PROJECT REPORT

SMART FARMER-IOT ENABLED SMART FARMING

APPLICATIONS

Team ID	PNT2022TMID50618
P.UMA SHANKARI(TL)	952819106303
D.RAJA AMSHA	952819106019
T.SANGEETHA	952819106023
S.SANKARESHNI	952819106024

CHAPTER 1

INDRODUCTION

- Smart farming refers to a farm management concept that uses modern technology with the aim of increase the quality and quantity of agricultural products. This approach includes aspects such as the Internet of Things (IoT), data management, soil scanning, as well as the access to GPS among other smart technologies.

1.1 Project overview:

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

- They can make the decision whether to water the crop or postpone it by monitoring the sensor parameters and controlling the motor pumps from the mobile application itself.

1.2 Purpose

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

CHAPTER 2

LITERATURE SURVEY

2.1 Existing Problem

The growth of the global population coupled with a decline in the natural resources, farmland, and the increase in unpredictable environmental conditions leads to food security is becoming a major concern for all nations worldwide. These problems are motivators that are driving the agricultural industry to transition to smart agriculture with the application of the Internet of Things and big data solutions to improve operational efficiency and productivity. The IoT integrates a series of existing state-of-the-art solutions and technologies, such as wireless sensor networks, cognitive radio ad hoc networks, cloud computing, big data, and end-user applications.

2.2 References

[1] MilosBrajovic, Stefan Vujovic, Slobodan Dukanovic, “An Overview of Smart Irrigation Software”,4th Mediterranean Conference on Embedded Computing,MECO – 2015.

[2] Ankit Patil, AkshayNaik, MayurBeldar, Sachin Deshpande, ”Smart Farming using Ardino and Data Mining ”, International Conference on Computing for Sustainable Global Development, 2016.

[3] Zhouqiao Ren, Xiaonan Lu, “Design of Fertilization Recommendation Knowledge Base and Appllication”,project of Cultivated Land Fertility Evaluation and Fertilization Recommendation in Zhejiang Province.

2.3 Problem Statement Definition

To achieve this objective, we discuss the vision of IoT-enabled smart agriculture ecosystems by evaluating their architecture. In addition, we discuss trends and opportunities of IoT applications for smart agriculture and also indicate the open issues and challenges of IoT application in smart agriculture. The aim / objective of this paper is to propose a Novel Smart IoT based Agriculture

Stick assisting farmers in getting Live Data (Temperature, Soil Moisture) for efficient environment
monitoring which will enable them to do smart farming and increase their overall yield and quality of
products. The Agriculture stick being proposed via this paper is integrated with Arduino Technology, Breadboard mixed with various sensors and live data feed can be obtained online from thingsspeak.com. The product being proposed is tasted on live agriculture fields giving high accuracy over 98% in feeds.

CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

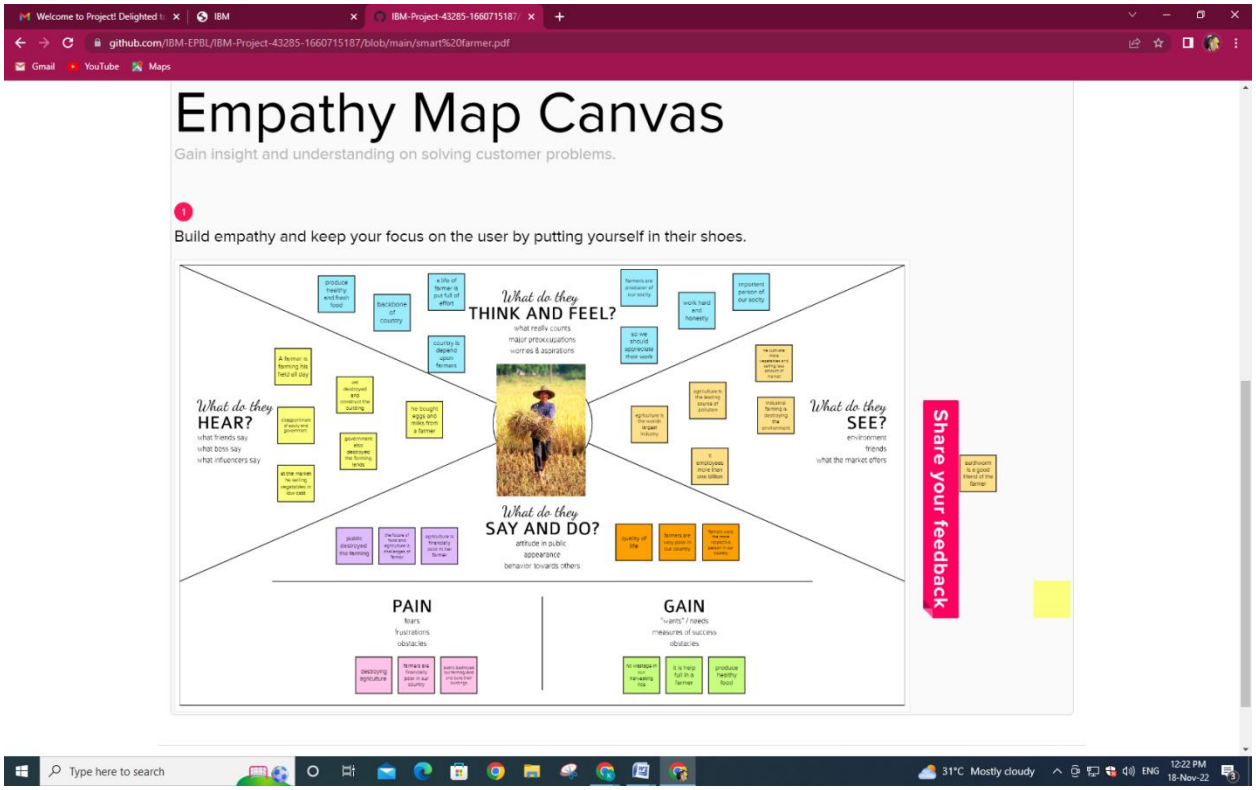


Fig :3.1 Empathy map

3.2 Ideation & Brainstorming

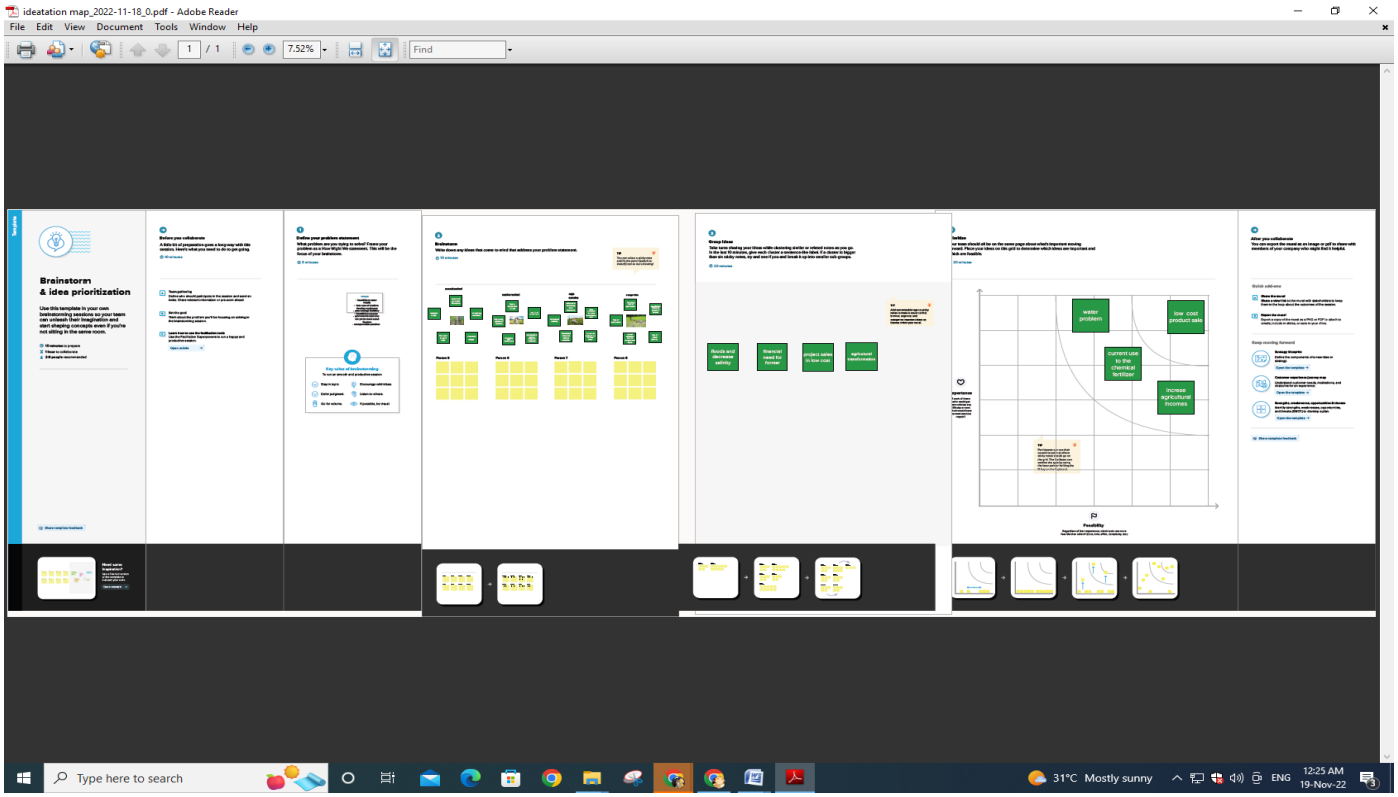


Fig :3.2 Ideation Map & brainstorming

3.3 Proposed Solution

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To develop web application which automatically sense and monitor the field even if the farmer near the field. whether the farmer want to postpone watering the crop, which can be done by mobile application itself.
2.	Idea / Solution description	Our project aim at developing a web application that built for sensing or monitoring information, such as soil condition, temperature and the prediction of natural factors like rainfall and weather, with the help of various sensor like light, temperature, humidity, soil moisture, crop health etc.. By using this application farmer can monitor the field conditions from anywhere.
3.	Novelty / Uniqueness	The unique feature of our application is easy to operate. When some problem causes in the farm, the sensor indicate us by the application.
4.	Social Impact / Customer Satisfaction	It will help the people with providing high yield and healthy crops. Our application indicate us before any hazards occurs.

5.	Business Model (Revenue Model)	Social media is the best way to spread our application in a good manner and with influencers we can attract the normal people.
6.	Scalability of the Solution	It provides service for the user or farmer which is monitored 24/7

Tabulation :3.1 Proposed Solution Templates

3.4 Proposed Solution fit

1. CUSTOMER SEGMENT(S) * Persons who have less number of farming knowledge to monitor or manage one or more farms.	**6.Customer Constraints** * Network connection, high adoption costs, and security concerns.	**5. AVAILABLE SOLUTIONS** *To increase the quantity and quality of agriculture products.

2. JOBS-TO-BE-DONE / PROBLEMS * Cope with climate change, soil erosion and biodiversity loss.	**9. PROBLEM ROOT CAUSE** * To alleviate security concerns, we use sensors to detect real-time status.	**7. BEHAVIOUR** *With the help of IOT devices you can know the real-time status of the crops.

3. TRIGGERS TR * Meeting other who have better cost management by using smart farming application. * Watching more benefits from using smart farming application in social media.	**10. YOUR SOLUTION SL** * Our patented sensorstechnology requires no batteries or wires and communicates wirelessly to a reader over a distance of as much as 19 meters. * The sensors	8. CHANNELS of BEHAVIOUR CH 8.1 ONLINE *Easy to monitoring from anywhere, controlling resources easily and effectively. 8.2 OFFLINE * Spending more time to

	4. EMOTIONS: **BEFORE / AFTER** * Before - High paid cost spending more time in farms to manage. Fear about sudden climate change. *After – Satisfied. Feeling secured. Better understanding about factors such as water, climate changing etc….	can sense applicators to apply less nitrogen to healthy plants and more nitrogen to weaker, unhealthy plants.	manage crops in farms, appoint people with salary to monitor farms.	

Tabulation :3.2 Proposed Solution Fit

CHAPTER 4

REQUIREMENT ANALYSIS

4.1 Functional Requirement

Following are the functional requirements of the proposed solution.

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

Tabulation :4.1 Functional Requirement

4.2 Non-Functional Requirement

Following are the non-functional requirements of the proposed solution.

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.

Tablution :4.2 Non Functional Rquriement

CHAPTER 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.

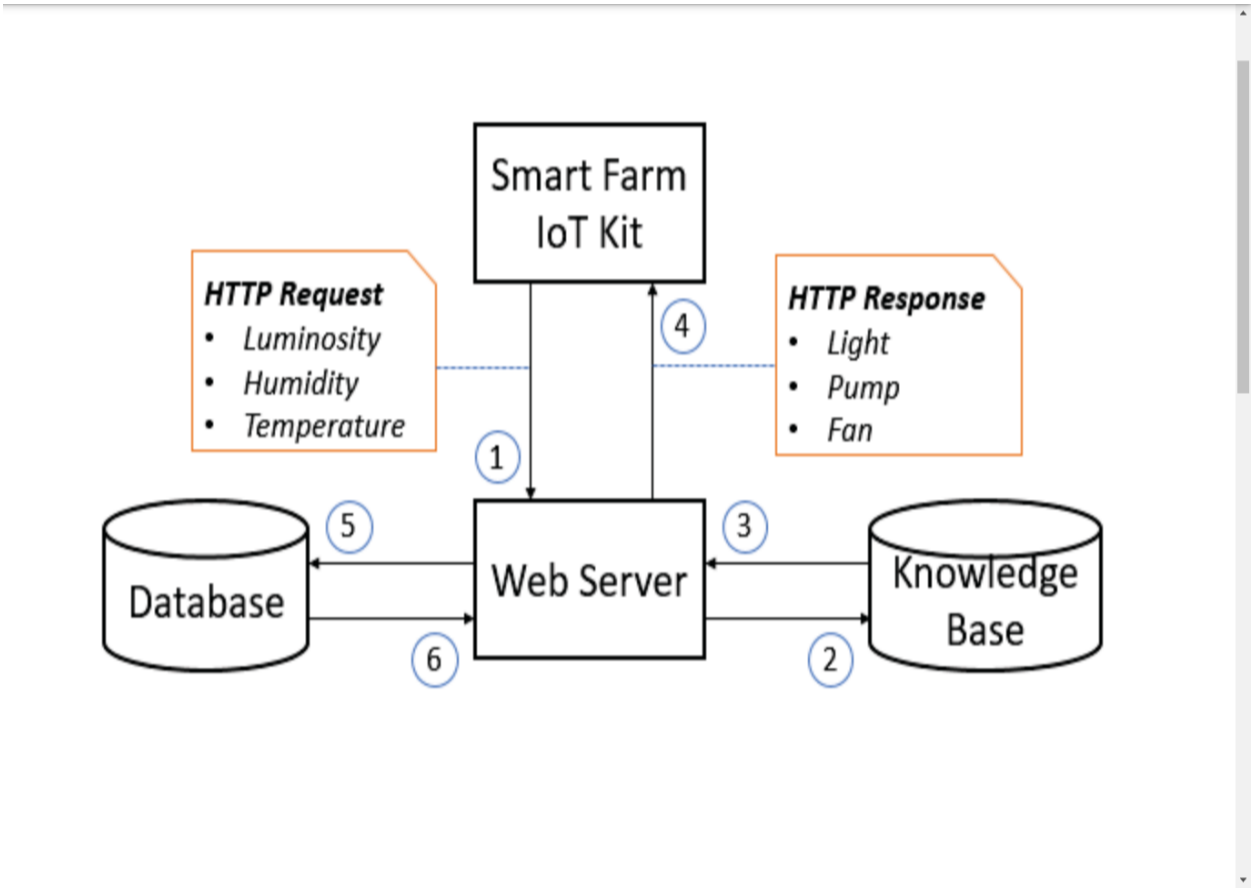
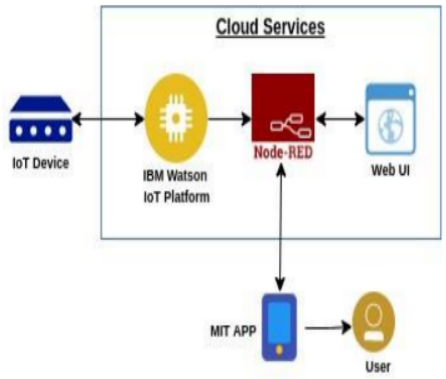


Fig :5.1 Data Flow Diagram1



User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	IoT devices	USN-1	Sensors and wi-fi module		High	Sprint-1
Customer	Software	USN-2	IBM Watson IoT platform, Workflows for IoT scenarios using Node-red		High	Sprint-2
Customer	MIT app	USN-3	To develop an application using MIT		High	Sprint-3
Customer	Web UI	USN-4	To make the user to interact with the software.	User can access the app for the services.	High	Sprint-4

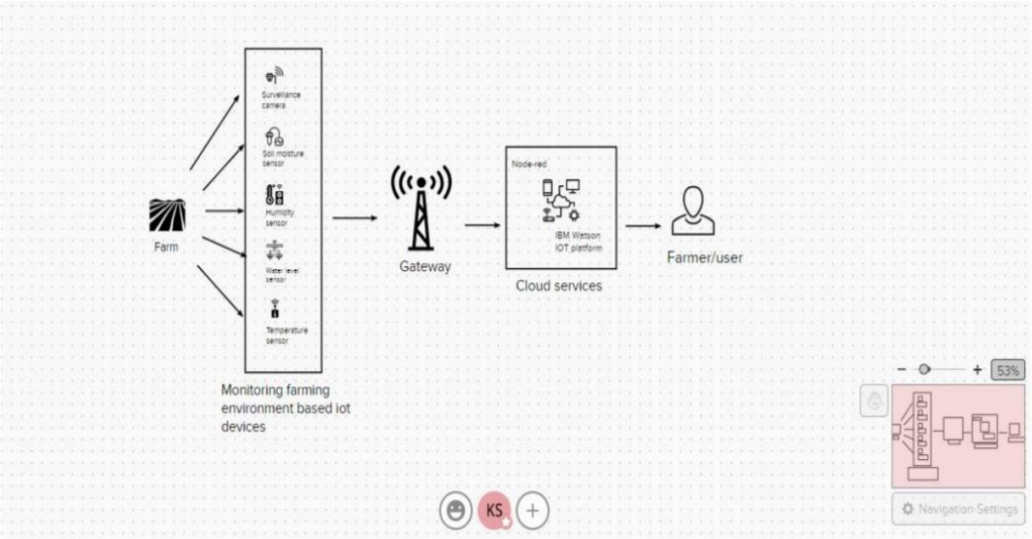
Fig 5.2 Data Flow Diagram2

5.2 Solution Architecture

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

Example - Solution Architecture Diagram:



Solution and Technical Architecture

Fig :5.3 Solution and Technical Architecture

5.3 User Stories

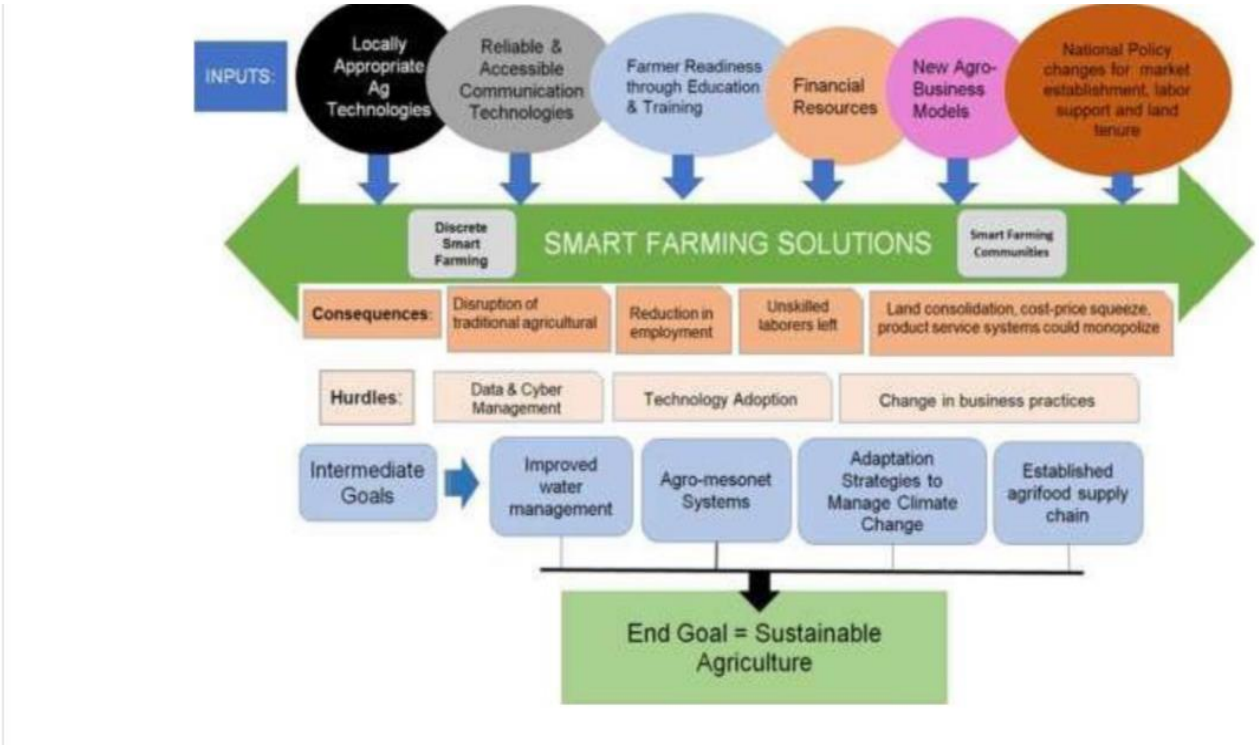


Fig :5.4 User Stories

CHAPTER 6

PROJECT PLANNING AND SCHEDULING

6.1 Sprint Planning & Estimation

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Sprint	**Functional Requirement (Epic)**	**User Story Number**	**User Story /Task**	**Story Points**	**Priority**	**Team Member**
Sprint-1	Registration (Farmer Mobile User)	UNS-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	P . uma shankari(TL) D.Rajaamsha,T.Sangeetha , S.Sankareshni

Sprint-1	Login	UNS-2	As a user, I will receive confirmation email once I have registered for the application	1	High	P . uma shankari(TL) D.Rajaamsha,T.Sangeetha , S.Sankareshni
Sprint-1	Data Visualization	UNS-4	As a user, I can register for the application through GMAIL	2	Medium	P . uma shankari(TL) D.Rajaamsha,T.Sangeetha , S.Sankareshni
Sprint - 1	Registration (Chemical Manufacturer - Web user)	USN - 1	As a new user, I want to first register using my organization email and create a password for the account.	2	High	P . uma shankari(TL) D.Rajaamsha,T.Sangeetha , S.Sankareshni
Sprint - 1	Registration (Chemical Manufacturer - Mobile User)	USN - 1	As a user, I want to first register using my email and create a password for the account.	3	High	P . uma shankari(TL) D.Rajaamsha,T.Sangeetha , S.Sankareshni
Sprint - 1	Login	USN - 2	As a registered user, I need to easily log in to the application.	2	Low	P . uma shankari(TL) D.Rajaamsha,T.Sangeetha , S.Sankareshni

Fig 6.1 Sprint 1

Sprint-2	User Interface	UNS-3	As a user, I can register for the application through Facebook	3	Low	P . uma shankari(TL) D.Rajaamsha,T.Sangeetha , S.Sankareshni
Sprint - 2	Login	USN - 2	As a registered user, I need to easily login log into my registered account via the web page in minimum time	3	High	P . uma shankari(TL) D.Rajaamsha,T.Sangeetha , S.Sankareshni
Sprint-3	Registration (Farmer - Web User)	USN - 1	As a user, I can log into the application by entering email and password	3	High	P . uma shankari(TL) D.Rajaamsha,T.Sangeetha , S.Sankareshni
Sprint - 3	Web UI	USN - 3	As a user, I need to have a userfriendly interface to easily view and access the resources.	3	Medium	P . uma shankari(TL) D.Rajaamsha,T.Sangeetha , S.Sankareshni
Sprint - 4	Login	USN - 2	As a registered user, I need to easily log in using the registered account via the web page.		High	P . uma shankari(TL) D.Rajaamsha,T.Sangeetha , S.Sankareshni
Sprint - 4	Web UI	USN - 3	As a user, I need to have a friendly user interface to easily view and access the resources	3	Medium	P . uma shankari(TL) D.Rajaamsha,T.Sangeetha , S.Sankareshni

Fig 6.2 Sprint planning

6.2 Sprint Delivery and Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Poin ts Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	12	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	6	6 Days	31 Oct 2022	05 Nov 2022	20	30 OCT 2022
Sprint-3	6	6 Days	07 Nov 2022	12 Nov 2022	20	6 NOV 2022
Sprint-4	6	6 Days	14 Nov 2022	19 Nov 2022	20	7 NOV 2022

Fig : Sprint Delivery and Schedule

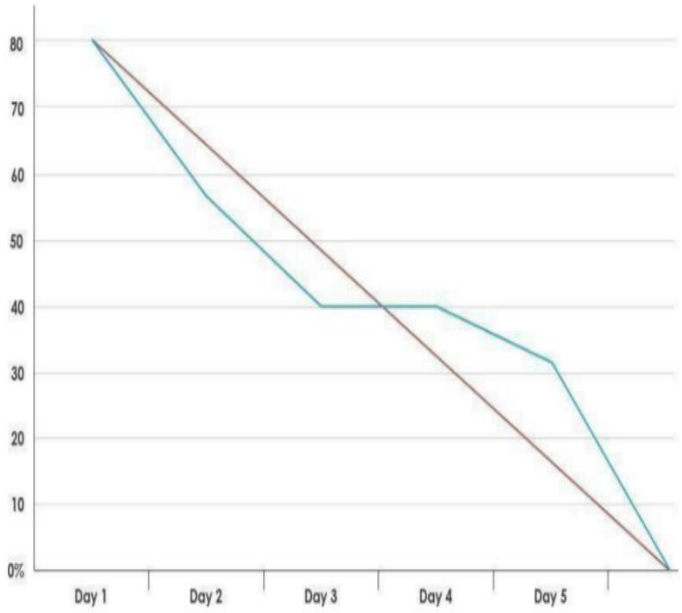
6.3 Reports From JIRA

Velocity:

AV for sprint 1= Sprint Duration /velocity =12/6=2
AV for sprint 2= Sprint Duration/Velocity=6/6=1
AV for Sprint 3=Sprint Duration/Velocity=6/6=1

AV for Sprint 4=Sprint Duration/Velocity=6/6=1

Burndown Chart:



CHAPTER 7

CODING AND SOLUTIONING

```
Import wiotp.sdk.device

Import time import os

Import datetime import
Random myConfig = {

“identity”: {

“orgId”:“3j2gcg”,

“typeId”: “ultrasonic”,

“deviceId”:“1407”

},

“auth”: {

“token”: “14073008”

} }

Client = wiotp.sdk.device.DeviceClient (config=myConfig, logHandlers=None)
client.connect () def myCommandCallback (cmd) :
print (“Message received from IBM IoT Platform: %s” %
cmd.data[‘command’]) m=cmd.data[‘command’] if (m==”motoron”):
Print (“Motor is switched on”) elif (m==”motoroff”): Print (“Motor is
switched
OFF”) Print (“ “) while
True:
Soil=random.ra

Ndint (0,100)

Temp=random.r

Andint (-20,
125)

Hum=random.r
Andint (0, 100)
myData={‘soil
moisture’: soil,
‘temperature’:te

Mp,

‘humidity’:hum
```

```
}
Client.publish
E Vent
(eventId=”s
tat u S”,
msgFormat
=” js on”,
data=myData, qos=0 , onPublish=None)print
(“Published data Successfully: %s”, myData)
Time.sleep(2)
Client.commandCallback
=myCommandCallback Client.disconnect()
```

7.1 Feature 1

The unique feature of our project is that we can add up to 5 soil moisture and humidity sensors and we can add up to 4 pumps. The device is also capable of sustaining solar power so that it could operate without any power shortages during day time. It is capable of operating autonomously without any human intervention.

7.2 Feature 2

The person who connected with the device can only view the data, other than the person connected with the device will not be able to view the sensor readings. It enables a simple device security principle that others cannot view and control the sensor readings from the device.

7.3 Data Base Scheme

The user who is connected to the device can view the readings in mobile as well as the desktop. It is both mobile and web responsive so the is now need to install a separate mobile application in the mobile devices to view the device status.

CHAPTER 8

TESTING

8.1 Test Cases

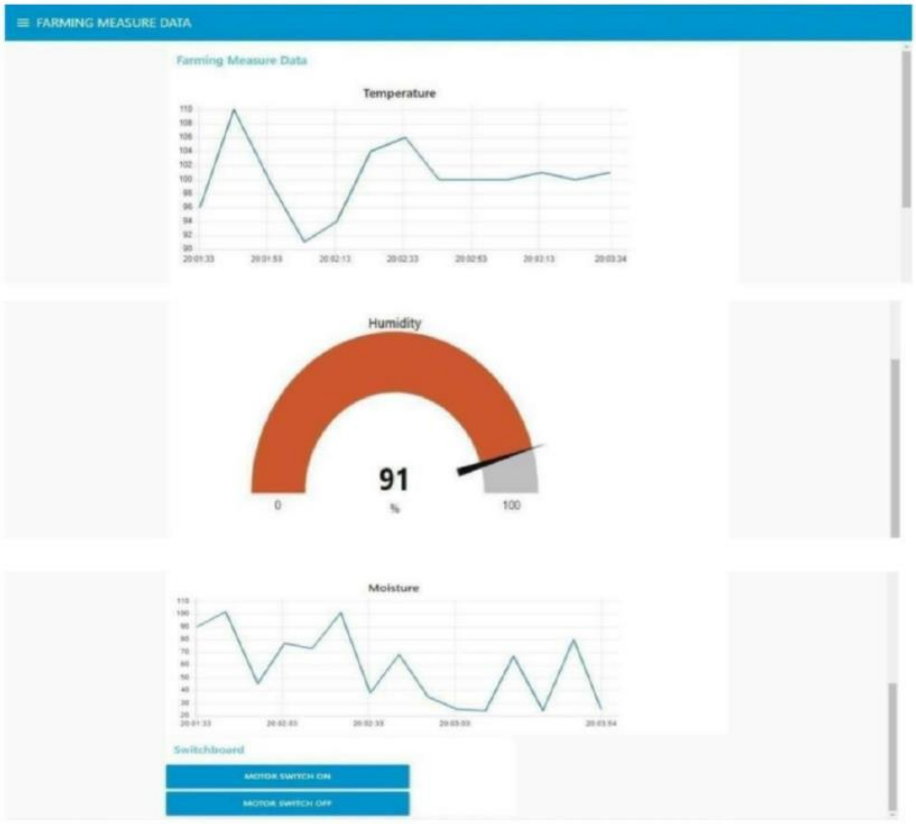
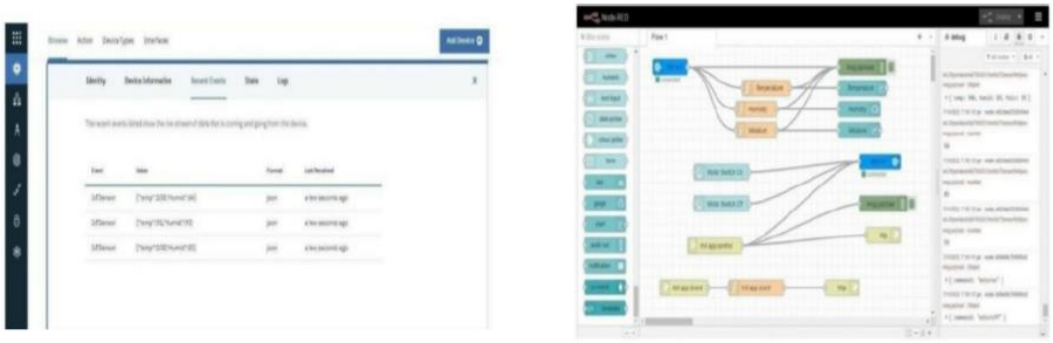


Fig :8.1 Test Cases



8.2 User Acceptance Testing

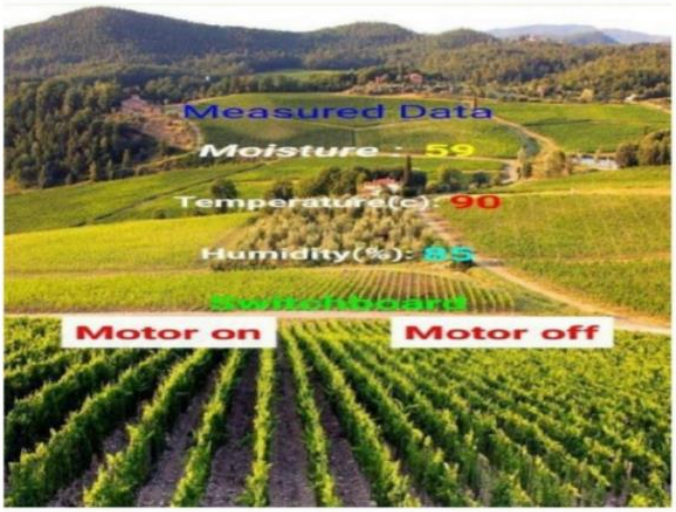


Fig :8.2 User Acceptance Testing

CHAPTER 9

ADVANTAGES AND DISADVANTAGES

Advantages

- All conservation efforts such as water usage and increased production per land unit directly affect the environmental footprint positively.
- Analyzing production quality and results in correlation to treatment can teach farmers to adjust processes to increase quality of the product.
- Accurately tracking production rates by field over time allows for detailed predicting of future crop yield and value of a farm.
- Automating processes in planting, treatment and harvesting can reduce resource consumption, human error and over all cost.
- Farmers can visualize production levels, soil moisture, sunlight intensity and more in real time and remotely to accelerate decision making process.
- Weather predictions and soil moisture sensors allow for water use only when and where needed.

Disadvantages

- The Cost Involved in Smart Agriculture
- There could be wrong Analysis of Weather Conditions
- Farmers are not used to these high-end technologies. They do not understand computer language or the artificial intelligence.
- In the case of equipment like robots and computer based intelligence for running the devices, it is highly unlikely that a normal farmer will be able to possess this knowledge or even develop them.
- The use of technology in farming and agriculture making It smart agriculture, is of course, a good initiative and a much-needed one with the present increasing demand in the food supply.

CHAPTER 10

CONCLUSION

- Smart farming can make agriculture more profitable for the farmer. Decreasing resource inputs will save the farmer money and labor, and increased reliability of spatially explicit data will reduce risks .The envisaged smart farming the coming years is not just a rudimentary vision, but a path for research, technological development and most importantly for innovation. New IoT based solutions that are making an optimal usage of digital devices and the virtual world in challenging as well as harsh environments are promising a huge impact for agri-food business, technology providers and finally for all of us as consumers.

CHAPTER 11

FUTURE SCOPE

 Smart farming” is an emerging concept that refers to managing farms using technologies like IoT, robotics, drones and AI to increase the quantity and quality of products while optimizing the human labor required by production.

 The Internet of Things (IoT) has provided ways to improve nearly every industry imaginable. In agriculture, IoT has not only provided solutions to often time-consuming and tedious tasks but is totally changing the way we think about agriculture

CHAPTER 12

APPENDIX

```
Import wiotp.sdk.device
Import time import os
Import datetime import
Random myConfig = {
“identity”: {
“orgId”: “3j2gcg”,
“typeId”: “ultrasonic”,
“deviceId”: “1407”
},
“auth”: {
“token”: “14073008”
} }
Client = wiotp.sdk.device.DeviceClient
(config=myConfig, logHandlers=None) client.connect () def
myCommandCallback (cmd) :
print (“Message received from IBM IoT Platform: %s” % cmd.data[‘command’])
m=cmd.data[‘command’] if (m==”motoron”):
Print (“Motor is switched on”) elif (m==”motoroff”):
Print (“Motor is switched OFF”)
Print (“ “)
while True:
Soil=rando
m.ra
Ndint (0,100)
Temp=random.r
Andint (-20,
125)
Hum=random.r
Andint (0, 100)
myData={‘soil
moisture’: soil,
‘temperature’:te
```

Mp,

‘humidity’:hum

}

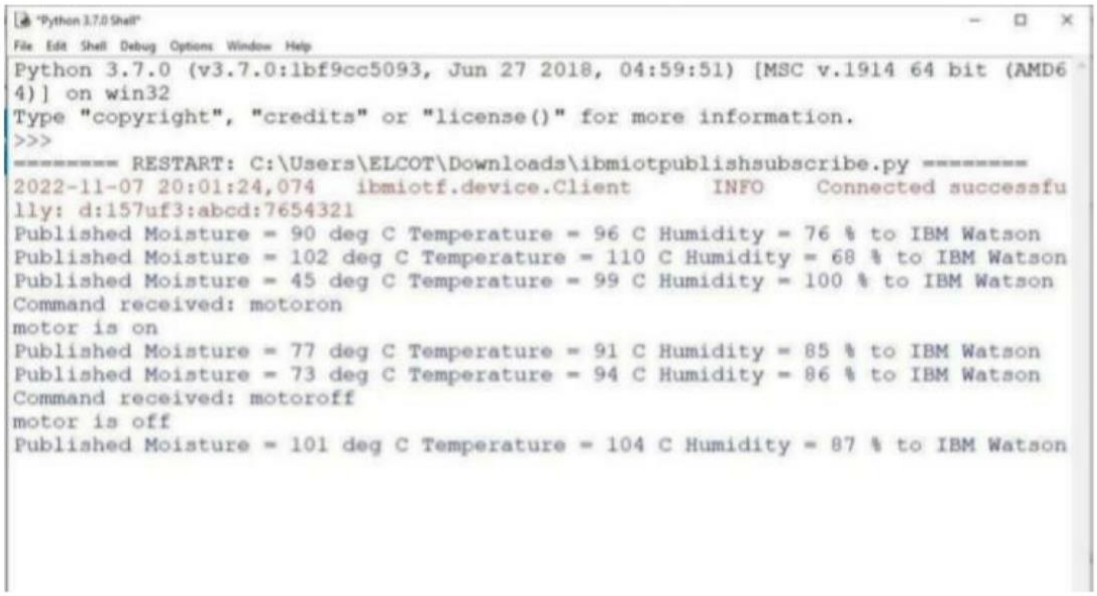
Client.publish

E Vent

(eventId=”stat u S”, msgFormat=” js on”,
data=myData, qos=0 , onPublish=None) print
(“Published data Successfully: %s”, myData)
Time.sleep (2)

Client.commandCallback = myCommandCallback Client.disconnect ()

OUTPUT



GITUP LINK

https://github.com/IBM-EPBL/IBM-Project-43285-1660715187