IBM PROJECT

SMARTFARMER - IOT ENABLED SMART FARMING APPLICATION

Batch : B1-1M3E

Team ID **:** PNT2022TMID47454

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Team Members :

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2. NITHYA SRI SANTHOSHINI K V N S
3. ARTHI S

<u>CONTENT</u>

1.INTRODUCTION

1.1 Project Overview:

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

1.2 Purpose:

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.

2. LITERATURE SURVEY

2.1 Existing problem :

Farmers cannot know if the application does not work properly. If the farmer is far from the crop field, it is difficult for him to monitor and control. Farmers cannot detect if any sensors are damaged.

2.2 References:

Andreas Kamilaris, Feng Gao, Francesc X. Prenafeta-Boldu and Muhammad Intizar Ali "Agri-IoT: A Semantic Framework for Internet of things-enabled Smart Farming Applications.",

Reuben Varghese and Smarita sharma "Affordable Smart Farming Using IoT"— 2018.

Nahina Islam, Biplob Ray and Faezeh Pasandideh "IoT Based Smart Farming: Are the LPWAN Technologies Suitable for Remote Communication?" --2022 .

Jinsuk Baek, Munene W. Kanampiu "A Strategic Sensor Placement for a Smart Farm Water Sprinkler System"— 2021.

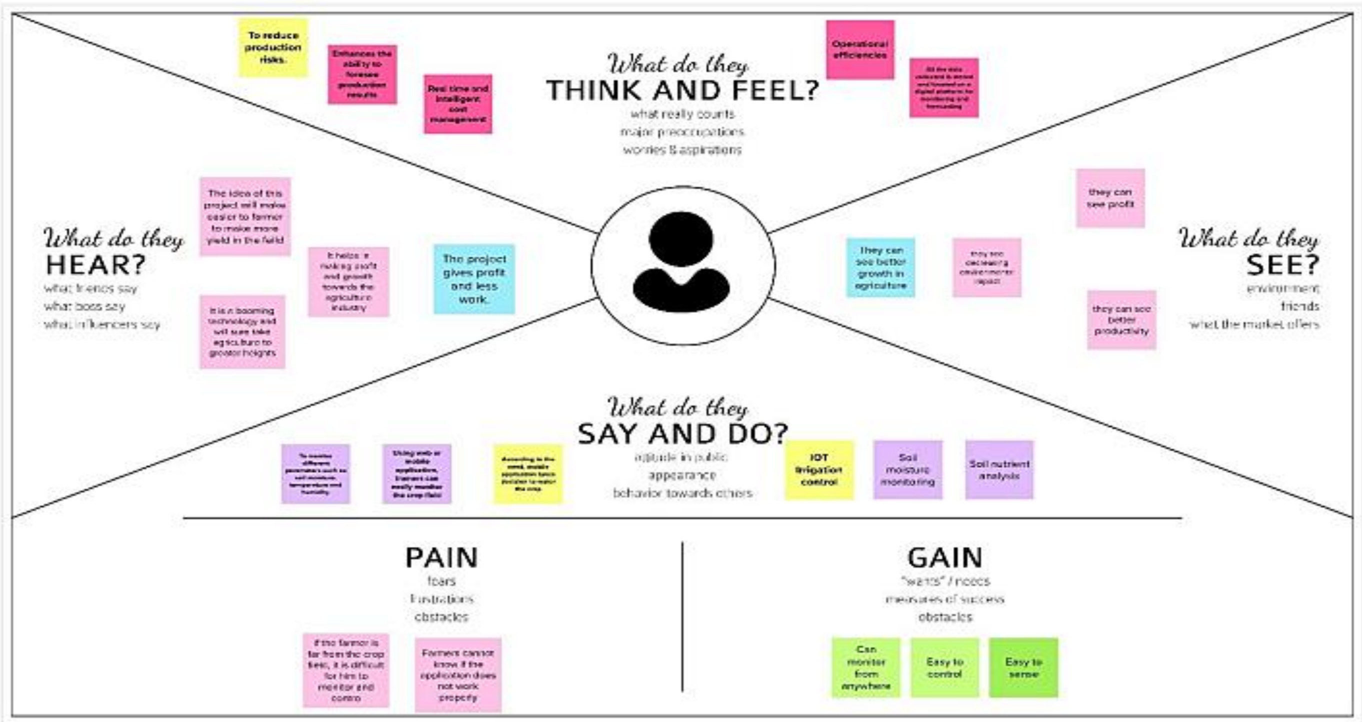
Nattapol Kaewmard and Saiyan Saiyod "Sensor Data Collection and Irrigation Control Using Smart Phone and Wireless Sensor Networks for Smart Farm" –2014.

2.3 Problem Statement Definition :

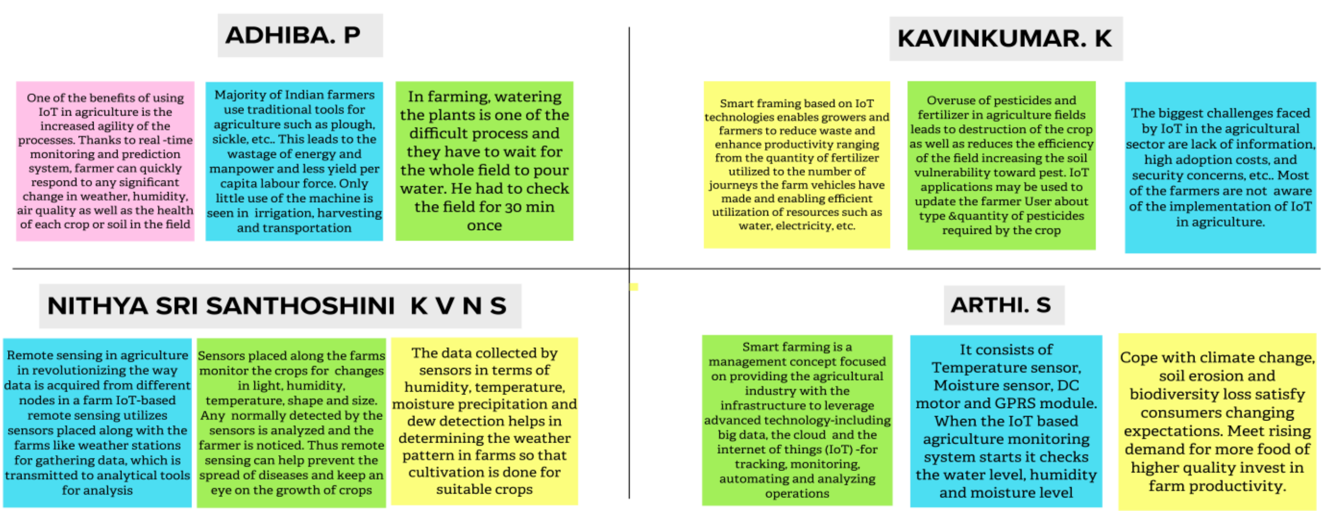
Farmer are under pressure to produce more food and use less energy and water in the process. A remote monitoring and control system will help farmers deal effectively with these pressures.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas :

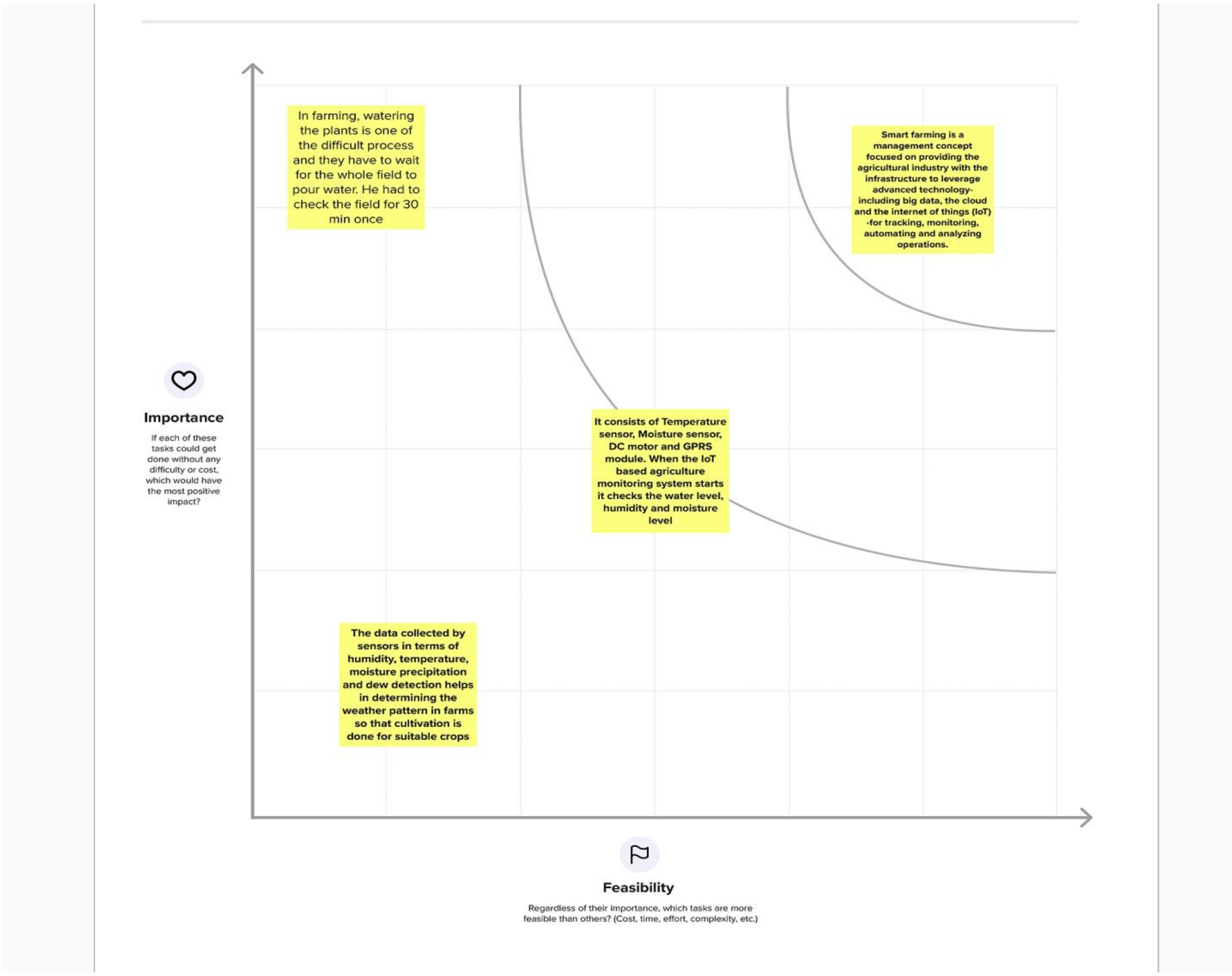


3.2 Ideation & Brainstorming:



GROUP IDEAS:

- ✓ soil moisture, temperature, humidity should be monitored.
- ✓ In farming, watering the plants is one of the difficult process and they have to wait for the whole field to pour water. He had to check the field for 30 min once.
- ✓ Intensive research on various plant diseases.
- ✓ It should operated in online mode only.
- ✓ Application should alert to monitor the crop field.

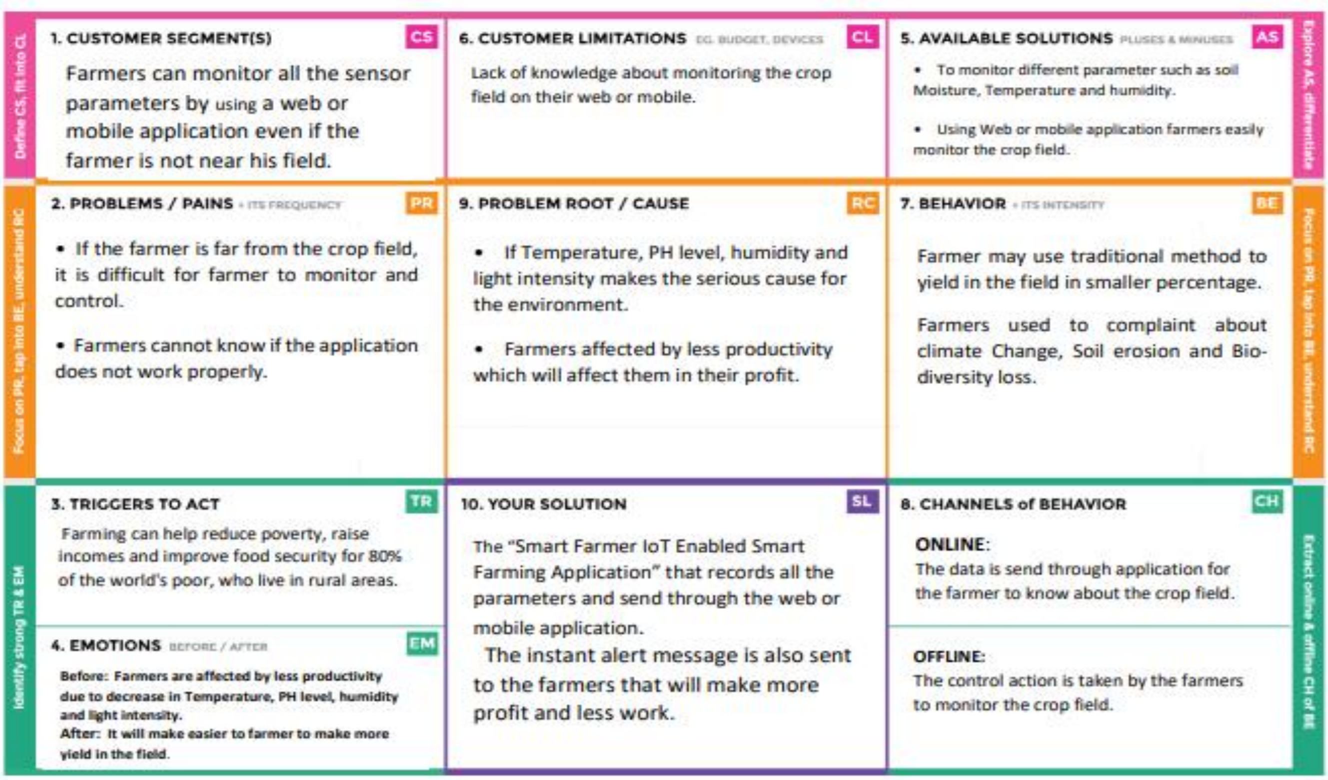


3.3 Proposed Solution :

S.No	Parameter	Description
1	Problem Statement (Problem to be solved)	✓ Helps the farmer in monitoring different parameters of his field like soil moisture, temperature, humidity using mobile application and sensors.
2	Idea / Solution description	✓ IOT based agricultural application
3	Novelty / Uniqueness	✓ Collect the data about the different types of the soil and predict the yield about, in which soil the particular crop will be efficiently cultivated.

4	Social Impact / Customer Satisfaction	✓ With farms being located in far-off areas and distant lands, farmers are seeking a better solution to their management issues. ✓ Smart Greenhouse and time management.
5	Business Model (Revenue Model)	✓ For first one week we will give free access to this app then, after using this app they will come to know about the efficiency of this app. ✓ Then according to their convenience, they can make use of this application by using premium either a month or a year.
6	Scalability of the Solution	✓ Decrease farmer's burden. ✓ Easy to control and monitoring. ✓ Adopt and learn new technologies.

3.4 Problem Solution fit:



4. REQUIREMENT ANALYSIS

4.1 Functional requirement:

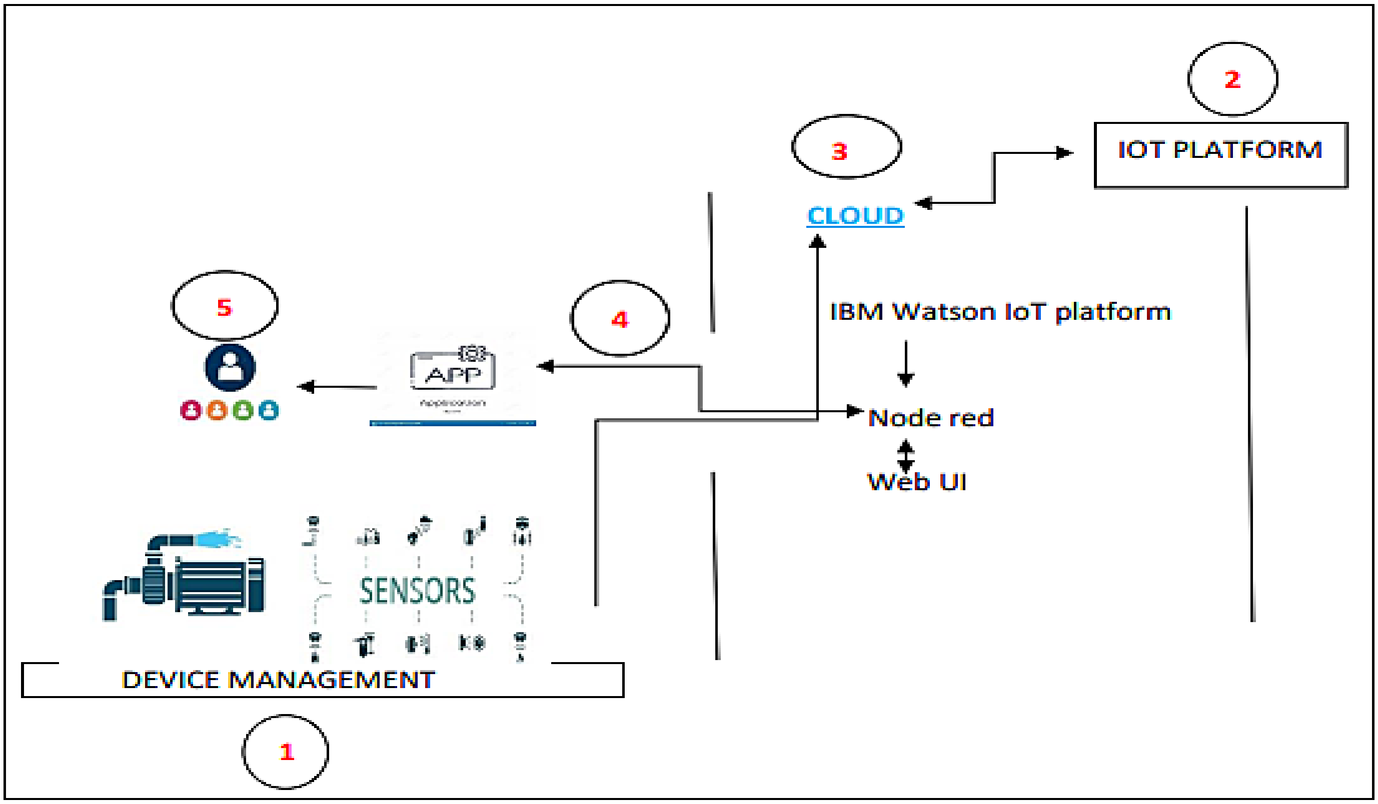
FR No.	Functional Requirement (Epic)	✓ Sub Requirement (story / sub-Task)
FR-1	User Visibility	✓ Alerts are given via Fast SMS
FR-2	User Reception	✓ The data like temperature, humidity, light intensity, pH level are received via SMS.
FR-3	User Understanding	✓ All the collected data are provided to the user through a mobile application which was developed. Depending upon the sensor values, Mobile Motor Pump controller waters the crop.
FR-4	User Action	✓ Placing IoT sensors in the field can help farmers getreal-time data on factors affecting crop health andoverall yield. ✓ This data helps farmers identify disease and infection in their crops, and earlier treatment interventions.

4.2 Non-Functional requirements:

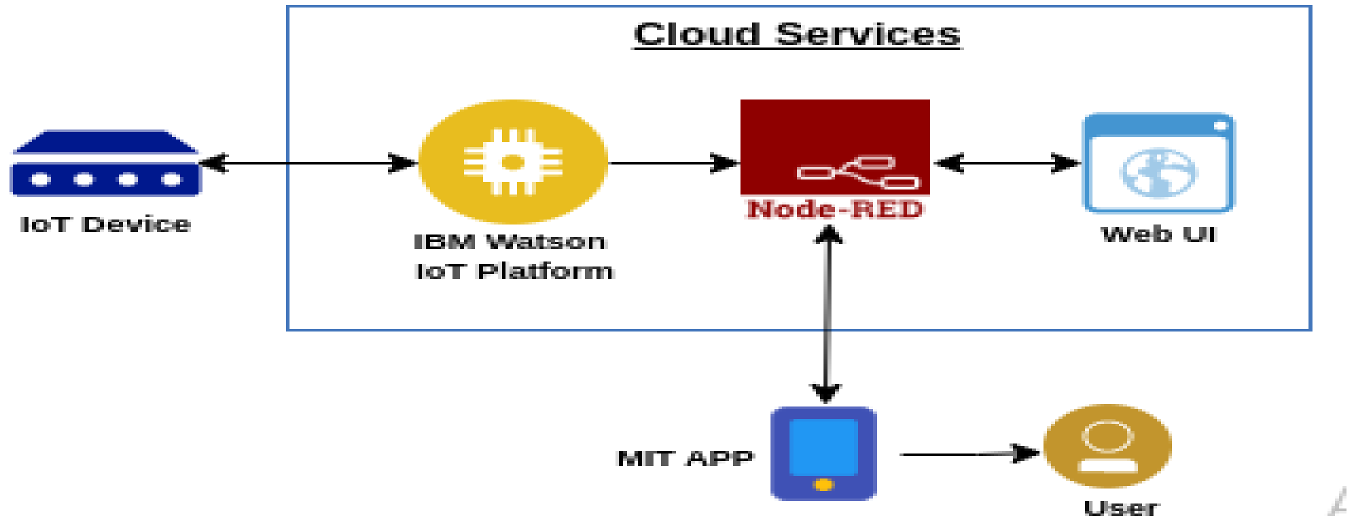
NFR No	Non-Functional Requirement	Description
NFR-1	Usability	✓ It ought to monitor the data collected by sensors on the mobile applications and website
NFR-2	Security	✓ It ought to access Sensor data securely and data security should be assured.
NFR-3	Reliability	✓ It might have a capacity to water crops accurately with the collected data.
NFR-4	Performance	✓ It ought to improve production, ensure accurate and efficient communication to farmers of real time data related to dynamic agricultural processes, weather forecasts, soil quality, availability and cost of labor.
NFR-5	Availability	✓ It could be accessible for day in and day out hours so it tends to be useful for individuals
NFR-6	Scalability	✓ The sensors used in this framework ought to have the option to effortlessly change overhaul concurring to change and need in requirements.

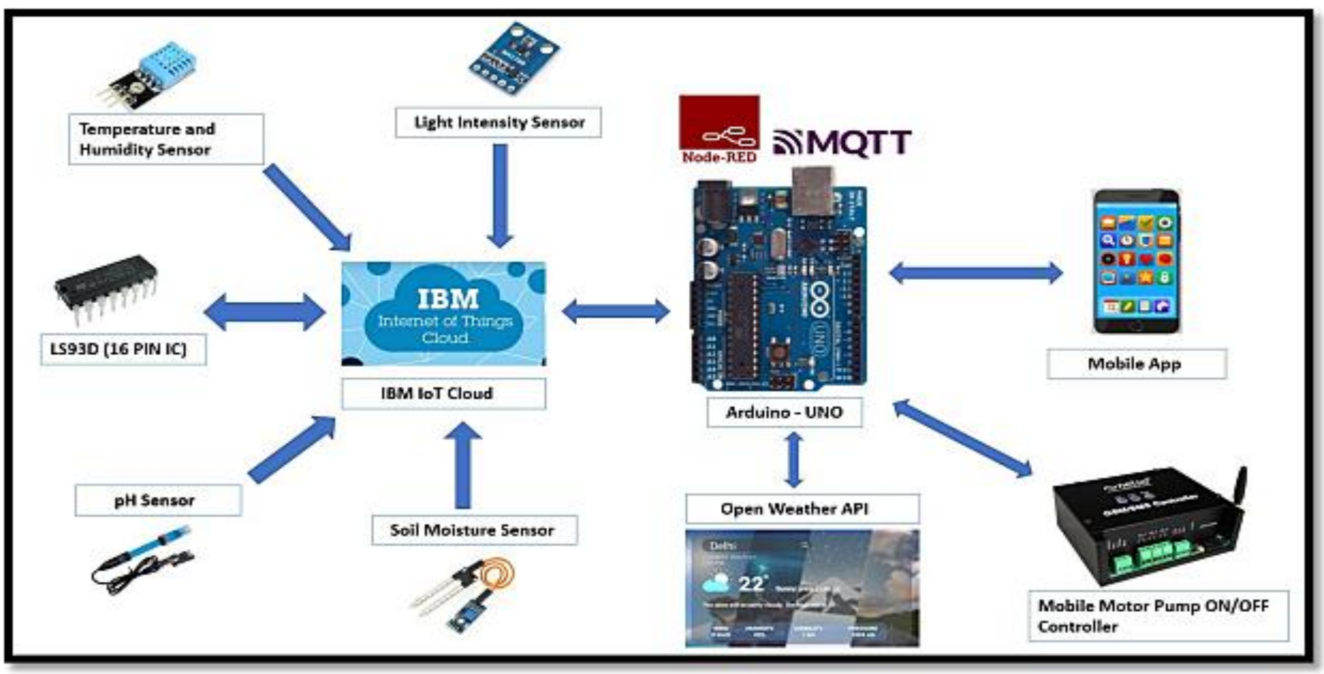
5. PROJECT DESIGN

5.1 Data Flow Diagrams:



5.2 Solution & 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	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I	I can receive confirmation	High	Sprint-1

			have registered for the application	email & click confirm		
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN-6	As a User, I can monitor the Dashboard	I can monitor the values of temperature, soil moisture,humidity via dashboard	High	Sprint-2
Customer Care Executive		USN-7	As a customer care executive,I will detect the problems	I will detect the problems and correct them if the device face any	Medium	Sprint-3
Administrator		USN-8	As an administrator, I ensure the efficiency of the device	I will ensure efficiency,cost, etc	High	Sprint-4

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation:

Sprint	Functional Requirement	User Story Number	User story /Task	Story Point	Priority	Team Members
Sprint-1		US-1	Create the IBM Cloud services which are being used in this project	6	High	Adhiba, Kavinkumar, Arthi, Nithiya sri santhoshini
Sprint-1		US-2	Configure the IBM Cloud services which are being used in completing this project	4	Medium	Adhiba, Kavinkumar, Arthi, Nithiya sri santhoshini
Sprint-1		US-3	IBM Watson IoT platform acts as the mediator to connect the web application to IoT devices, so create the IBM Watson IoT platform.	5	Medium	Adhiba, Kavinkumar, Arthi, Nithiya sri santhoshini

Sprint-1		US-4	In order to connect the IoT device to the IBM cloud, create a device in the IBM Watson IoT platform and get the device credentials.	5	High	Adhiba, Kavinkumar, Arthi, Nithiya sri santhoshini
Sprint-2		US-1	Configure the connection security and create API keys that are used in the Node-RED service for accessing the IBM IoT Platform.	10	High	Adhiba, Kavinkumar
Sprint-2		US-2	Create a Node -RED service.	10	High	Adhiba, Kavinkumar.
Sprint-3		US-1	Develop a python script to publish random sensor data such as temperature, moisture, soil and humidity to the IBM IoT platform	7	High	Adhiba, Kavinkumar, Arthi, Nithiya sri santhoshini
Sprint-3		US-2	After developing python code, commands are received just print the statements which represent the control of the devices.	5	Medium	Adhiba, Kavinkumar, Arthi, Nithiya sri santhoshini
Sprint-3		US-3	Publish Data to The IBM Cloud	8	High	Adhiba, Kavinkumar, Arthi, Nithiya sri santhoshini
Sprint-4		US-1	Create Web UI in Node - Red (MIT app inventor)	10	High	Adhiba, Kavinkumar, Arthi, Nithiya sri santhoshini
Sprint-4		US-2	Configure the Node -RED flow to receive data from the IBM IoT platform and also use fast2sms for SMS service	10	High	Adhiba, Kavinkumar, Arthi, Nithiya sri santhoshini

6. 2 Sprint Delivery Schedule:

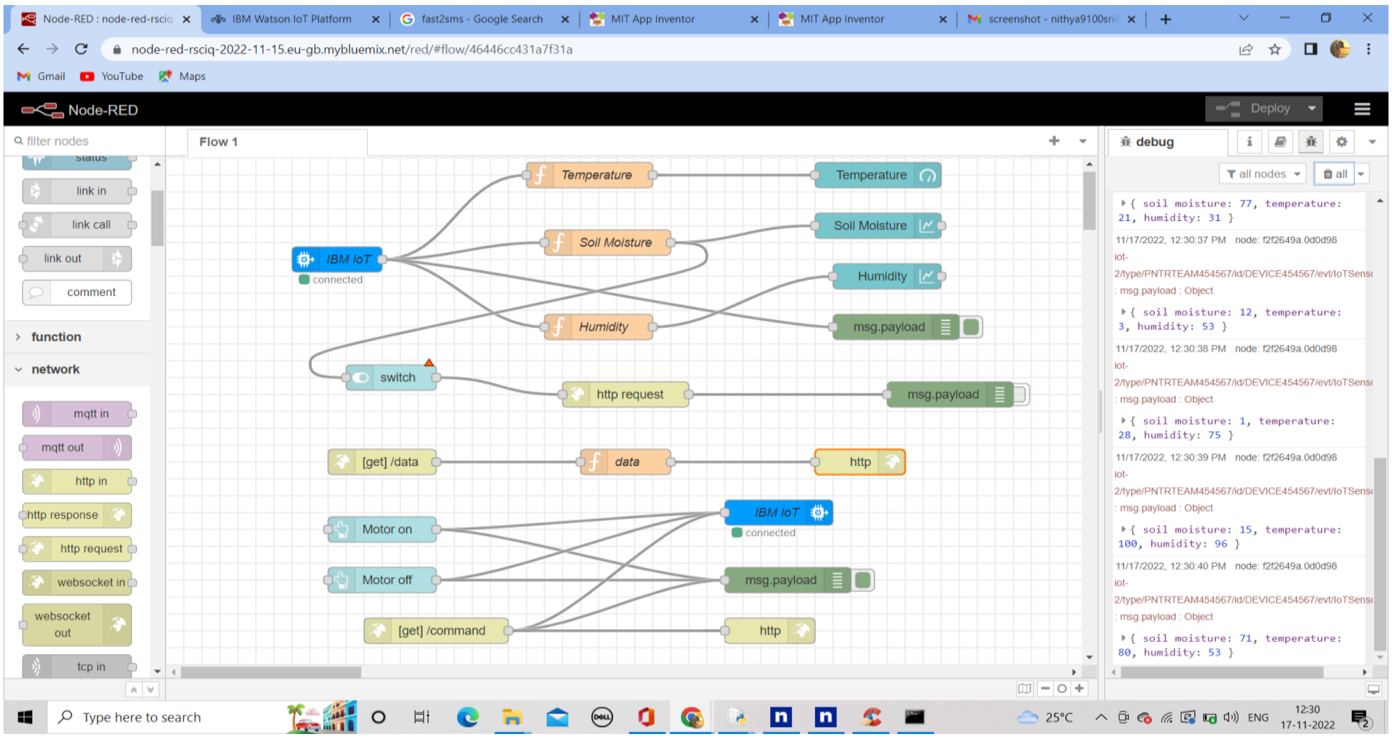
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022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

6.3 Reports from JIRA:

Reports from JIRA regarding sprint delivery

7. CODING & SOLUTIONING

7.1 Feature 1 (Node Red Output):



7.2 Feature 2: (Python code):

```
import time

import sys

import ibmiotf.application

import ibmiotf.device

import random


 #Provide your IBM Watson Device Credentials

organization = "7um9ms"

deviceType = "PNTRTEAM454567"

deviceId = "DEVICE454567"

authMethod = "token"
```

```
authToken = "2bB!y?GuCED9(8THRD"

 # Initialize GPIO

 def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="motoron":
        print ("motor is on")
    else :
        print ("motor is off")
       #print(cmd)
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:
        #Get Sensor Data from DHT11

        soil=random.randint(0,100)
        temp=random.randint(0,100)
        hum=random.randint(0,100)
```

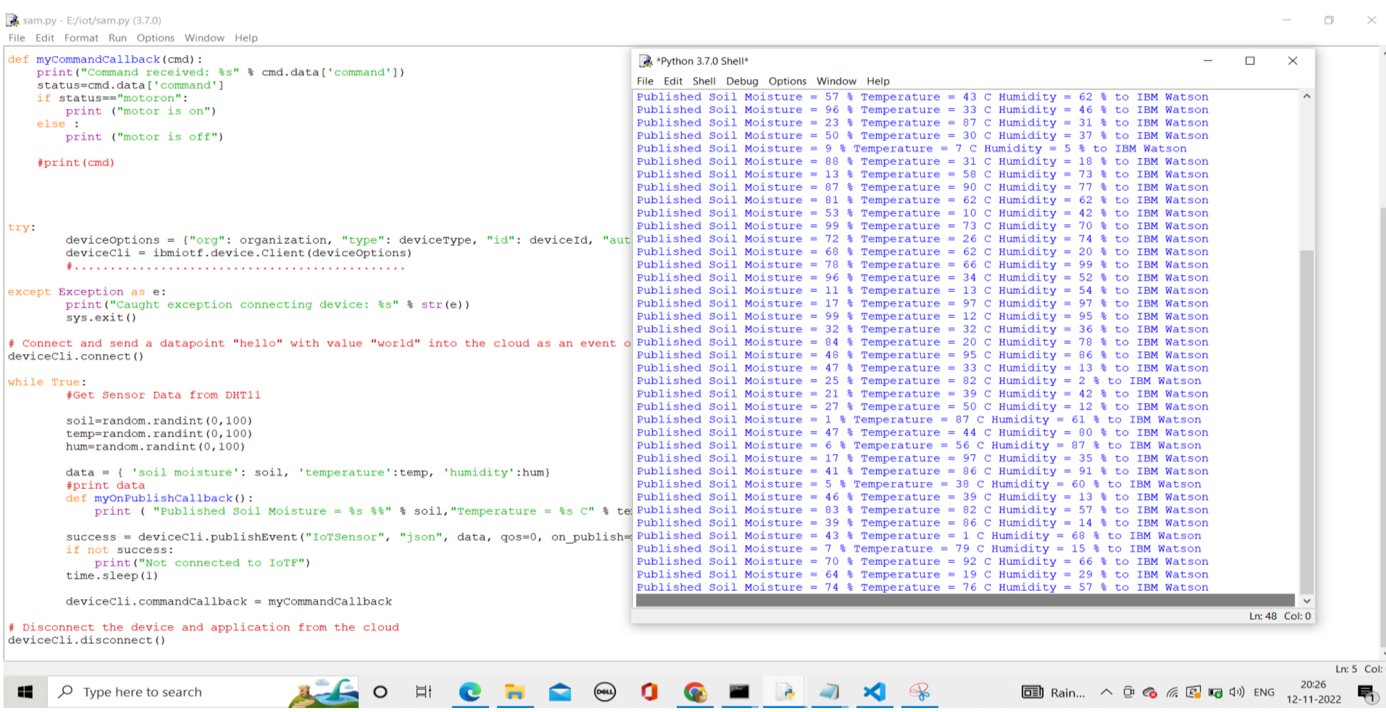
```
        data = { 'soil moisture': soil, 'temperature':temp, 'humidity':hum}
        #print data
        def myOnPublishCallback():
            print ( "Published Soil Moisture = %s %%" % soil,"Temperature = %s C" % temp, "Humidity = %s
%%" % hum, "to IBM Watson")

        success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0, on_publish=myOnPublishCallback)
        if not success:
            print("Not connected to IoTF")
        time.sleep(1)

        deviceCli.commandCallback = myCommandCallback

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

7.3 Feature 3: (Python Output):



8. TESTING

8.1 Test Cases:

8.2 User Acceptance Testing:

9. RESULTS

9.1 Performance Metrics:

10. ADVANTAGES AND DISADVANTAGES

Advantage:

1. They Can monitor from anywhere.
2. This project gives more profit and less work.
3. Easy to control and sense.
4. Real-time updates about the parameters.
5. Get immediate alerts about the parameters.
6. Measure the Soil Moisture , temperature, humidity levels immediately.

Disadvantage:

1. Sudden climate change cause soil erosion and biodiversity loss.
2. The farmers cannot know if the application does not work properly.

11. CONCLUSION:

Agriculture is an integral part of smart growth.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.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.This paper presented about monitoring the plants and alert the farmers about the crops.This system is basic yet reliable.

12. FUTURE SCOPE:

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. What exactly is a smart farm, though? Here is a rundown of what smart farming is and how it's changing agriculture. Many believe that IoT can add value to all areas of farming, from growing crops to forestry. While there are several ways that IoT can improve farming, two of the major ways IoT can revolutionize agriculture are precision farming and farming automation.Importantly, IoT-based smart farming doesn't only target large-scale farming operations; it can add value to emerging trends in agriculture like organic farming, family farming, including breeding particular cattle and/or growing specific cultures, preservation of particular or high-quality varieties, and enhance highly transparent farming to consumers, society and market consciousness.

13. APPENDIX:

source code:

1. Python Code Final

GitHub and Project Demo Link

1. GitHub link
2. Project Demo Link