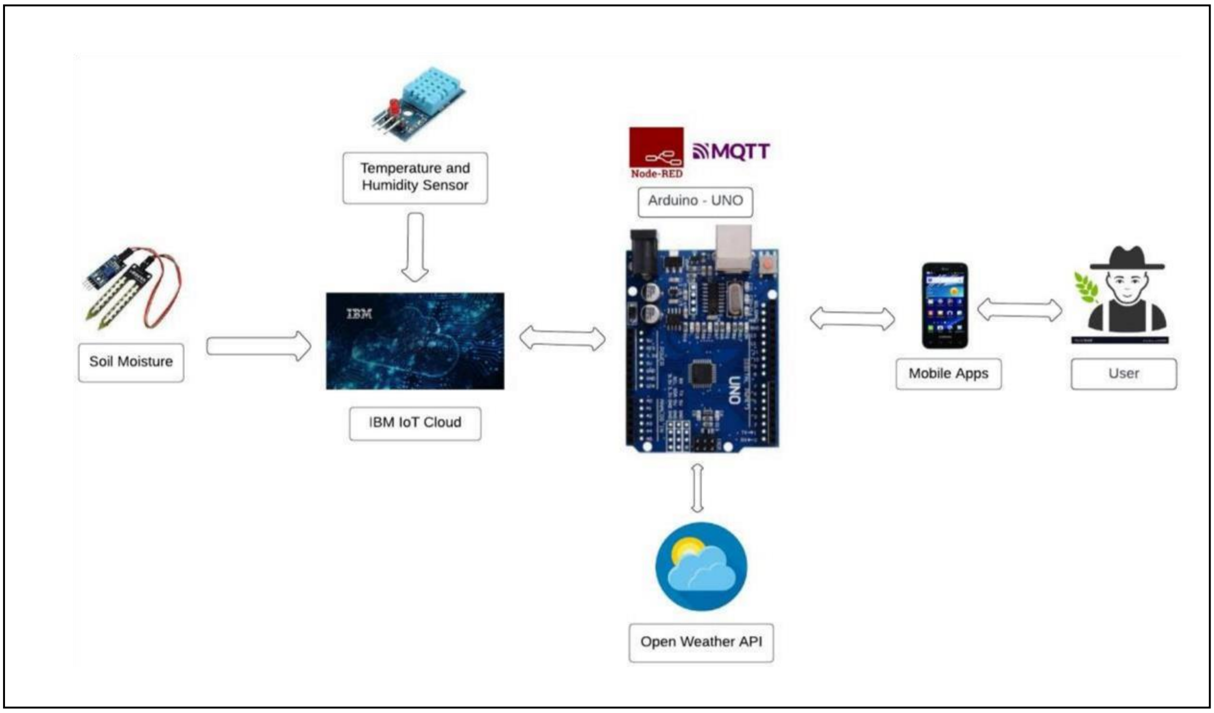
PROJECT DESIGN

5.1 DATAFLOW 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



5.2 SOLUTION ARCHITECTURE



- The different soil parameters (temperature, humidity, Soil Moisture) are sensed using different sensors, and the obtained value is stored in the IBM cloud.
- Arduino UNO is used as a processing unit that processes the data obtained from sensors and weather data from weather API.
- Node-red is used as a programming tool to wire the hardware, software, and APIs. The MQTT protocol is followed for 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 make a decision through an app, whether to water the crop or not depending upon the sensor values. By using the app they can remotely operate the motor switch

5.3 USER STORIES

User Type	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Acceptance criteria**	**Priority**	**Release**	**User Type**
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	Customer (Mobile user)
		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 Gmail		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)	Dashboard	USN-5	As a User can view the dashboard, and this dashboard include the check roles of access and then move to the manage modules.	I can view the dashboard in this smart farming application system.	High	Sprint 2	Customer (Web user)
		USN-6	User can remotely access the motor switch	In the smart farming app	High	Sprint 3	

CHAPTER 6

PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Simulation creation	USN-1	Connect Sensors and Arduino with code	2	High	Subhan Basha.Z
Sprint-2	Software	USN-2	Creating device in the IBM Watson IoT platform workflow for IoT Scenarios using NodeRED	2	High	Seetharaman.A
Sprint-3	MIT App Inventor	USN-3	Develop an application for the Smart farmer project using MIT App Inventor	2	High	Saravanan.M
Sprint-3	Dashboard	USN-3	Design the Modules and test the app	2	High	Saravanan.M
Sprint-4	Web UI	USN-4	To make the user to interact with software.	2	High	Vasanth, Selvabharathi

CHAPTER 7

CODING AND SOLUTION

7.1 FEATURE

Receiving commands from IBM cloud using C++ program

```
#include "Arduino.h"
#include "dht.h"
#include "SoilMoisture.h"
 #define dht_apin A0
#define organization = "sw4p6zc"
#define deviceType = "smartfarmer"
#define deviceId = "smartfarmer_1"
 #define authMethod = "use-token-auth
 #define authToken="123456789"
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";
char publishTopic[] = "iot-2/evt/abcd_1/fmt/json";char topic[] = "iot-
2/cmd/home/fmt/String";
char authMethod[] = "use-token-auth"; char token[]=TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;
const int sensor_pin = A1; //soil moistureint pin_out = 9;
dht DHT; int c=0; void setup()
{
pinMode(2, INPUT); //Pin 2 as INPUT pinMode(3, OUTPUT); //PIN 3 as OUTPUT
pinMode(9, OUTPUT);//output for pump
}
void
loop()
```

```
{
if (digitalRead(2) == HIGH)
{
digitalWrite(3, HIGH);        //turn   the   LED/Buzz   ON
delay(10000);  digitalWrite(3, LOW);        //  turn  the
LED/Buzz OFF delay(100); }

Serial.begin(9600); delay(1000);
DHT.read11(dht_apin); //temprature float h=DHT.humidity;

float t=DHT.temperature; delay(5000); Serial.begin(9600);
  float moisture_percentage; int sensor_analog;
sensor_analog = analogRead(sensor_pin);
moisture_percentage = ( 100 - ( (sensor_analog/1023.00) * 100
) ); float m=moisture_percentage; delay(1000);
if(m<40)//pump
{
while(m<
40)
{
digitalWrite(pin_out,HIGH);  //open pump sensor_analog = analogRead(sensor_pin);
  moisture_percentage = ( 100 - ( (sensor_analog/1023.00) *100 ) );
  m=moisture_percentage; delay(1000);
}
digitalWrite(pin_out,LOW);  //closepump
```

```
}

if(c>
=0)

{

mySerial.begin(9600);delay(15000);Serial.begin(9600);delay(1000);Serial.print("\r");
delay(1000);

Serial.print((String)"update-
>"+(String)"Temprature="+t+(String)"Humidity="+h+(String
)"Moisture="+m); delay(1000);
}

}
```

Output

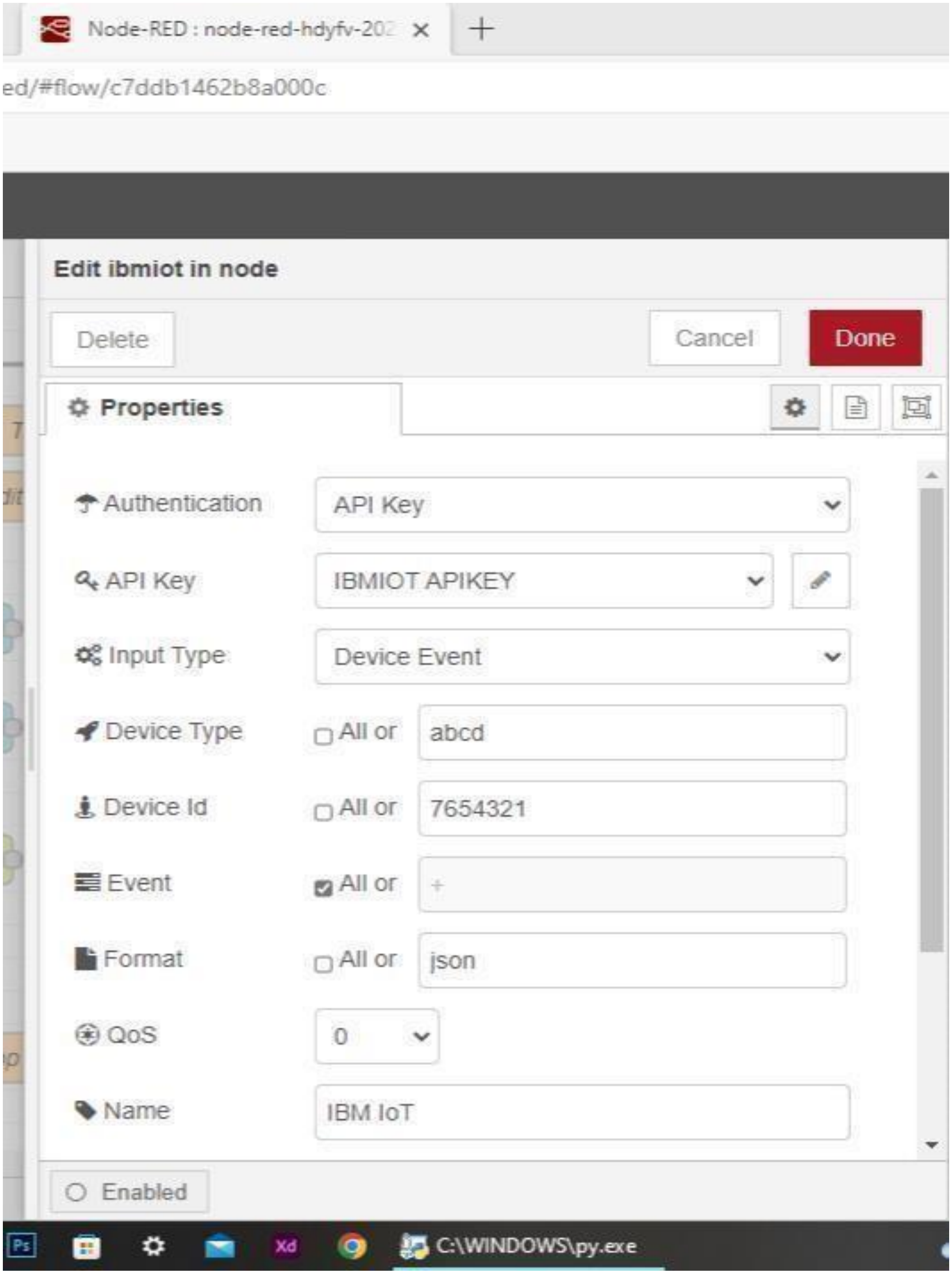
```
22:33:04.891 -> temp = 7  humidity = 39  moist = 33
22:33:05.917 -> temp = 58  humidity = 30  moist = 32
22:33:06.894 -> temp = 44  humidity = 28  moist = 23
22:33:07.919 -> temp = 9  humidity = 20  moist = 25
22:33:08.896 -> temp = 92  humidity = 22  moist = 27
22:33:09.928 -> temp = 3  humidity = 27  moist = 29
22:33:10.911 -> temp = 40  humidity = 42  moist = 23
22:33:11.898 -> temp = 69  humidity = 29  moist = 37
22:33:12.922 -> temp = 60  humidity = 23  moist = 39
22:33:13.941 -> temp = 78  humidity = 46  moist = 35
22:33:14.948 -> temp = 97  humidity = 46  moist = 32
22:33:15.923 -> temp = 67  humidity = 40  moist = 33
22:33:16.951 -> temp = 79  humidity = 39  moist = 39
22:33:17.926 -> temp = 21  humidity = 27  moist = 32
22:33:18.949 -> temp = 93  humidity = 26  moist = 25
22:33:19.926 -> temp = 45  humidity = 28  moist = 31
```

Send
Autoscroll Show timestamp
Newline 9600 baud Clear output

7.2 FEATURE

Configuration of Node-Red to send commands to IBM cloud

ibmiot out node I used to send data from Node-Red to IBM Watson device. So, after adding it to the flow we need to configure it with credentials of our Watson device.



Here we add two buttons in UI
1 -> for motor on

2 -> for motor off

We used a function node to analyses the data received and assign command to each number.

The Java script code for the analyses is:

if(msg.payload===1)

msg.payload={"command”: “ON"}; else

if(msg.payload===0)

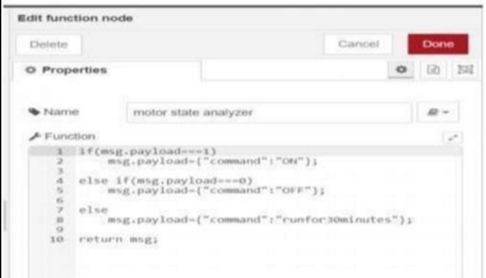
msg.payload={"command”:

“OFF"};

Then we use another function node to parse the data and get the command and represent it visually with text node.

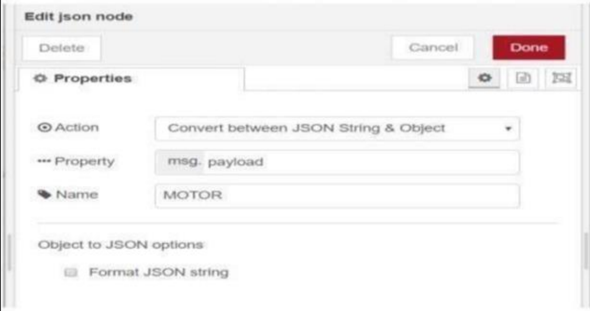
The Java script code for that function node is:

- var state=msg.payload;
  msg.payload = state.command;
- return msg;

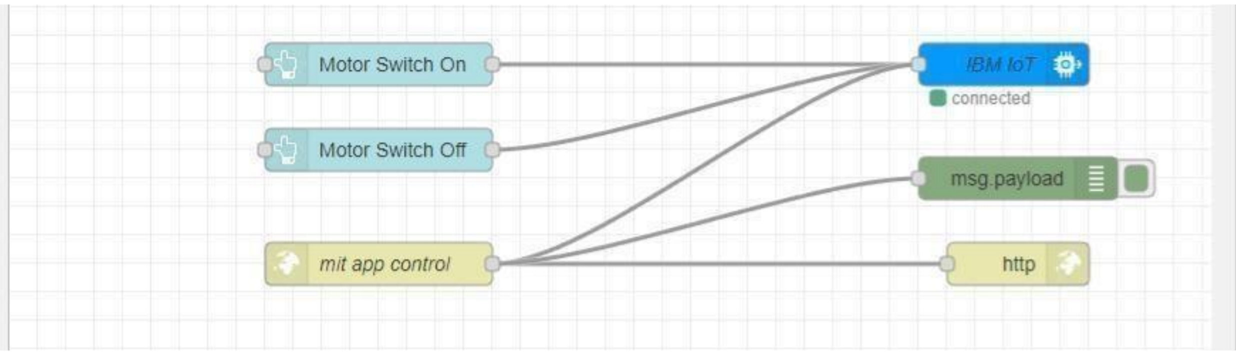


The above images show the java script codes of analyser and state function nodes.

Then we add edit Json node to the conversion between JSON string & object and finally connect it to IBM IoT Out.



Edit JSON node needs to be configured like this



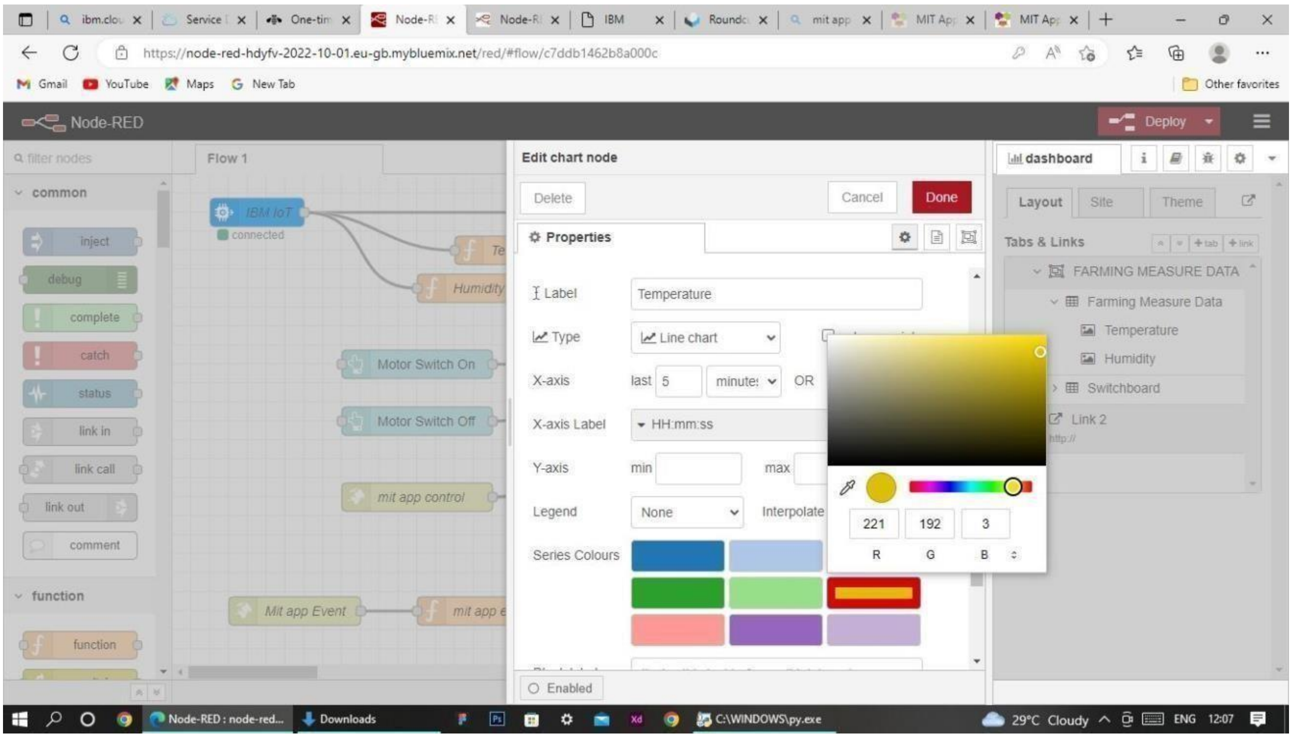
This is the program flow for sending commands to IBM cloud.

Adjusting User Interface

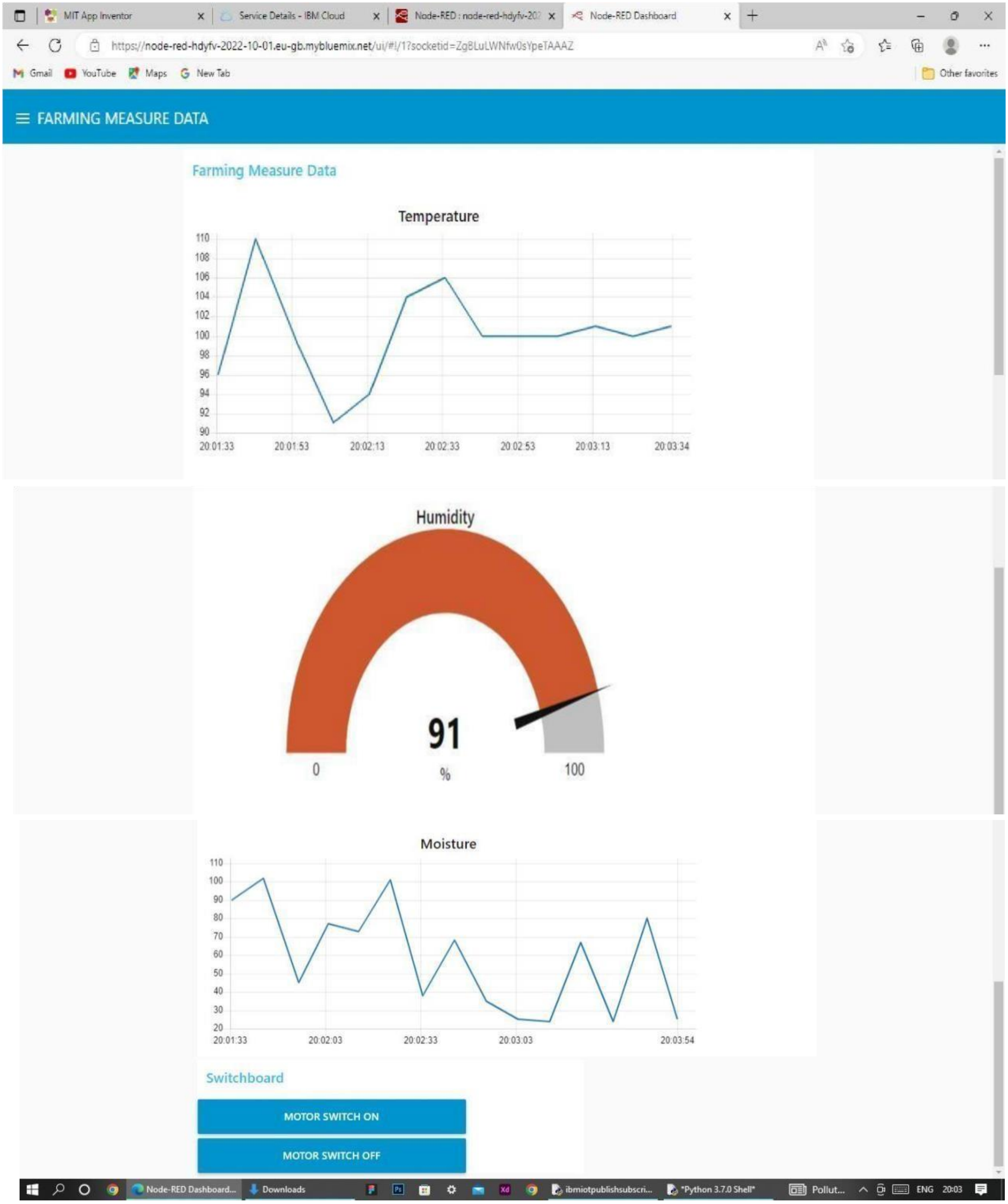
In order to display the parsed JSON data a Node-Red dashboard is created

Here we are using Gauges, text and button nodes to display in the UI and helps to monitor the parameters and control the farm equipment.

Below images are the Gauge, text and button node configurations.



Web APP UI Home Tab

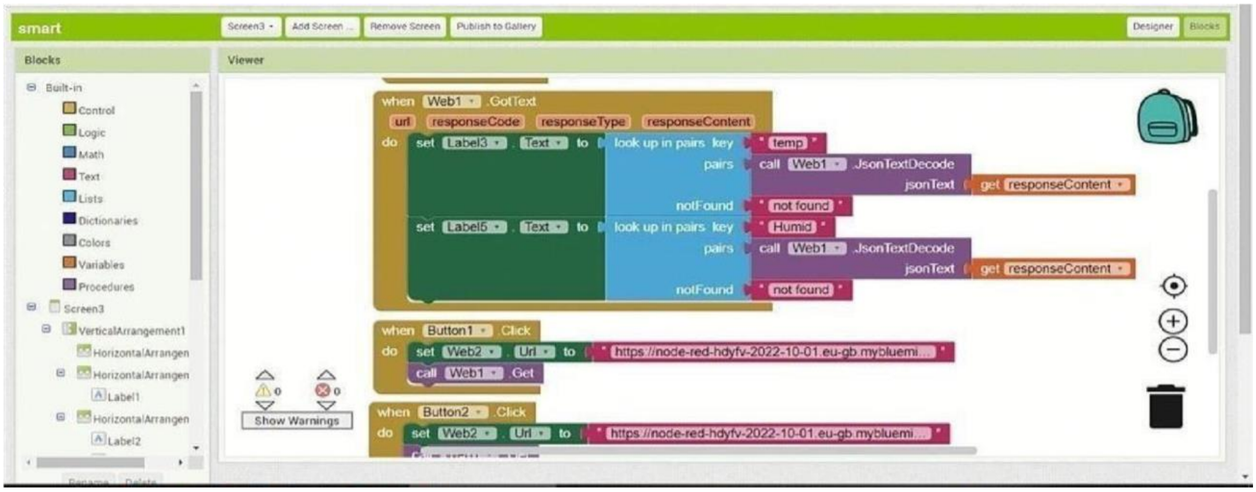


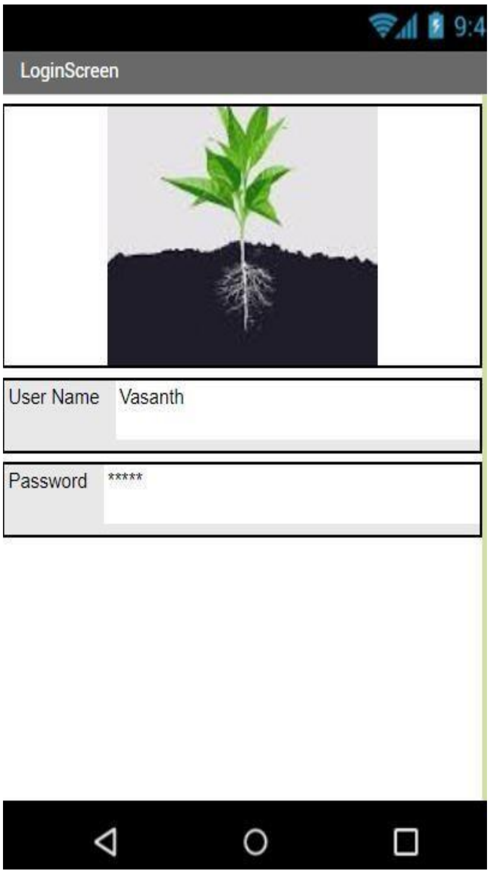
w

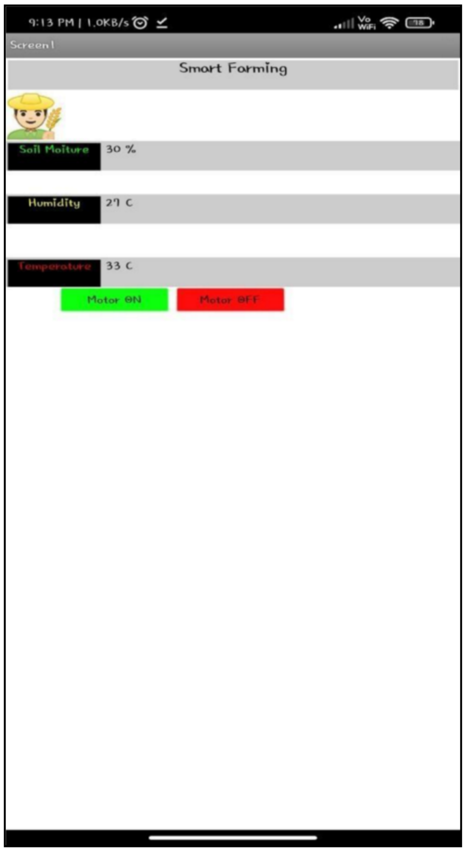
Mobile App UI

SMART FARMER APPLICATION

Blocks







CHAPTER 8

TESTING

8.1 Test Cases

Shopenzer Testcases Testscearnios

Date	3-Nov-22
Team ID	PNT2022TMIDxxxxxx
Project Name	Project - xxx
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)	BUG ID	Executed By
LoginPage_TC_001	Functional	Home Page	Verify user is able to see the Login/ Signup popup when user clicked on My account button		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup displayed or not	MIT App Inventor https://appinventor.mit.edu	Login popup should display		Fail	Steps not Clear to follow		Bug-1234	
LoginPage_TC_002	UI	Home Page	Verify the UI elements in Login/Signup popup		1.Enter Smart App 2.Verify login/Singup popup with below UI elements: a.Username text box b.password text box c.Submit button d.New customer? Create account link e.Last password? Recovery password	MIT App Inventor https://appinventor.mit.edu	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Last password? Recovery password link	Working as expected	Pass				
LoginPage_TC_003	Functional	Home page	Verify user is able to log into application with Valid credentials		1.Enter MIT App Inventor URL (https://appinventor.mit.edu) Smart app and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box	Username: IBM password: IBM	User should navigate to user account homepage	Working as Expected	Pass				
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with InValid credentials		1.Enter URL MIT App Inventor https://appinventor.mit.edu and smart app click go 2.Click on My Account dropdown button 3.Enter InValid username/email in Email text box 4.Enter valid password in password text box	Username: chalam@gmail password: Testing123	Application should show 'Incorrect email or password ' validation message.	Working as Expected	Pass				

8.2 USER ACCEPTENCE TESTING

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

Increasing control over production leads to **better cost management and waste reduction**. The ability to trace anomalies in crop growth or livestock health, for instance, helps eliminate the risk of losing yields. Additionally, automation boosts efficiency. Smart farming **reduces the ecological footprint of farming**. Minimized or site-specific application of inputs, such as fertilizers and pesticides, in precision agriculture systems will mitigate leaching problems as well as the emission of greenhouse gases.

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	8	3	2	2	16
Duplicate	1	0	2	0	3
External	2	3	0	1	6
Fixed	9	2	3	17	31
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	1	4	1	1	7
Totals	21	12	9	22	66

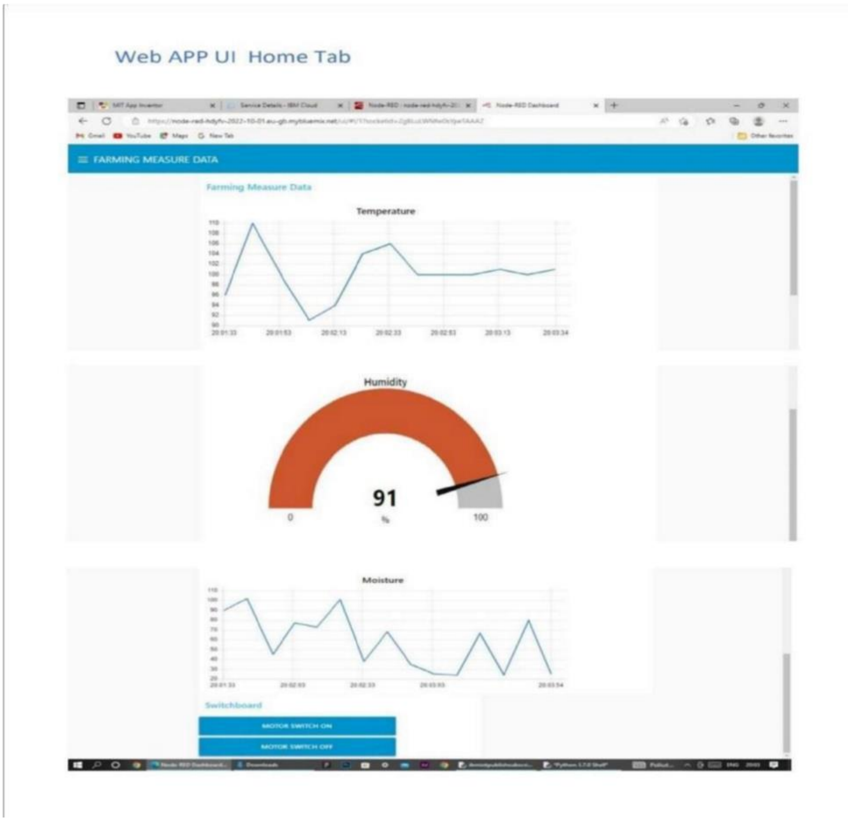
3. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	5	0	0	5
Client Application	30	0	0	30
Security	2	0	0	2
Outsource Shipping	2	0	0	2
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	1	0	0	1

CHAPTER 9

RESULT



CHAPTER 10

ADVANTAGES AND DISADVANTAGES

Advantages:

- Farms can be monitored and controlled remotely.
- Increase in convenience to farmers.
- Less labor cost.
- Better standards of living.

Disadvantages:

- Lack of internet/connectivity issues.
- Added cost of internet and internet gateway infrastructure.
- Farmers wanted to adapt the use of WebApp.

CHAPTER 11
CONCLUTION

An IoT-based SMART FARMING SYSTEM for live monitoring of temperature,humidity and soil moisture is proposed using Arduino and cloud computing. The system has high efficiency and accuracy in acquiring live temperature and soil moisture data. The IoT-based smart farming system proposed in this report constantly assists farmers by providing accurate live feeds of ambient temperature and soil moisture for over 99 curated results, thus enabling farmers to increase their agricultural yields and help manage food production efficiently.

CHAPTER 12

FUTURE SCOPE

By collecting data from Sensor with IoT devices, we can learn about the “real state” of Crops. In future, IoT system in agriculture enables predictive analytics and helps you make better harvest decisions. It is important to use the latest information and communication technology to manage the family in order to improve the quantity and quality of products while optimizing the human labor force. In between Technologies available for today's glory: Soil, water, light, humidity and temperature control. Small Agricultural Products are designed to support field monitoring through the automation of automation systems using Sensors. As a result, Fame and associated volumes can easily monitor field conditions from anywhere

CHAPTER 13

APPENDIX

GitHup & Project Demo Link :

GitHup repositories: https://github.com/IBM-EPBL/IBM-Project-44835-1660726995