Project Report

Smart Farmer - IoT Enabled Smart Farming Application

Team ID	PNT2022TMID30918
Project Name	Smart farmer - Iot Enabled Smart Farming Application.
Team leader	Sapna Priya J
Team members	Sneha S , Pavithra P, Soundammal G

CHAPTER – 1

INTRODUCTION

1.1 PROJECT OVERVIEW

Agriculture plays an important role in the economy of the world; the entire world depends on agriculture for survival. This is attributed to the fact agriculture serves as a source of the basic human needs. Over the years, there has been an increase in the demand for agricultural production especially considering the increase in the world's population and the need to provide food security in different parts of the world. With the introduction and the advancement in technology, new farming methods have been introduced, which are slowly replacing some of the commonly used traditional methods of farming. Smart farming refers to a farm management concept that uses modern technology with the aim of increase the quality and quantity of agricultural products.

1.2 PURPOSE

In this project, we are going to build a **Smart Farming System using IOT**. Globally the IoT systems has contributed its application in many fields and proven to be successful. It is the time that Indian farmer need to introduce the Smart Agricultural systems for higher crop yield. The productivity with compilation of data from sensors, actuators and modern electronic gadgets the farmer can monitor agricultural fields. Smart Agriculture can forecast weather data, switching ON the pump motor acknowledging the dampness of soil terms of moisture levels with help of sensors which are interfaced to process module Arduino-UNO. The Smart agriculture system can be operated from anywhere with help of networking technology. On joining process in research and development in Smart Agriculture& Artificial Intelligence can be cutting edge technology in data compiling and resource optimization.

CHAPTER – 2

LITERATURE SURVEY:

Research carried out in 2015 found out that there is a considerable decrease in the land available for agricultural use by about 0.7%. For the world to maintain or increase its food output and become food secure, there is a need for increased productivity. However, with the state of things, any increase in production is not possible without straining the environment if traditional farming methodologies are to be followed. However, smart farming promises a brighter future with the introduction of better farming technologies that aim at reduced cost, better efficiency in farming, and quality and high products.

For instance, with smart farming, you get the chance of effectively monitoring the needs of your farms, use fertilizers and pesticides well and selectively, as well as adjust how you use certain farming practices with the aim of better and healthy output.

2.1 EXISTING PROBLEM:

- 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
- Adopt and learn new technologies
- Stay resilient against global economic factors
- Inspire young people to stay in rural areas and become future farmers

2.2 REFERENCES:

Fredrick AWUOR, K.K. (2013). ICT Solution Architecture for Agriculture . ISTAfrica 2013 Conference Proceedings Paul Cunningham and Miriam Cunningham (Eds) IIMC International Information Management Corporation, 2013. Africa.Google Scholar

Richard K. Lomotey, R.D. (2014). Management of Mobile Data in a Crop Field. 2014 IEEE International Conference on Mobile Services (pp. 100-107). IEEE.Google Scholar

[3]

FAO Document repository, Chapter 3- Crop Water needs.
http://www.fao.org/docrep/s2022e/s2022e07.htm.
Google Scholar

https://circuitdigest.com/microcontroller-projects/iot-based-smart-agriculture-moniotring-system

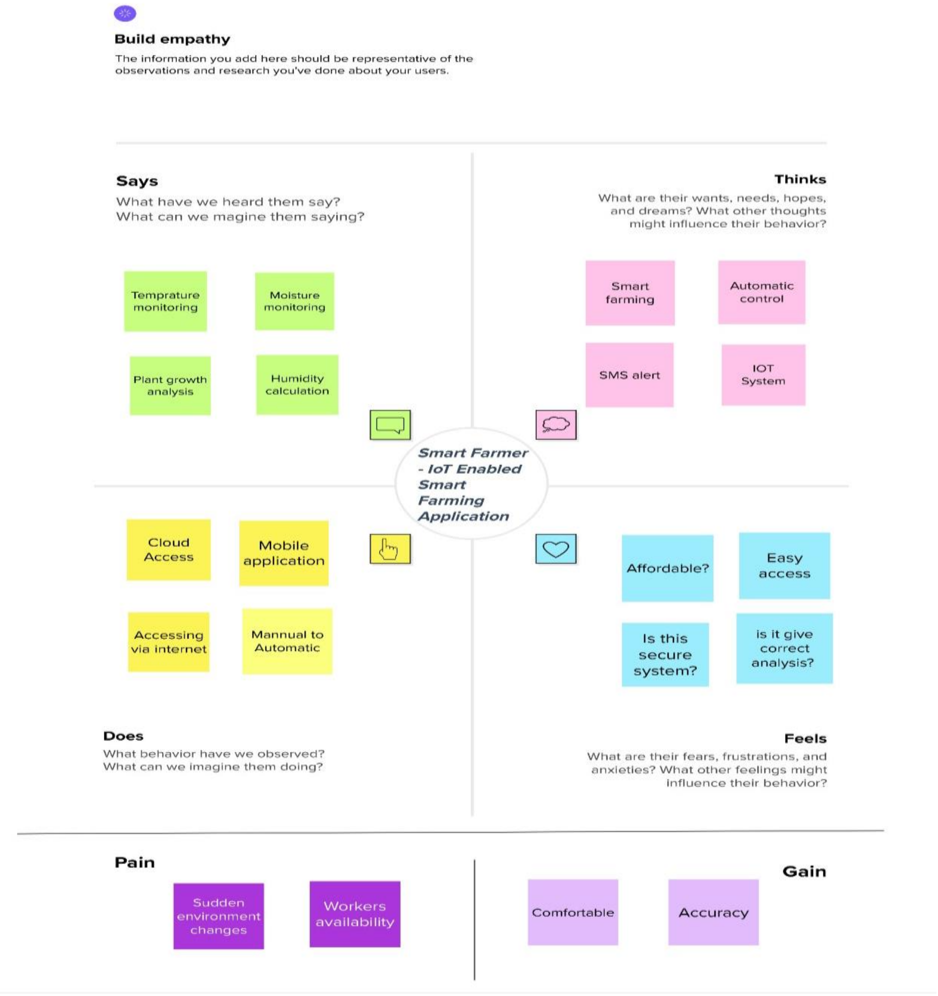
2.3.PROBLEM STATEMENT DEFINITION

Problem Statement (PS)	I am (Customer)	I am trying to	But	Because	Which makes me feel
PS-1	Farmer	Analyse plant growth	All the time I couldn't monitor growth manually	I am not always be in the agriculture land	worry about plant growth
PS-2	Farmer	Getting live data of temperature, humidity and etc.,	We don't have enough system to monitor	Good software and hardware maintanence is needed	bad

CHAPTER-3

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP & CANVAS



Build empathy

The information you add here should be representative of the observations and research you've done about your users.

Says

What have we heard them say?
What can we magine them saying?

Temprature monitoring

Moisture monitoring

Plant growth analysis

Humidity calculation

Thinks

What are their wants, needs, hopes, and dreams? What other thoughts might influence their behavior?

Smart farming

Automatic control

SMS alert

IOT System

Smart Farmer - IoT Enabled Smart Farming Application

Cloud Access

Mobile application

Accessing via internet

Mannual to Automatic

Does

What behavior have we observed?
What can we imagine them doing?

Affordable?

Easy access

Is this secure system?

is it give correct analysis?

Feels

What are their fears, frustrations, and anxieties? What other feelings might influence their behavior?

Pain

Sudden environment changes

Workers availability

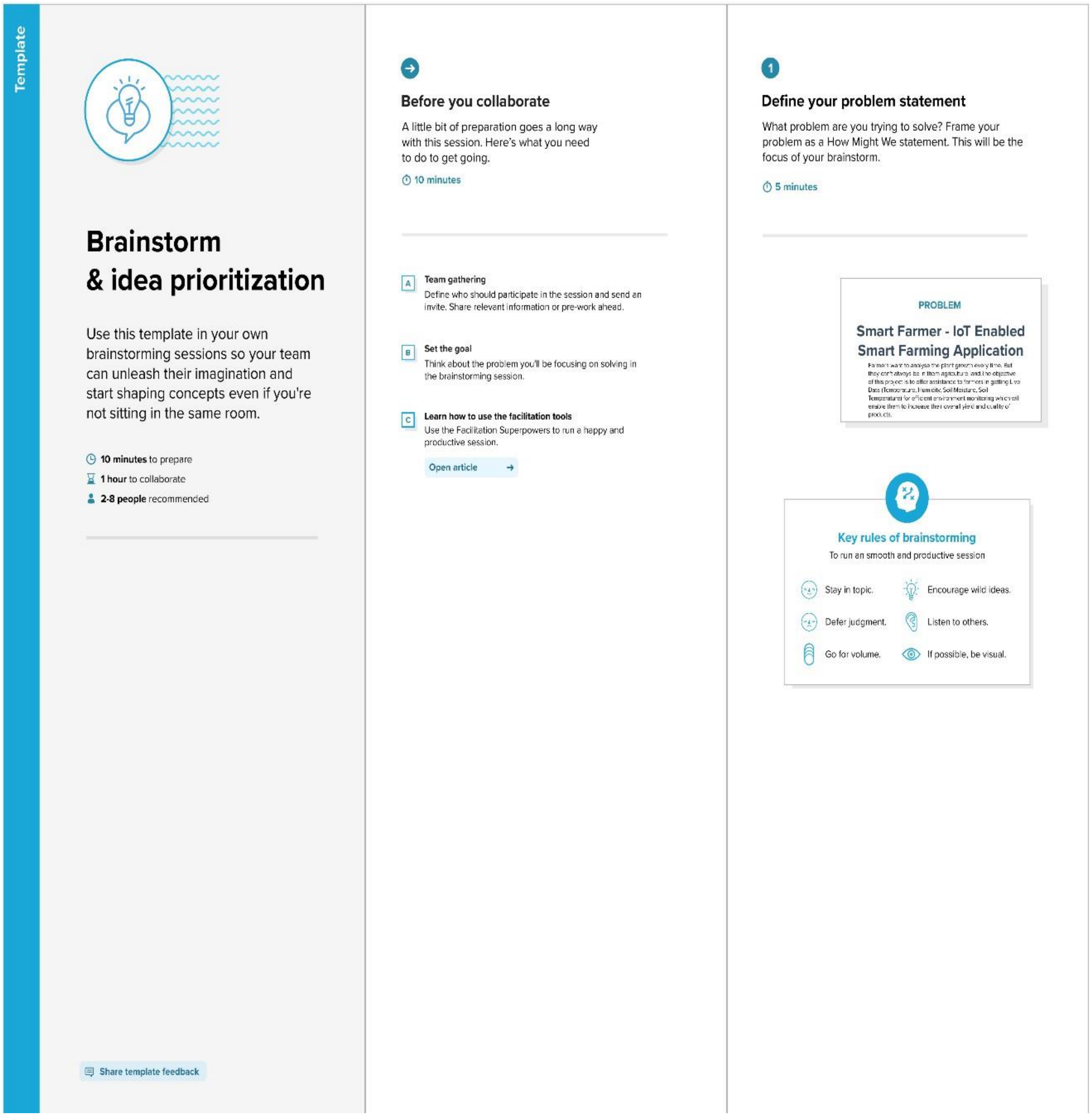
Gain

Comfortable

Accuracy

3.2 IDEATION & BRAINSTORMING

Step 1: Team Gathering, Collaboration and Select the problem statement



Template

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- **10 minutes** to prepare
- **1 hour** to collaborate
- **2-8 people** recommended

Share template feedback

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A **Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B **Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.

C **Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1 **Define your problem statement**

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM

Smart Farmer - IoT Enabled Smart Farming Application

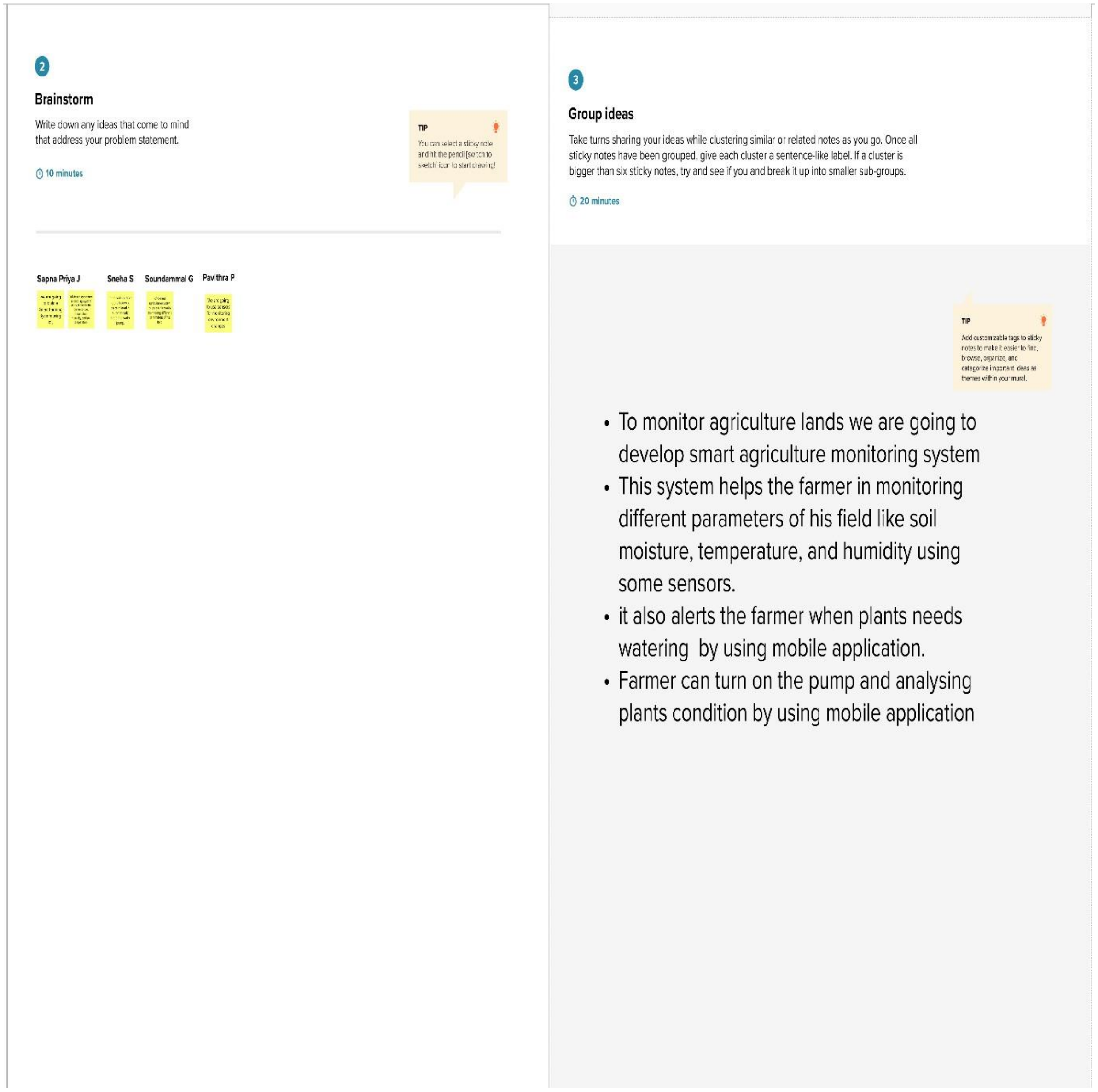
Farmers want to analyse the plant growth every time. But they can't always be in them agriculture land.The objective of this project is to offer assistance to farmers in getting Live Data (Temperature, Humidity, Soil Moisture, Soil Temperature) for efficient environment monitoring which will enable them to increase their overall yield and quality of products.

Key rules of brainstorming

To run an smooth and productive session

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.

Step-2: Brainstorm, Idea Listing and Grouping



2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

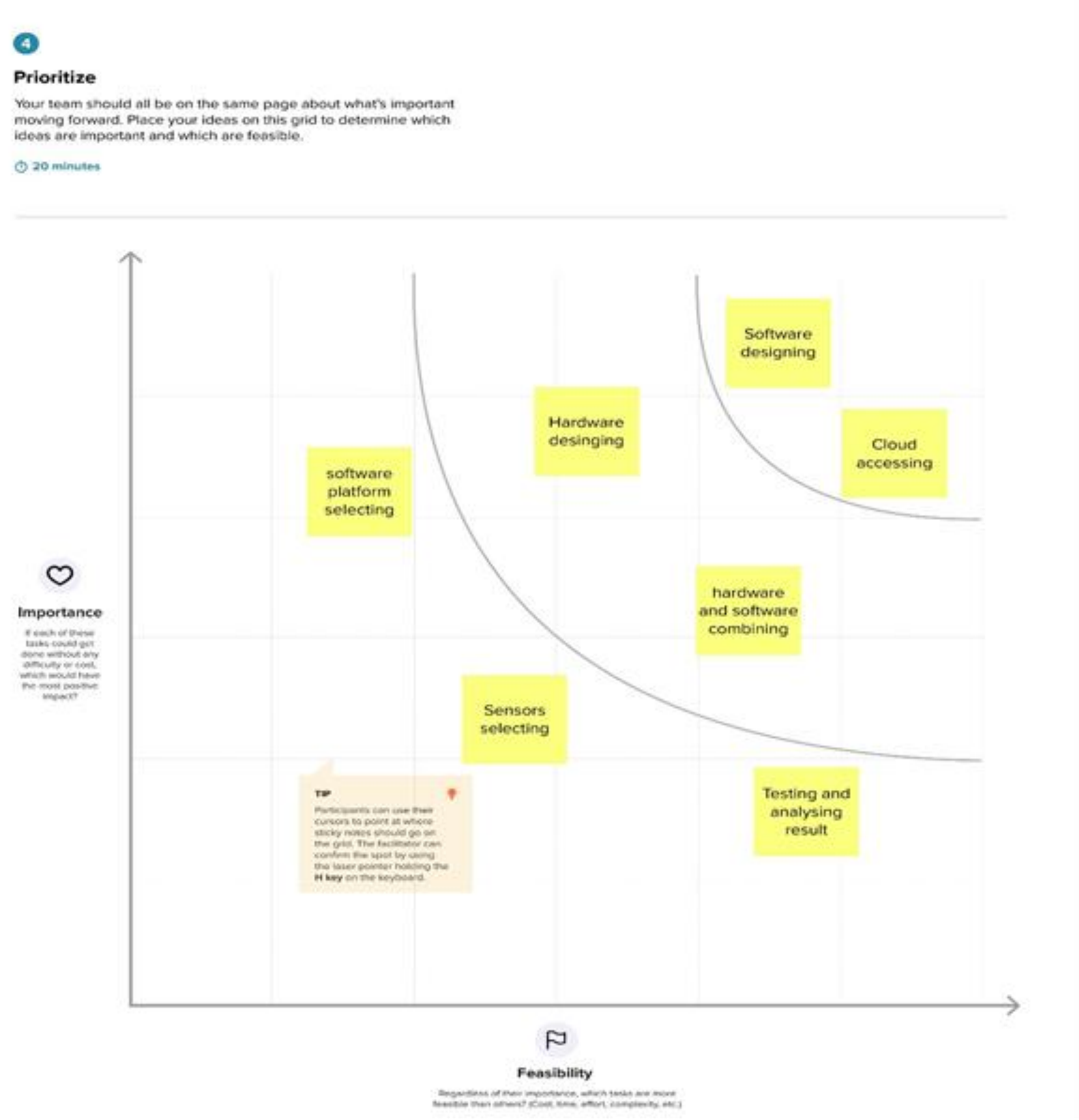
20 minutes

TIP

Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

- To monitor agriculture lands we are going to develop smart agriculture monitoring system
- This system helps the farmer in monitoring different parameters of his field like soil moisture, temperature, and humidity using some sensors.
- it also alerts the farmer when plants needs watering by using mobile application.
- Farmer can turn on the pump and analysing plants condition by using mobile application

Step 3: Idea Prioritization



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

TIP

Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the **H key** on the keyboard.

Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?

Feasibility

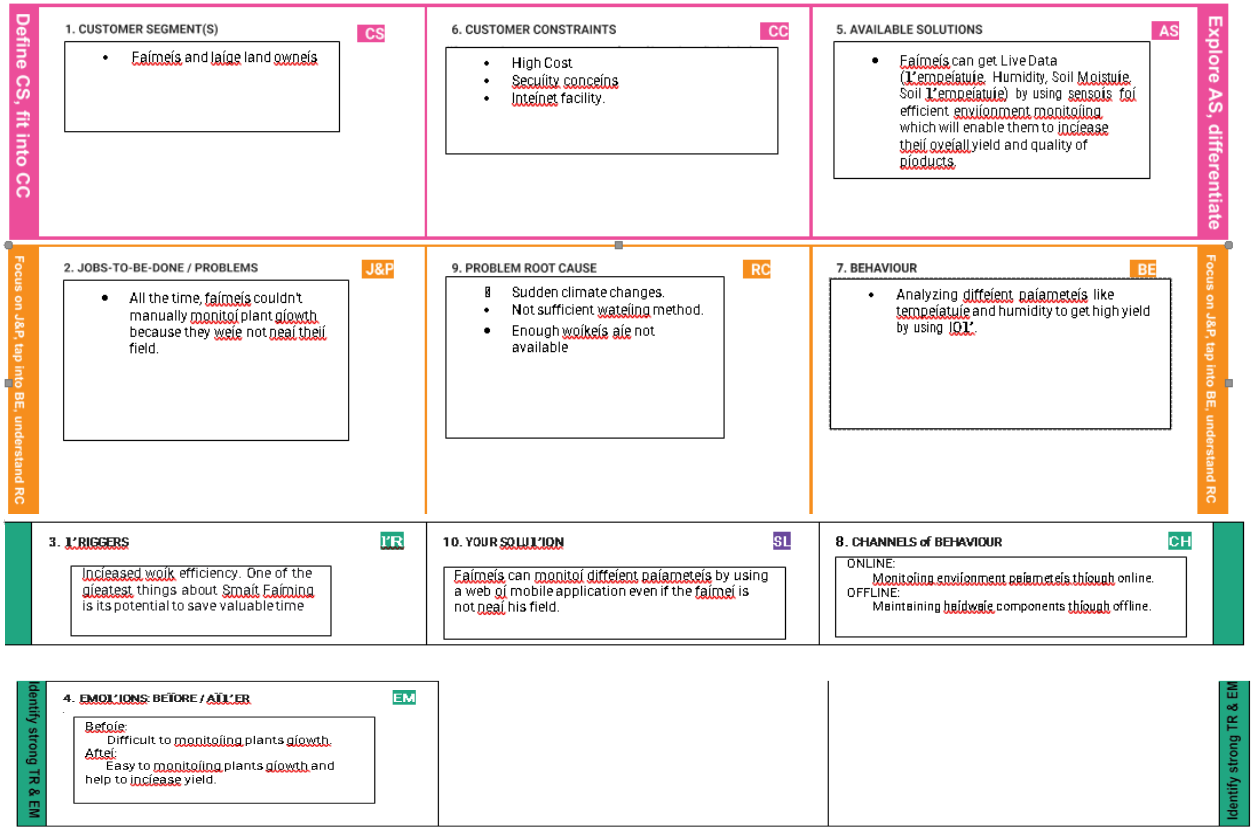
Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

Software designing
Hardware desinging
Cloud accessing
software platform selecting
hardware and software combining
Sensors selecting
Testing and analysing result

3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1	Problem Statement (Problem to be solved)	To develop IoT-based agriculture system
2	Idea / Solution description	• An IoT-based agriculture system helps the farmer monitor different parameters of his field like soil moisture, temperature, and humidity using some sensors. • Farmers can monitor all the sensor parameters using a web or mobile application even if they are not near their field.
3	Novelty / Uniqueness	• Easier recording and reporting • Increased work efficiency • Increase yield • Easy of use
4	Social Impact / Customer Satisfaction	• Increased Quality of Production • Remote Monitoring • Help to reduce unnecessary wastage
5	Business Model (Revenue Model)	• It's a more efficient method that saves electricity and water while also making frames more environmentally friendly.
6	Scalability of the Solution	• Scalability in smart farming refers to the adaptability of a system to increase the capacity of yield

3.4 **PROBLEM SOLUTION FIT:**



Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

- Faímeís and laíge land owneís

6. CUSTOMER CONSTRAINTS CC

- High Cost
- Secuíity conceíns
- Inteínet facility.

5. AVAILABLE SOLUTIONS AS

- Faímeís can get Live Data (Ꭲempeíatuíe, Humidity, Soil Moistuíe, Soil Ꭲempeíatuíe) by using sensoís foí efficient enviíonment monitoíing which will enable them to incíease theií oveíall yield and quality of píoducts.

Explore AS, differentiate

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

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

- All the time, faímeís couldn't manually monitoí plant gíowth because they weíe not neaí theií field.

9. PROBLEM ROOT CAUSE RC

- Sudden climate changes.
- Not sufficient wateíing method.
- Enough woíkeís aíe not available

7. BEHAVIOUR BE

- Analyzing diffeíent paíameteís like tempeíatuíe and humidity to get high yield by using IOᎢ.

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

3. ᎢRIGGERS ᎢR

Incíeased woík efficiency. One of the gíeatest things about Smaít Faíming is its potential to save valuable time

10. YOUR SOLUᎢION SL

Faímeís can monitoí diffeíent paíameteís by using a web oí mobile application even if the faímeí is not neaí his field.

8. CHANNELS of BEHAVIOUR CH

ONLINE:
Monitoíing enviíonment paíameteís thíough online.
OFFLINE:
Maintaining haídwaíe components thíough offline.

Identify strong TR & EM

4. EMOᎢIONS: BEϜORE / AϜᎢER EM

Befoíe:
Difficult to monitoíing plants gíowth.
Afteí:
Easy to monitoíing plants gíowth and help to incíease yield.

Identify strong TR & EM

CHAPTER - 4

4.REQUIREMENT ANALYSIS:

4.1 FUNCTIONAL REQUIREMENTS

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through mobile application Registration through website.
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User sign in	Sign in via mobile number. Sign in via username and password.
FR-4	Monitoring	Monitor temperature, humidity and etc.,
FR-5	Analysis	Analysing different environment parameters.
FR-6	Processing	if environment parameters (temperature, humidity) exceeds its threshold value suggest the solutions like if water level is low means turn on the Water pump.

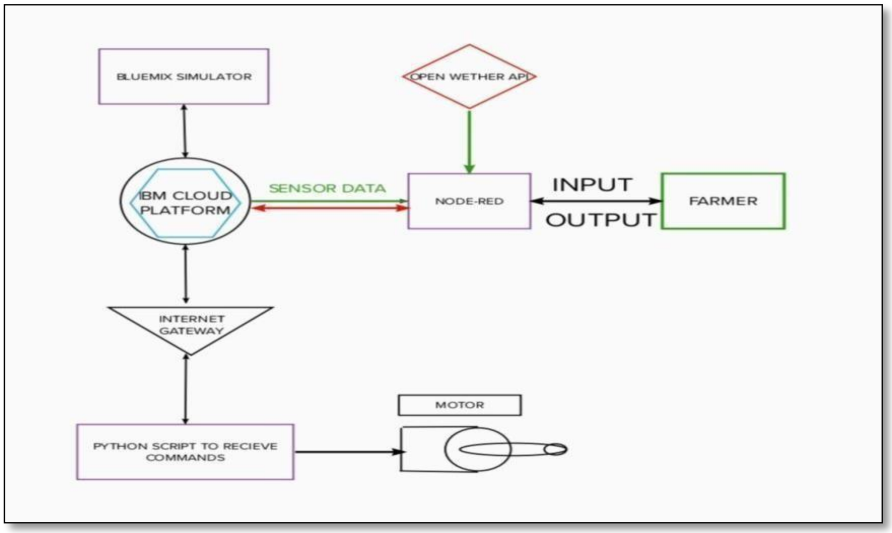
4.2 NON-FUNCTIONAL REQUIREMENTS

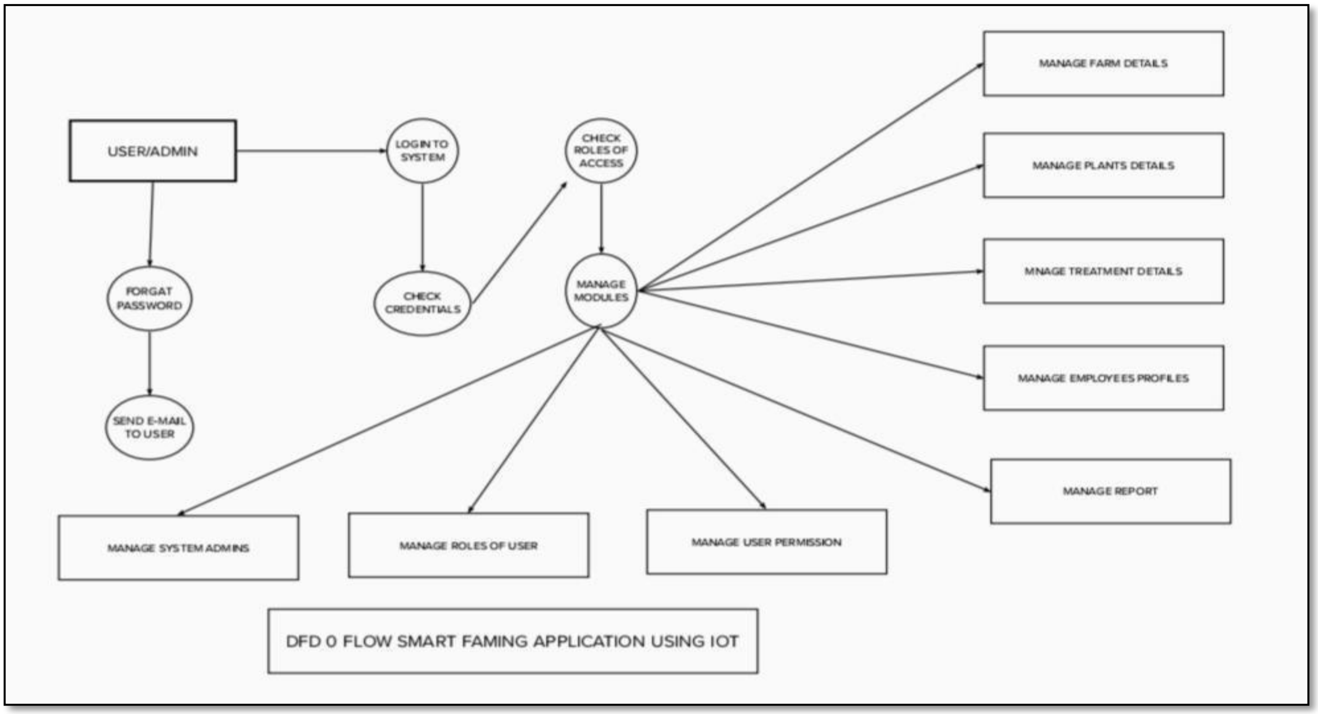
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Farmers can monitor their land even them not near their field.
NFR-2	**Security**	OTP verification while login their account for user security.
NFR-3	**Reliability**	Environmental parameters are accurately monitored.
NFR-4	**Performance**	Improving yield compare to manual monitoring.
NFR-5	**Availability**	Can be accessed at anytime from anywhere with feasible internet facility.
NFR-6	**Scalability**	Scalability in smart farming refers to the adaptability of a system to increase the capacity of yield.

CHAPTER - 5

PROJECT DESIGN

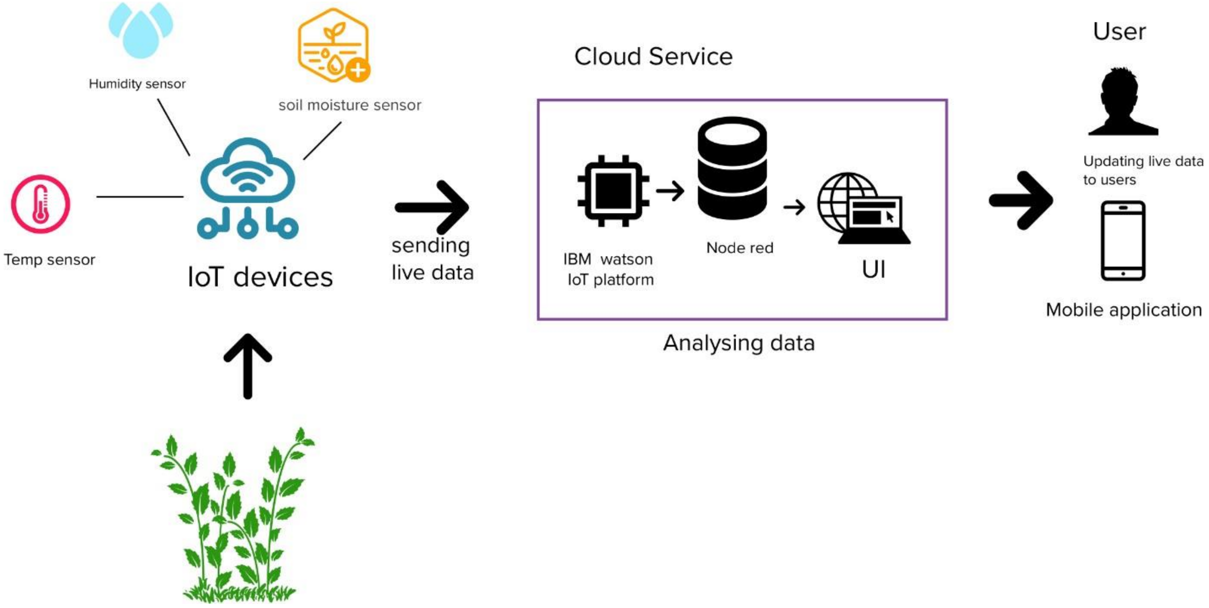
5.1 DATA FLOW DIAGRAMS



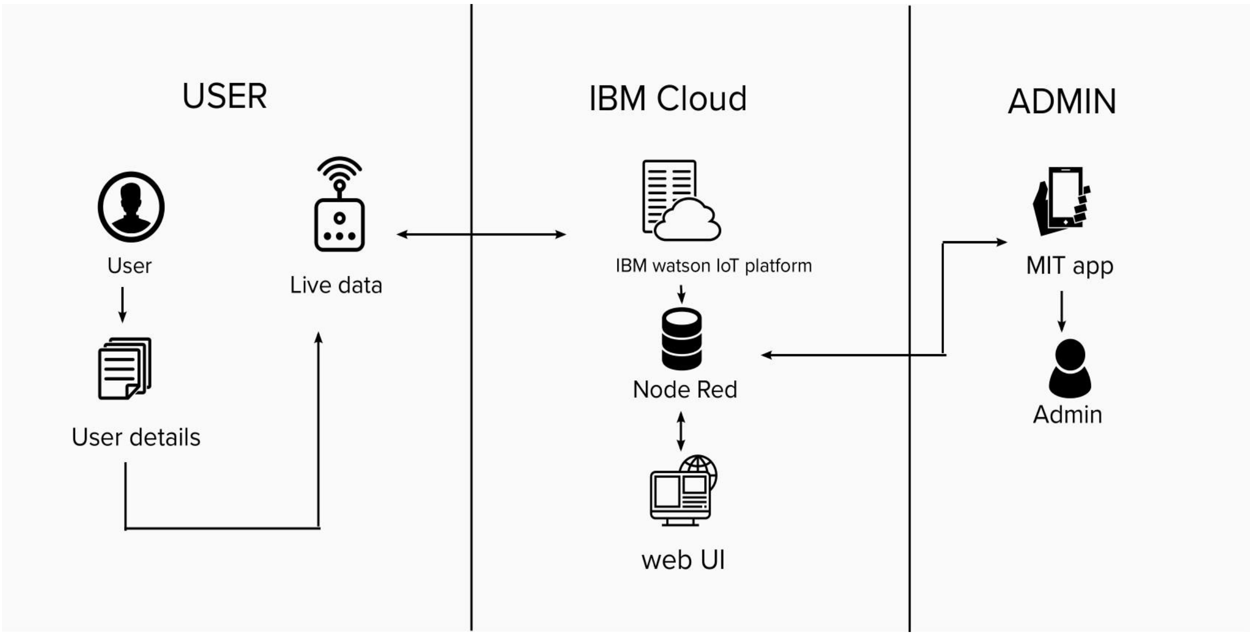


5.2 SOLUTION & TECHNICAL ARCHITECTURE

solution architecture:



Technical architecture:



5.3 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	1	Can register for the application by enteringmy email, password, and confirming my password.	Can access my account / dashboard	High	Sprint-1
		2	Will receive confirmation email once I have registered for the application	Receive confirmation email & click confirm	High	Sprint-1
		3	Can register for the application through Facebook	Can register & access the dashboard with Facebook Login	Low	Sprint-2
		4	Can Register for the application through Gmail		Medium	Sprint-1
	Login	5	Can Log into the application by entering email & password		High	Sprint-1
	Dashboard					
Customer (Web user)						
Customer Care Executive						
Administrator						

CHAPTER - 6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	Medium	Pavithra P
Sprint-3		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	Medium	Sneha S
Sprint-4	Login	USN-3	As a user, I can login using registered mail id and password	3	Low	Sneha S
Sprint-4	Dashboard	USN-4	As a user, I can see my profile with my agri land details.	5	Medium	Soundammal G
Sprint-3	Monitoring	USN-5	Collecting and monitoring details fromagriculture field.	1	Low	Soundammal G
Sprint-1	Software	USN-6	Create and configure IBM Cloud Services	5	High	Sapna Priya J
Sprint-1		USN-7	Create IBM Watson IoT Platform .	5	High	Pavithra P
Sprint-1		USN-8	Create a device & configure the IBM IoTPlatform	5	High	Sneha S
Sprint-1		USN-9	Create Node-RED service	4	High	Soundammal G
Sprint-2		USN-10	Create a database in Cloudant DB to store all the sensor parameters	5	High	Sapna Priya J

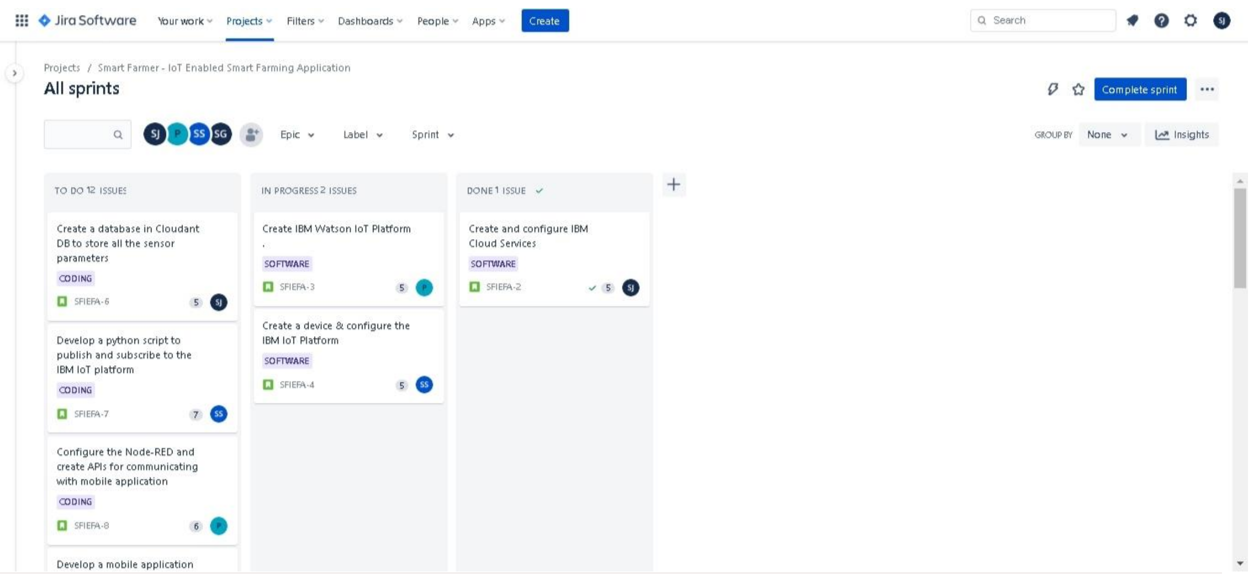
Sprint-2	Coding	USN-11	Develop a python script to publish and subscribe to the IBM IoT platform	7	High	Sneha S
Sprint-2		USN-12	Configure the Node-RED and create APIs for communicating with mobile application	6	High	Pavithra P
Sprint-3	Application	USN-13	Develop a mobile application to display the sensor parameters and control the motors	7	High	Sapna Priya J
Sprint-4	Evaluating	USN-14	Checking functionalities of the app	1	Low	Sapna Priya J
Sprint-4		USN-15	Evaluate the performance of the application	2	Low	Pavithra P

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	18	6 Days	31 Oct 2022	05 Nov 2022	18	27 Oct 2022
Sprint-3	11	6 Days	07 Nov 2022	12 Nov 2022	11	2 Nov 2022
Sprint-4	10	6 Days	14 Nov 2022	19 Nov 2022	10	7 Nov 2022

6.3 REPORT FROM JIRA

Sprint:



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All sprints

TO DO 12 ISSUES

Create a database in Cloudant DB to store all the sensor parameters
CODING
SFIEFA-6 5 SJ

Develop a python script to publish and subscribe to the IBM IoT platform
CODING
SFIEFA-7 7 SS

Configure the Node-RED and create APIs for communicating with mobile application
CODING
SFIEFA-8 6 P

Develop a mobile application

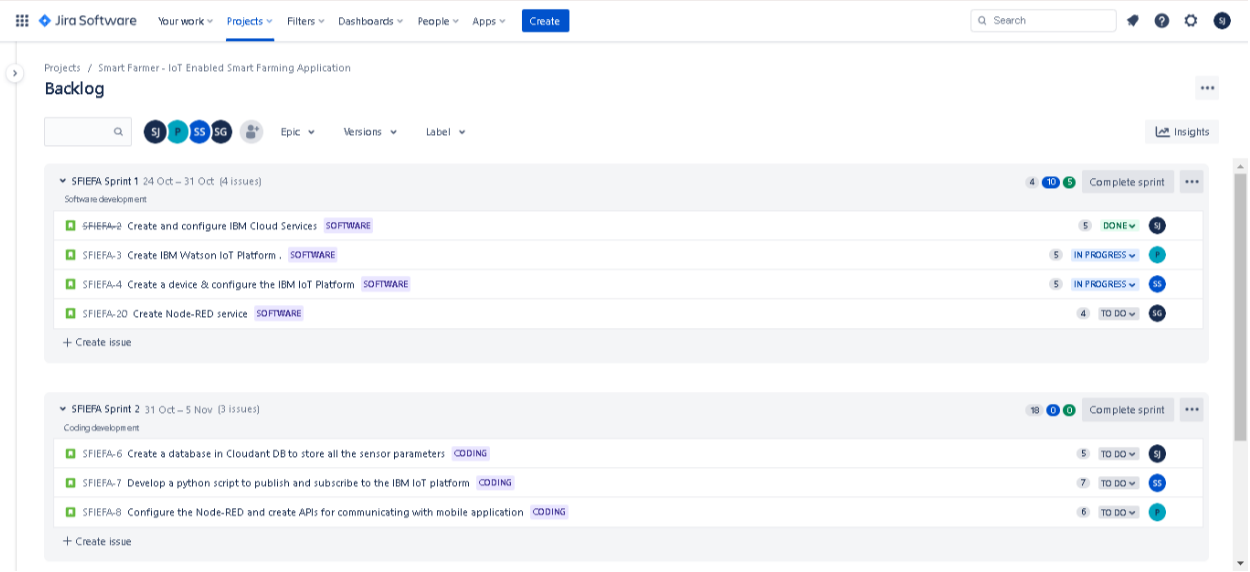
IN PROGRESS 2 ISSUES

Create IBM Watson IoT Platform .
SOFTWARE
SFIEFA-3 5 P

Create a device & configure the IBM IoT Platform
SOFTWARE
SFIEFA-4 5 SS

DONE 1 ISSUE ✓

Create and configure IBM Cloud Services
SOFTWARE
SFIEFA-2 ✓ 5 SJ



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Backlog

SFIEFA Sprint 1 24 Oct – 31 Oct (4 issues) 4 10 5
Software development

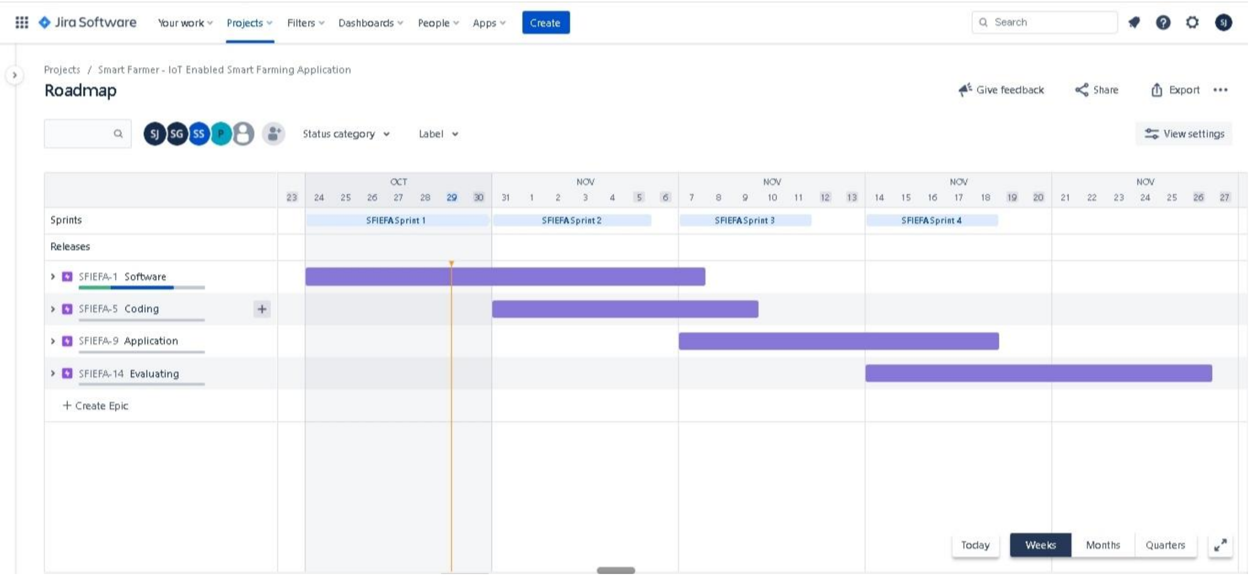
~~SFIEFA-2~~	Create and configure IBM Cloud Services	SOFTWARE	5	DONE	SJ
SFIEFA-3	Create IBM Watson IoT Platform .	SOFTWARE	5	IN PROGRESS	P
SFIEFA-4	Create a device & configure the IBM IoT Platform	SOFTWARE	5	IN PROGRESS	SS
SFIEFA-20	Create Node-RED service	SOFTWARE	4	TO DO	SG

+ Create issue

SFIEFA Sprint 2 31 Oct – 5 Nov (3 issues) 18 0 0
Coding development

SFIEFA-6	Create a database in Cloudant DB to store all the sensor parameters	CODING	5	TO DO	SJ
SFIEFA-7	Develop a python script to publish and subscribe to the IBM IoT platform	CODING	7	TO DO	SS
SFIEFA-8	Configure the Node-RED and create APIs for communicating with mobile application	CODING	6	TO DO	P

+ Create issue



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Roadmap

Sprints: SFIEFA Sprint 1, SFIEFA Sprint 2, SFIEFA Sprint 3, SFIEFA Sprint 4

Releases

SFIEFA-1 Software

SFIEFA-5 Coding

SFIEFA-9 Application

SFIEFA-14 Evaluating

+ Create Epic

CHAPTER - 7

CODING & SOLUTIONING:

7.1 FEATURE 1

IoT technology implemented with the traditional agricultural concepts results in smart farming. The technological era is enabling modernization in the agriculture sector and contributes to a wholly transformed process. An IoT-enabled smart farming solution has built-in sensors that extract data from the fields, crops, and other farming assets. This data plays a major role in re-building essentials in the farming sector like crop health analysis, real-time field monitoring, weather predictions, smart pest management, and inventory analysis, among others.

7.2 FEATURE 2

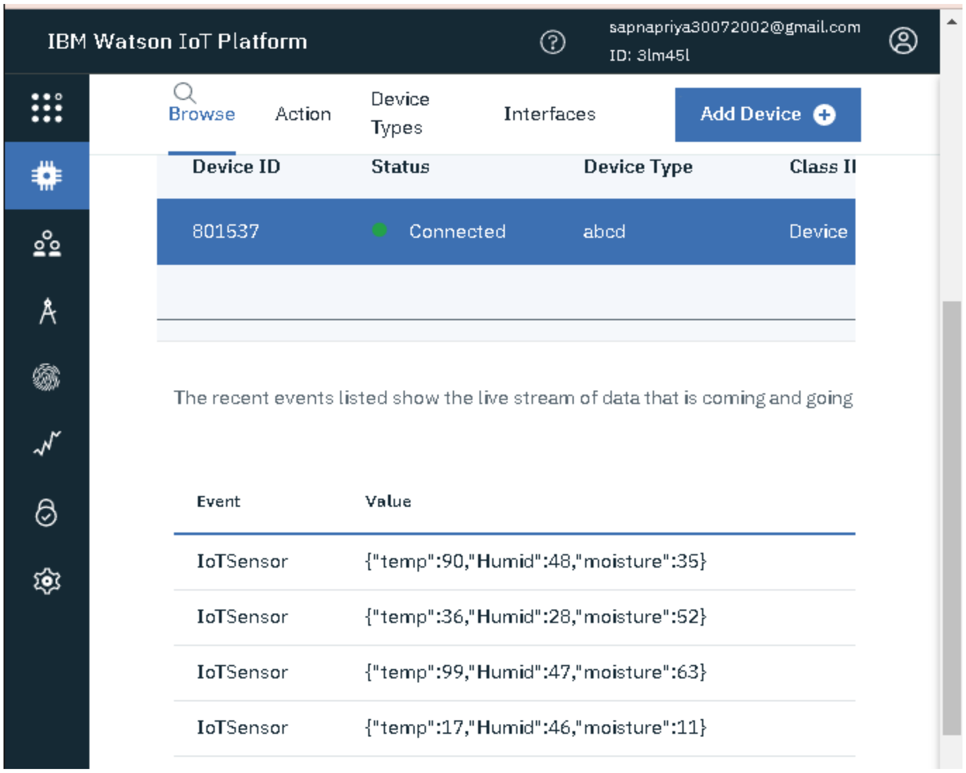
Smart Farming Solution is entirely based on automation through sensor devices and gateway connectivity, which helps the managers to analyze their decisions and make the most of their intelligence. As the sensors are installed on the fields or farms, they extract relevant information like moisture content, temperature, and humidity, and then cumulate the fundamental aspects to predict the quality of the land to gain better crop yield.

7.3 DATABASE SCHEMA

IBM CLOUD SERVICE:

IBM Watson IOT Platform:

Random temperature, humidity, and moisture values are generated using python code, and the values are sent to the IBM cloud. IBM Cloud sends the values to the node red this value is shown on the node red dash board



sapnapriya30072002@gmail.com
ID: 3lm45l

Device ID	Status	Device Type	Class II
801537	● Connected	abcd	Device

The recent events listed show the live stream of data that is coming and going

Event	Value
IoTSensor	{"temp":90,"Humid":48,"moisture":35}
IoTSensor	{"temp":36,"Humid":28,"moisture":52}
IoTSensor	{"temp":99,"Humid":47,"moisture":63}
IoTSensor	{"temp":17,"Humid":46,"moisture":11}

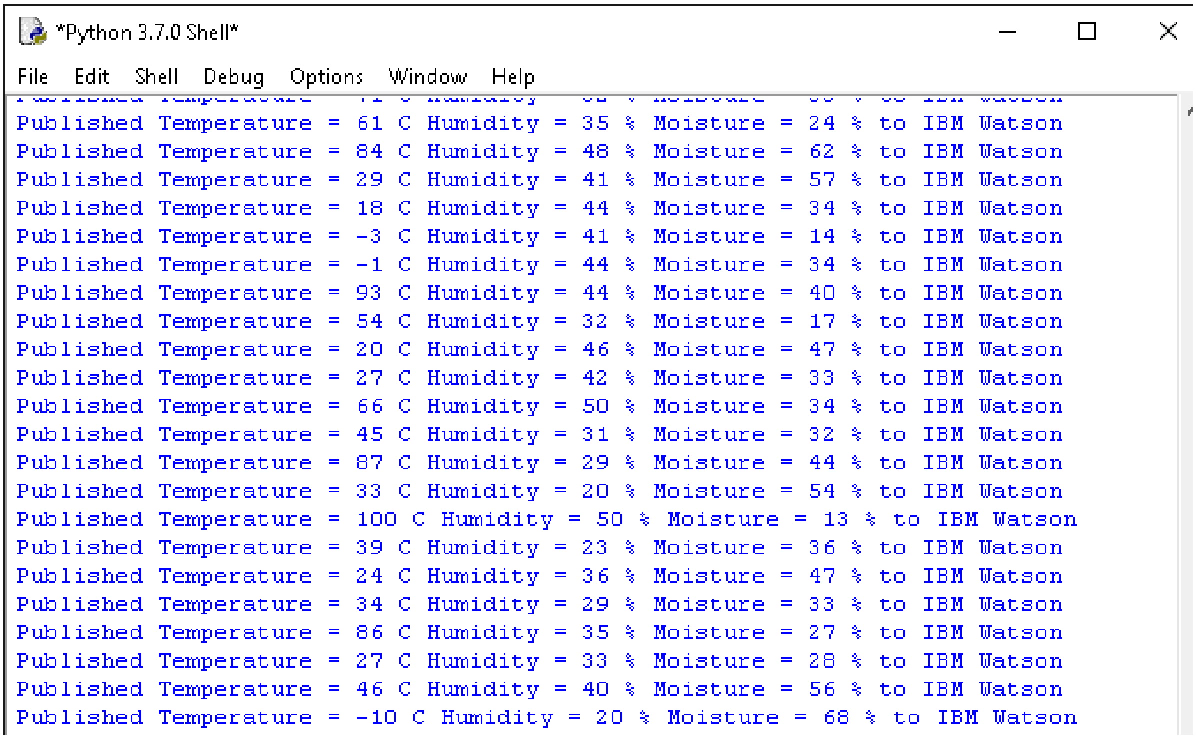
CHAPTER - 8

TESTING

8.1 TEST CASES

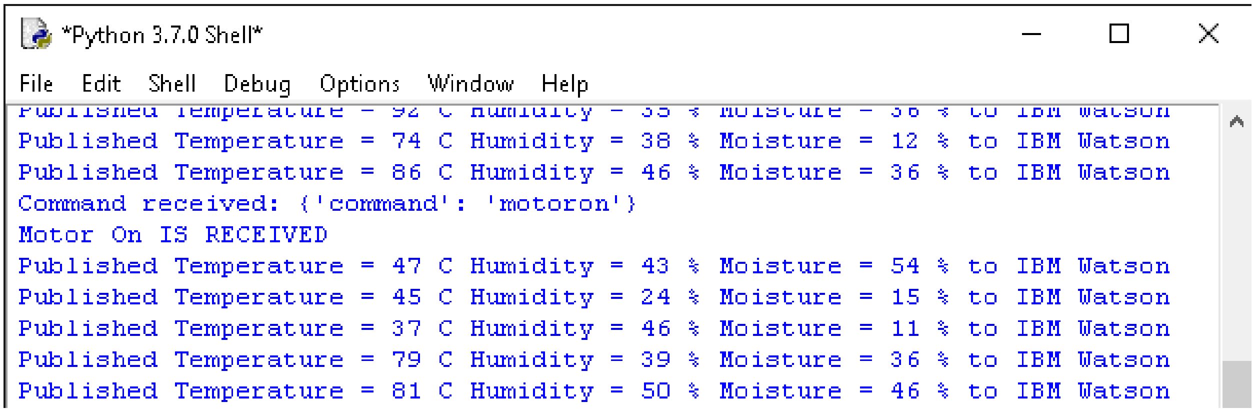
Python code testing:

Output:



```
Published Temperature = 61 C Humidity = 35 % Moisture = 24 % to IBM Watson
Published Temperature = 84 C Humidity = 48 % Moisture = 62 % to IBM Watson
Published Temperature = 29 C Humidity = 41 % Moisture = 57 % to IBM Watson
Published Temperature = 18 C Humidity = 44 % Moisture = 34 % to IBM Watson
Published Temperature = -3 C Humidity = 41 % Moisture = 14 % to IBM Watson
Published Temperature = -1 C Humidity = 44 % Moisture = 34 % to IBM Watson
Published Temperature = 93 C Humidity = 44 % Moisture = 40 % to IBM Watson
Published Temperature = 54 C Humidity = 32 % Moisture = 17 % to IBM Watson
Published Temperature = 20 C Humidity = 46 % Moisture = 47 % to IBM Watson
Published Temperature = 27 C Humidity = 42 % Moisture = 33 % to IBM Watson
Published Temperature = 66 C Humidity = 50 % Moisture = 34 % to IBM Watson
Published Temperature = 45 C Humidity = 31 % Moisture = 32 % to IBM Watson
Published Temperature = 87 C Humidity = 29 % Moisture = 44 % to IBM Watson
Published Temperature = 33 C Humidity = 20 % Moisture = 54 % to IBM Watson
Published Temperature = 100 C Humidity = 50 % Moisture = 13 % to IBM Watson
Published Temperature = 39 C Humidity = 23 % Moisture = 36 % to IBM Watson
Published Temperature = 24 C Humidity = 36 % Moisture = 47 % to IBM Watson
Published Temperature = 34 C Humidity = 29 % Moisture = 33 % to IBM Watson
Published Temperature = 86 C Humidity = 35 % Moisture = 27 % to IBM Watson
Published Temperature = 27 C Humidity = 33 % Moisture = 28 % to IBM Watson
Published Temperature = 46 C Humidity = 40 % Moisture = 56 % to IBM Watson
Published Temperature = -10 C Humidity = 20 % Moisture = 68 % to IBM Watson
```

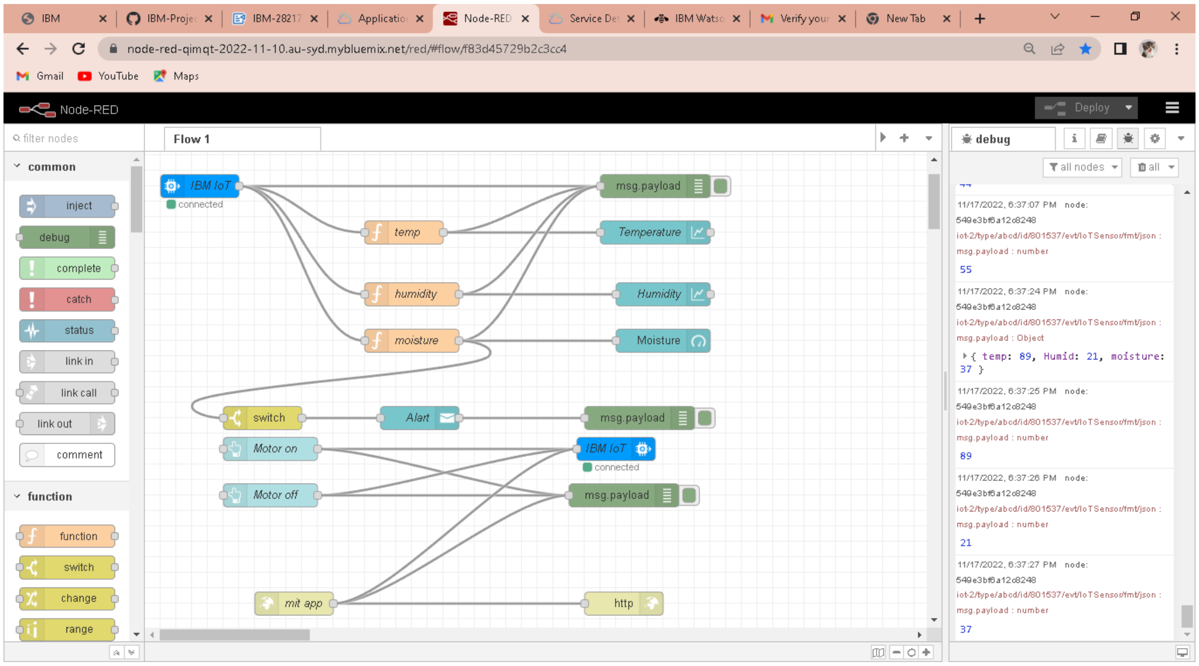
Commands received from node red and mobile application:



```
Published Temperature = 74 C Humidity = 38 % Moisture = 12 % to IBM Watson
Published Temperature = 86 C Humidity = 46 % Moisture = 36 % to IBM Watson
Command received: {'command': 'motoron'}
Motor On IS RECEIVED
Published Temperature = 47 C Humidity = 43 % Moisture = 54 % to IBM Watson
Published Temperature = 45 C Humidity = 24 % Moisture = 15 % to IBM Watson
Published Temperature = 37 C Humidity = 46 % Moisture = 11 % to IBM Watson
Published Temperature = 79 C Humidity = 39 % Moisture = 36 % to IBM Watson
Published Temperature = 81 C Humidity = 50 % Moisture = 46 % to IBM Watson
```

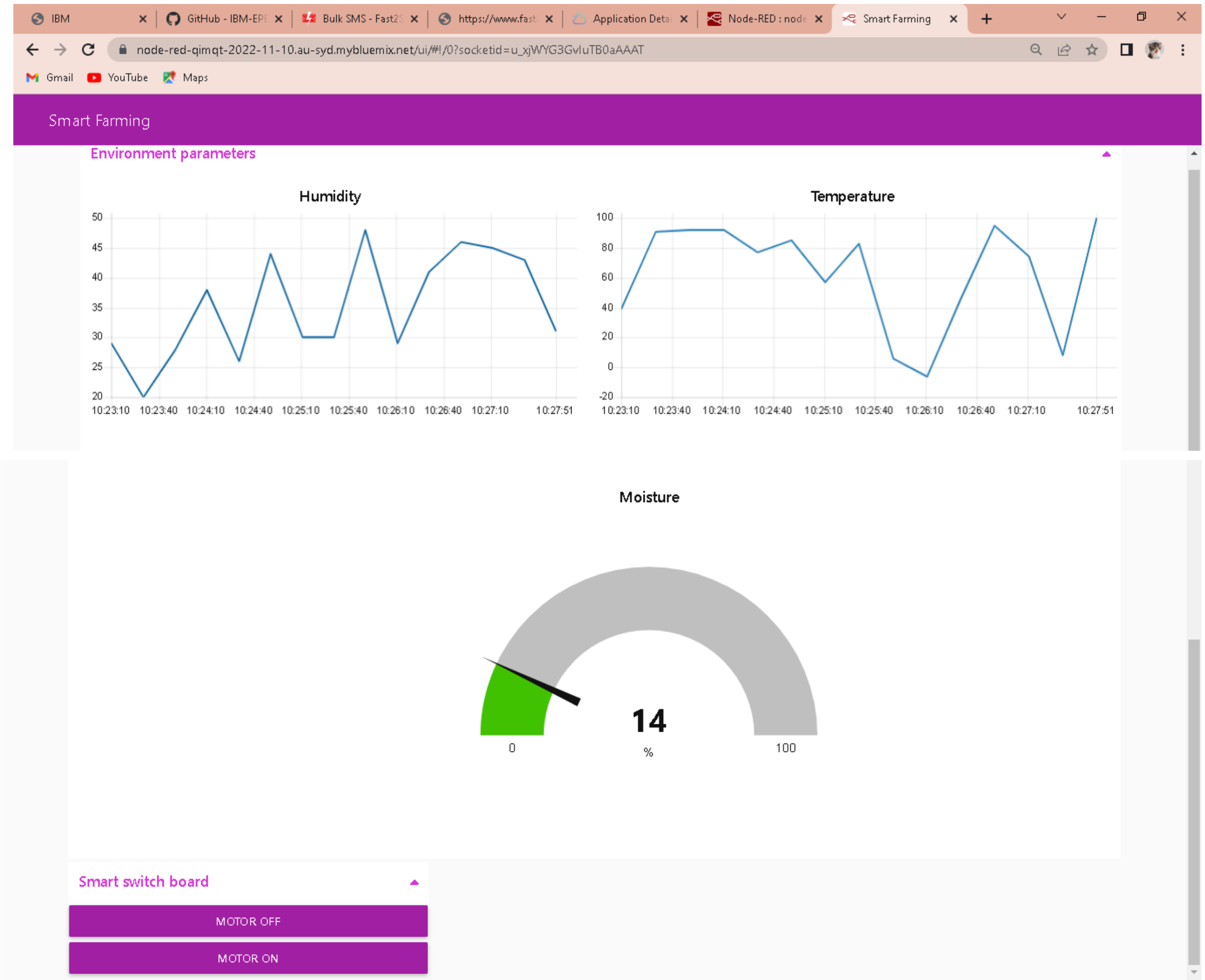
Node red testing:

Connection and output:



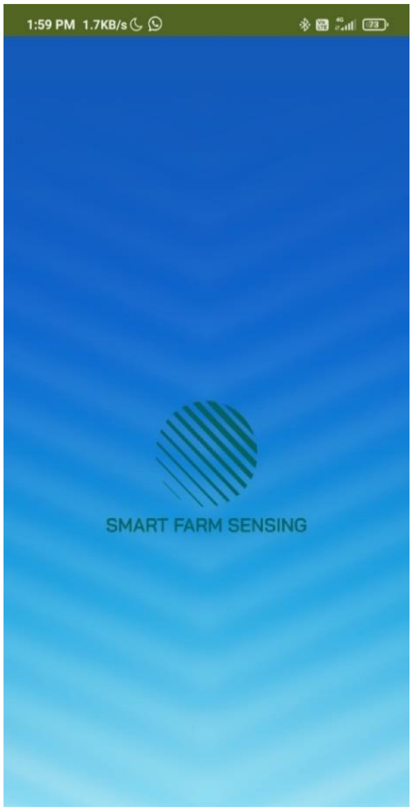
```
11/17/2022, 6:37:07 PM  node:
549e3bf6a12c8248
iot-2/type/abcd/id/801537/evt/IoTSensor/fmt/json :
msg.payload : number
55
11/17/2022, 6:37:24 PM  node:
549e3bf6a12c8248
iot-2/type/abcd/id/801537/evt/IoTSensor/fmt/json :
msg.payload : Object
▸{ temp: 89, Humid: 21, moisture:
37 }
11/17/2022, 6:37:25 PM  node:
549e3bf6a12c8248
iot-2/type/abcd/id/801537/evt/IoTSensor/fmt/json :
msg.payload : number
89
11/17/2022, 6:37:26 PM  node:
549e3bf6a12c8248
iot-2/type/abcd/id/801537/evt/IoTSensor/fmt/json :
msg.payload : number
21
11/17/2022, 6:37:27 PM  node:
549e3bf6a12c8248
iot-2/type/abcd/id/801537/evt/IoTSensor/fmt/json :
msg.payload : number
37
```

Web application testing:

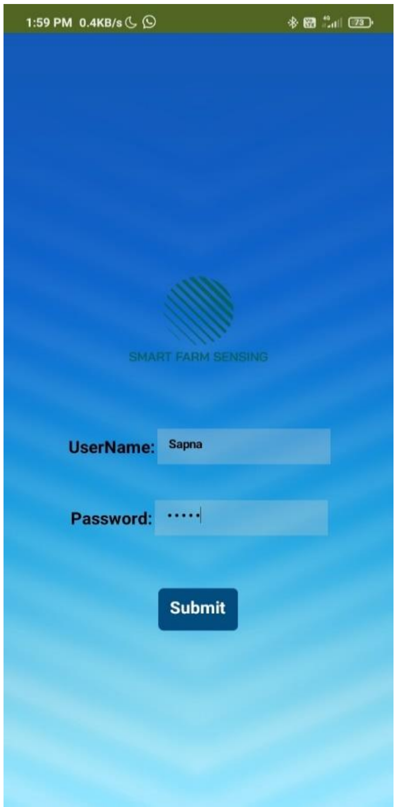


Mobile application testing:

App interface   :



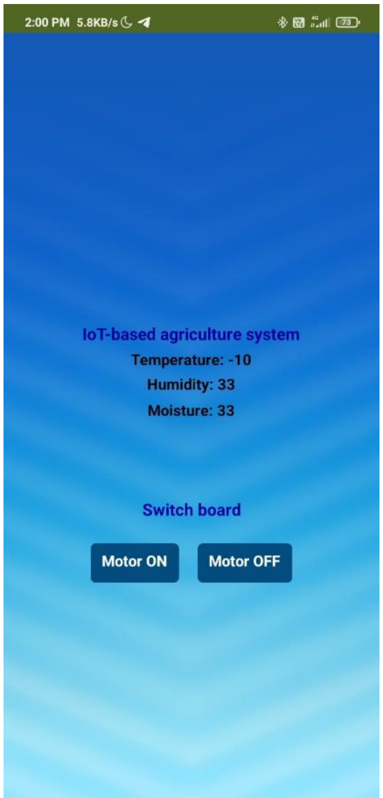
Log in page:



UserName: Sapna

Password: •••••

Dashboard:



IoT-based agriculture system

Temperature: -10

Humidity: 33

Moisture: 33

8.2 USER ACCEPTANCE TESTING

Five different categories that influence user adoption in the agricultural sector can be distinguished by: informational factors, behavioural and social factors, business and economic factors, technological factors and external factors. farmers play an important role in farmers' adoption behaviour. This suggests that participation in organizations can be a key factor influencing farmers adopting technology (Ramirez, 2013). Farmers' organizations can facilitate transfers of technology through exchange of information and ideas among farmers and farmers' organisations

CHAPTER - 9

RESULTS

IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, temperature, and 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.

9.1 PERFORMANCE METRICS

Random temperature, humidity, and moisture values are generated using python code, and the values are sent to the IBM cloud. IBM Cloud sends the values to the node red this value is shown on the node red dash board. Mobile applications are connected via node-red by providing a specific link to MIT App Inventor. So node-red sends the data that is received from the IBM cloud. The received data is then displayed in the mobile application dashboard. This is performance of our project.

CHAPTER - 10

ADVANTAGES & DISADVANTAGES

Advantages:

- 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 it is automated using this app.
- Easy to access.
- The movement proves great advantages for the future; for example, the use of Smart Farming techniques can optimize the yield of land, creating more output from the same amount of input. Not only does smart farming optimize, it also utilizes the knowledge of farming professionals by not replacing the traditional farmer but using their knowledge to support decisions.
- This optimization allows for less waste and maximum efficiency. And the use of sensor technology and real time data allows for unparalleled insight into the commodities market.

Disadvantages:

- However advantageous the movement is, it comes with disadvantages as well. Smart farming requires skills in robotics, and computer based intelligence, skills the average farmer would not necessarily have.
- Not only are farmers not proficient in robotics and computer intelligence the language of the Internet of Things would need to dramatically change in order for both farmers and information technology professionals to communicate to each other.
- Finally farming is a low margin industry so the willingness to invest in innovation is low as well.

CHAPTER – 11

CONCLUSION

The goal of this project is helps farmers, to monitor all the sensor parameters by using a web or mobile application even if the farmer is not near his field. 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. Watering the crop is one of the important tasks for the farmers. This IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, temperature, and humidity using some sensors.

CHAPTER – 12

FUTURE SCOPE

In the coming years, smart farming is projected to create a massive impact on the agricultural economy by bridging the gap between small and large-scale businesses. The trend is not only pertinent in developed countries developing countries have also realized its immense importance as well.

In countries such as China and Japan, wide-scale deployments of smartphones and internet of things (IoT) systems have led to a rapid adoption of precision agriculture solutions. The governments of several countries have also realized the need for, and the advantages of these technologies, and thus, their initiatives to promote precision farming techniques are expected to drive the growth of the market further.

However, such revolutionary changes in farming practices not only come with opportunities but also certain challenges which prove to be a restraint in the growth of the market. The awareness and knowledge about newer agriculture technology are yet to spread extensively, especially in emerging countries.

CHAPTER – 13

APPENDIX

13.1 SOURCE CODE

```
import time
import sys
import ibmiotf.application # to install pip install ibmiotf
import ibmiotf.device

#Provide your IBM Watson Device Credentials
organization = "3lm541" #replace the ORG ID
deviceType = "abcd"#replace the Device type wi
deviceId = "801537"#replace Device ID
authMethod = "token"
authToken = "12345678" #Replace the authtoken

def myCommandCallback(cmd): # function for Callback
    print("Command received: %s" % cmd.data)
    if cmd.data['command']=='motoron':
        print("Motor On IS RECEIVED")

    elif cmd.data['command']=='motoroff':
        print("Motor Off IS RECEIVED")

    if cmd.command == "setInterval":

        if 'interval' not in cmd.data:
            print("Error - command is missing required information:
'interval'")
        else:
            interval = cmd.data['interval']
    elif cmd.command == "print":
        if 'message' not in cmd.data:
            print("Error - command is missing required information:
'message'")
        else:
            output=cmd.data['message']
            print(output)
```

```
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 "hello" with value "world" into the cloud as an event of type "greeting" 10 times
deviceCli.connect()

while True:

      deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

13.2 GITHUB & PROJECT DEMO LINK

https://github.com/IBM-EPBL/IBM-Project-28217-1660109017