PROJECT REPORT

Project Name: SMARTFARMER- IOT ENABLED SMART FARMING APPLICATION **Team ID:** PNT2022TMID31424 **Team:**

JAGANATHAN .M– TEAM LEAD

ARUNKUMARAN .M

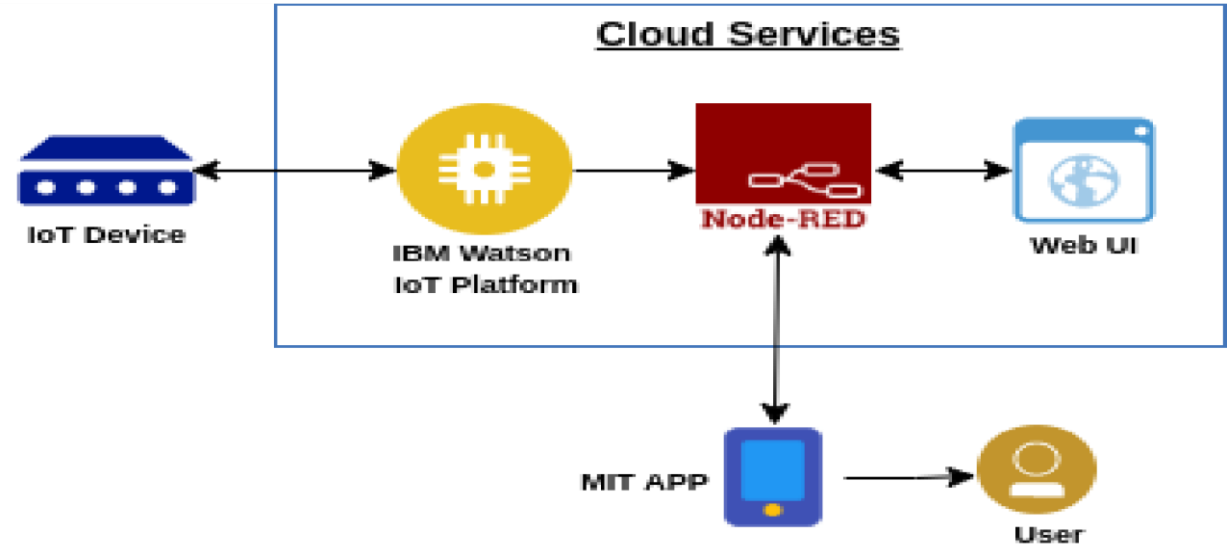
MATHUMITHA.R

JANANI.R

1. INTRODUCTION

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 Is shown below. It includes NodeMCU, Arduino Nano, sensors like soil moisture and Dht11, solenoid valves, relays.

2.LITERATURE SURVEY

2.2 Existing problem

The challenges of a smart agriculture system include the integration of these sensors and tying the sensor data to the analytics driving automation and response activities. When integrated, the use of data analytics can reduce the overall cost of agriculture and contribute to higher production from the same amount of area through precise control of water, fertilizer and light. Smart methods allow for farming on smaller and more distributed lands through remote monitoring, whether indoor or outdoor.

To successfully deploy a smart agriculture system, consider setting up a communications network that can integrate a limited number of sensors across a large area of farmland. This will require third-party network provisioning or setting up a private network consisting of access points and uplinks to a private backhaul network, which channels all the data traffic to centralized monitoring software or an analytics head-end system

• It is not a secure system.

• There is no motion detection for protection of agriculture field.

• Automation is not available.

2.2 References

Reference. No	Reference
[1]	Natthanan Promsuk, "Improving of the Interference Classification Techniques under the Smart Farming Environment using iSVM", *2022 19th International Joint Conference on Computer Science and Software Engineering (JCSSE)*, pp.1-5, 2022.
[2]	Smart Farming: The IoT based Future Agriculture 4th *International Conference on Smart System and Inventive Technology (ICSSIT), Year*:2022

[3]	Implementation of Smart Farming using IoT *Asian Journalof Applied Science and Technology (AJAST) Volume 5, Issue 2, Pages 58-67, April-June 2021*
[4]	Smart farm and monitoring system for measuring the Environmental condition using wireless sensor network - IoT Technology in farming Year: 2020
[5]	Farm Easy- IoT based Automated Irrigation, Monitoring and Pest Detection using Thing Speak for Analysis of Ladies Finger Plant. *2020 International Conference on Recent Trends on Electronics, Information, Communication & Technology (RTEICT)Year: 2020*

2.3 Problem Statement Definition

Mr.Vasanth is a farmer with an engineering background. He's moved into agriculture with his father. Since he is a beginner in farming, he needs someone to guide him in the initial years and he plan to incorporate technology into farming to reduce the work and labour, improve productivity, more yield, suggestions to improve soil, and next crop planting ideas. He is actively researching a few agro products that solve his problem. These problems are common to many beginning and experienced farmers.

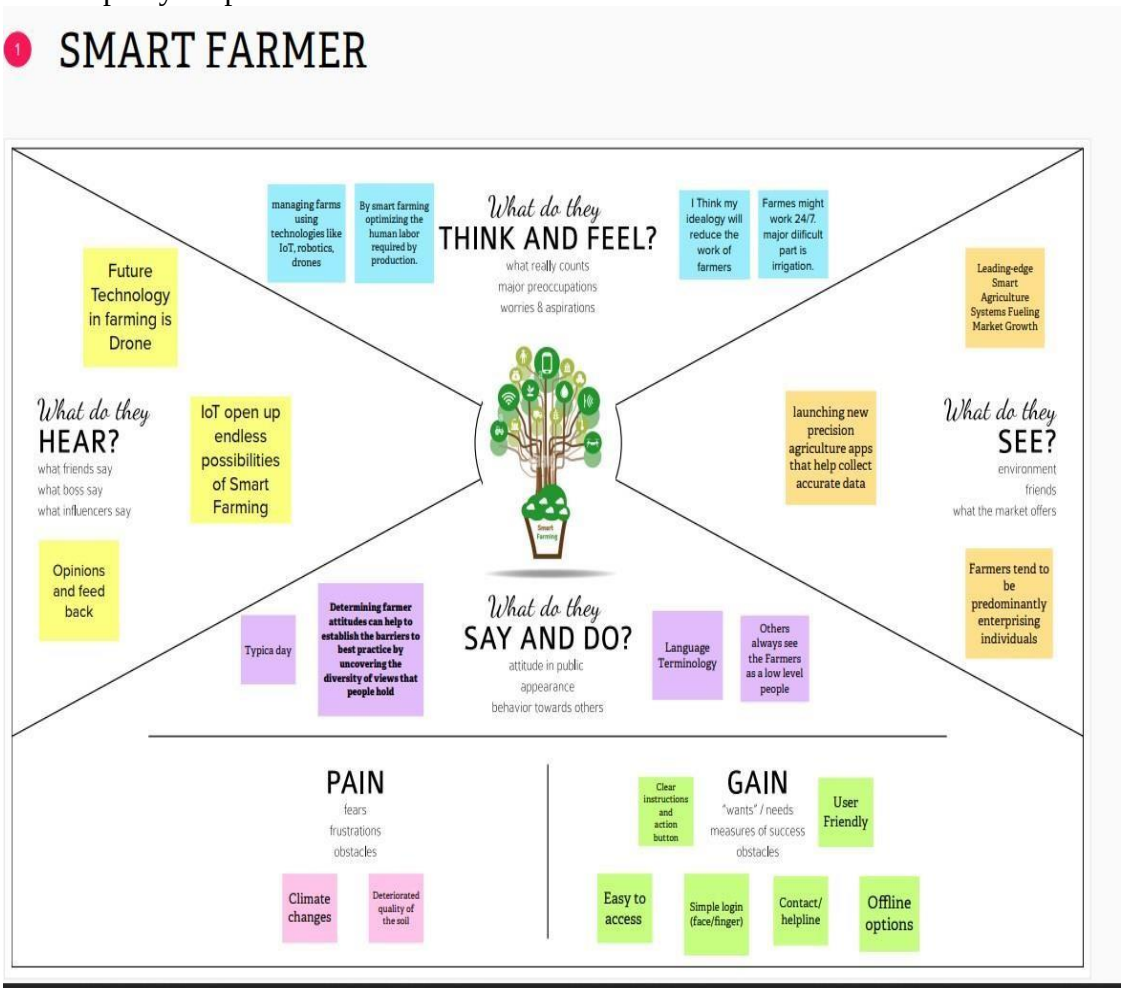
Who does the problem affect?	Persons who do Agriculture
What are the boundaries of the problem?	Labour cost, Cope with climate change, soil erosion and biodiversity loss.
What is the issue?	Loss of agricultural land and the decrease in the varieties of crops and livestock produced.
When does the issue occur?	Increasing pressures from climate change, soil erosion, its mostly starts from first day farming
Why is it important that we fix the problem?	It is required for the growth of better-quality food products. It is important to maximize the crop yield. It is important to maintain soil richness
What solution to solve this issue?	An application is introduced to know about various data about their land remotely, where they can schedule some events for a month or a day. It also provides suggestions to users based on the crop they planted.

What methodology used to solve the issue?	Some search results info from internet based on crop planted. Arduino microcontroller to control the process and various sensors for data. An alert message using GSM. An app built using MIT App Inventor.

Example:

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation and Brainstorming

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Step-2: Brainstorm, Idea Listing and Grouping

2

Brainstorm

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

10 minutes

KAVIPRIYA M S

majority of Indian farmers use traditional tools for agriculture such as plough, sickle, etc. This leads to the wastage of energy and manpower and less yield per capita labour force. Only little use of the machine is seen in irrigation, harvesting and transportation.

In Farming Watering the plants is one of the difficult process and they have to wait for the whole filed to pour water.
he had to check the field for 30 min once

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.

VASANTH N

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.

SELVA BHARTHI A

IoT in agriculture uses robots, drones, remote sensors, and computer imaging combined with continuously progressing machine learning and analytical tools for monitoring crops, surveying, and mapping the fields, and providing data to farmers for rational farm management plans to save both time and money.

SWATHY MM

Remote sensing in agriculture is revolutionizing the way data is acquired from different nodes in a farm' IoT-based remote sensing utilizes sensors placed along with the farms like weather stations for gathering data, which is transmitted to analytical tools for analysis

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.

One of the benefits of using IoT in agriculture is the increased agility of the processes. Thanks to real-time monitoring and prediction systems, farmers can quickly respond to any significant change in weather, humidity, air quality as well as the health of each crop or soil in the field.

BALA

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.

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.

3

Group ideas

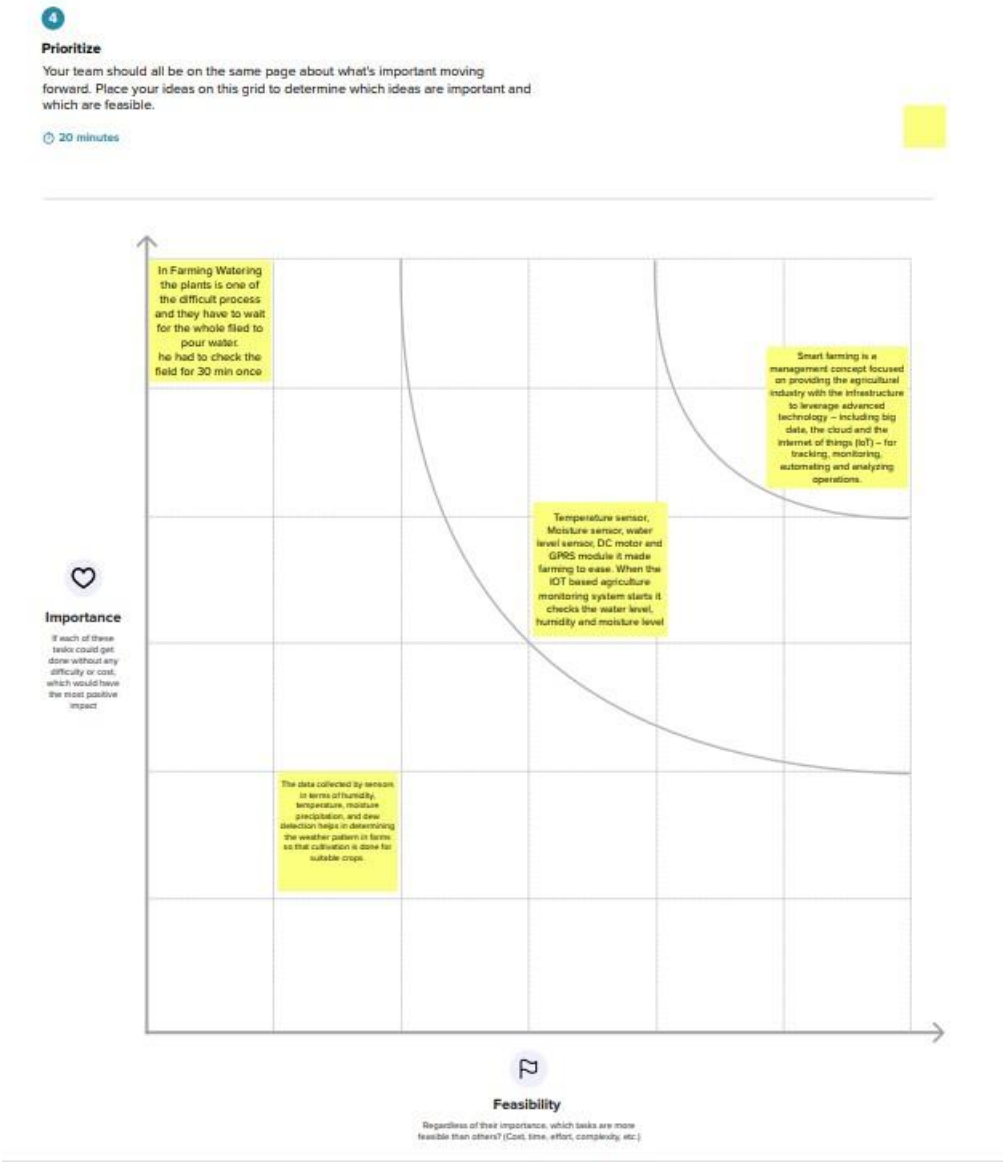
20 minutes

In Farming Watering the plants is one of the difficult process and they have to wait for the whole filed to pour water.
he had to check the field for 30 min once

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

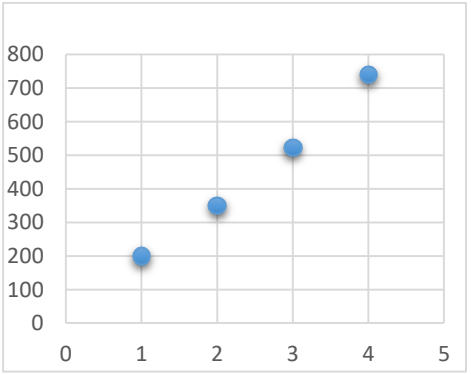
Smart farming is a management concept focused on providing the agricultural industry with the infrastructure to leverage advanced technology – including big data, the cloud and the internet of things (IoT) – for tracking, monitoring, automating and analyzing operations.

Step-3: Idea Prioritization



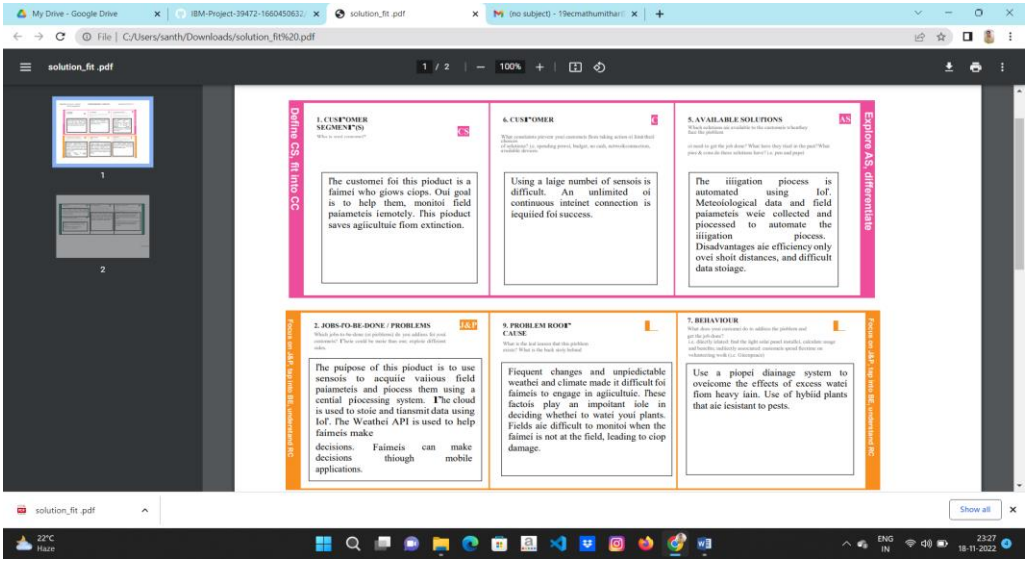
3.3 Proposed Solution

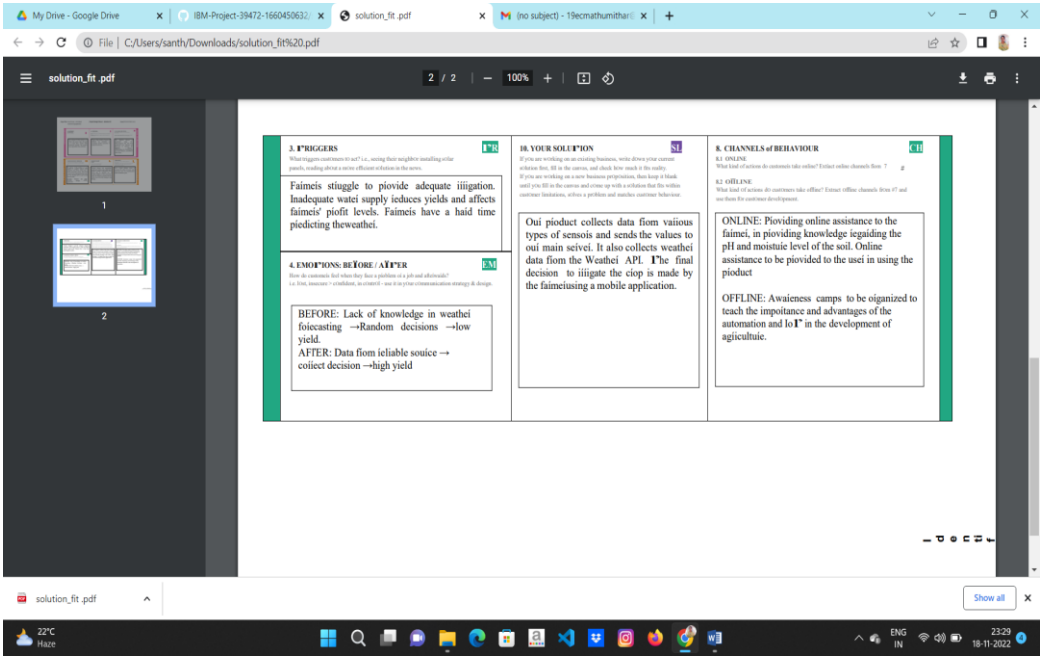
S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	• Watering the field is a difficult process, Farmers have to wait in the field until the water covers the whole farm field. • Power Supply is also one of the problems. In Village Side, the power supply may vary. • The Biggest Challenges 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 Problem solution fit





4. Requirement Analysis

4.1 Functional Requirement

Functional Requirements:

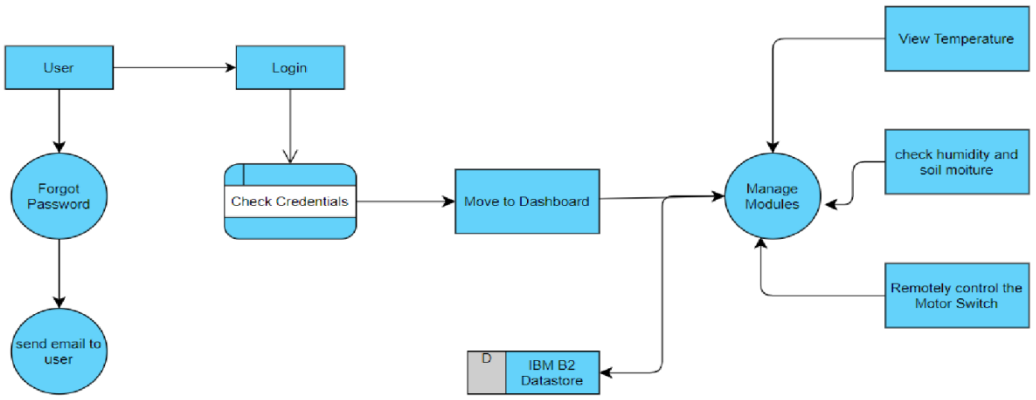
Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Log in to system	Check Credentials Check Roles of Access.
FR-4	Manage Modules	Manage System Admins Manage Roles of User Manage User permission
FR-5	Check whether details	Temperature details Humidity details
FR-6	Log out	Exit

5. PROJECT DESIGN

5.1 Data flow diagrams

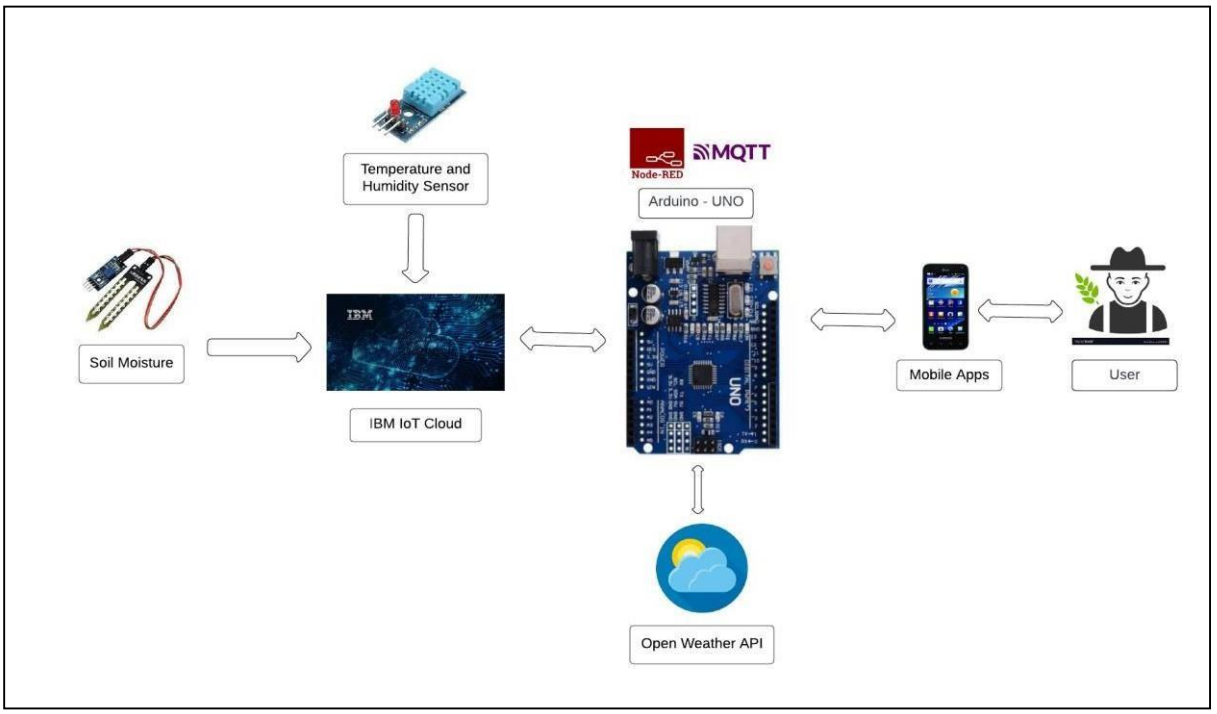
Data Flow Diagrams:



5.2 Solution and Technical 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.

6.PROJECT PLANNING AND SCHEDULING



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

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 python code	2	High	Jaganathan, Arunkumaran
Sprint-2	Software	USN-2	Creating device in the IBM Watson IoT platform, workflow for IoT scenarios using Node-Red	2	High	Mathumitha, Janani, Arunkumaran
Sprint-3	MIT App Inventor	USN-3	Develop an application for the Smart farmer project using MIT App Inventor	2	High	Jaganathan, Arunkumaran, Mathumitha
Sprint-3	Dashboard	USN-3	Design the Modules and test the app	2	High	Mathumitha, Janani
Sprint-4	Web UI	USN-4	To make the user to interact with software.	2	High	Jaganathan, Janani

Project Tracker, Velocity & Burndown Chart: (4 Marks)

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		05 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022		12 Oct 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022		15 Oct 2022

Velocity:
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

7.CODING AND SOLUTIONING

7.1 Feature

PROGRAM :

```
import wiotp.sdk.device
import time
import os
import datetime
import random
myConfig = {
"identity": {
"orgId": "hjSfmy",
```

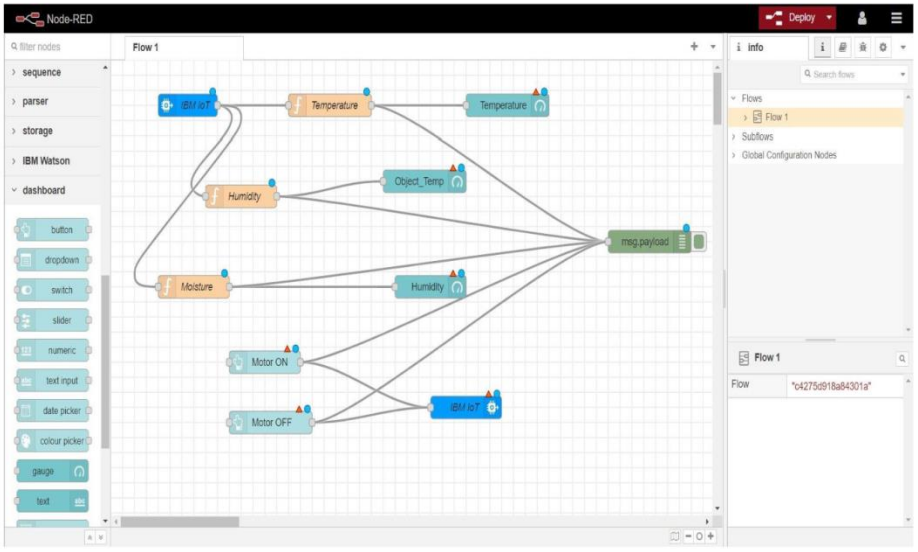
```
"typeId": "DeviceIk",
"deviceId": "67890"
},
"auth": {
"token": "87654321"
}
}
client = wiotp.sdk.device.DeviceClient (config=myConfig,
logHandlers=None)
client.connect ()
def myCommandCallback (cmd) :
print ("Message received from IBM IoT Platform: %s" %
cmd.data['command'])
m=cmd.data['command']
if (m=="motoron"):
print ("Motor is switched on")
elif (m=="motoroff"):
print ("Motor is switched OFF")
print (" ")
while True:
```

```
soil=random.randint (0,100)
temp=random.randint (-20, 125)
hum=random.randint (0, 100)
myData={'soil moisture': soil, 'temperature':temp, 'humidity':hum}
client.publishEvent (eventId="status", msgFormat="json",
data=myData, qos=0 , onPublish=None)
print ("Published data Successfully: %s", myData)
time.sleep (2)
client.commandCallback = myCommandCallback
client.disconnect ()
```

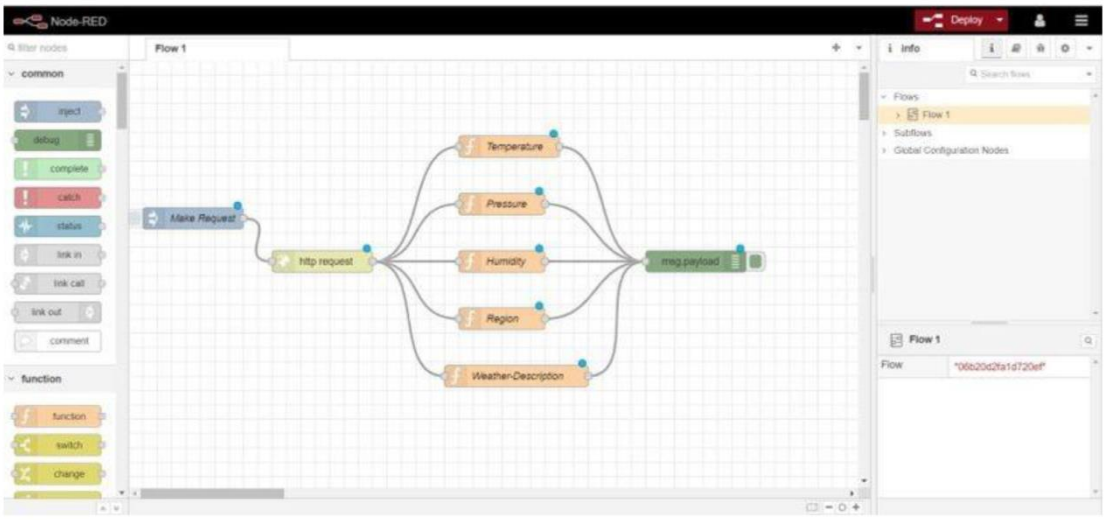
8.TESTING

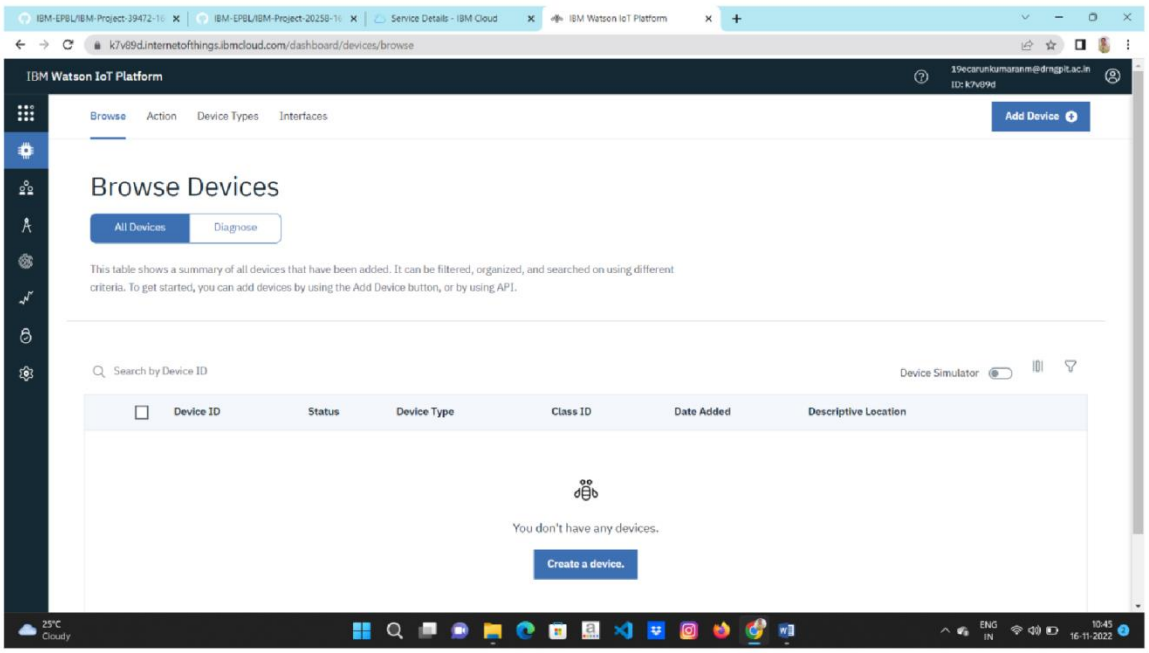
8.1 Test case

Flow 1

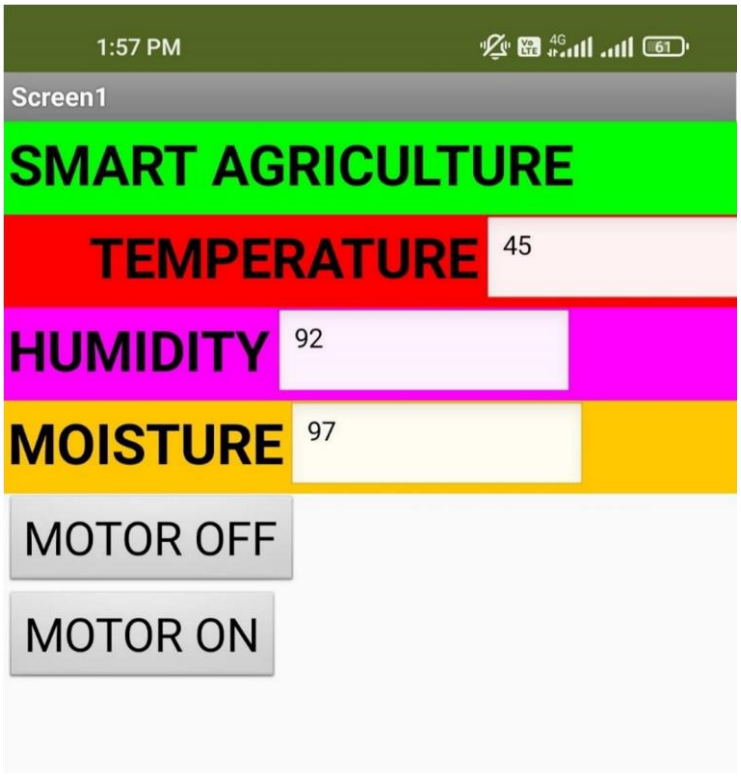


Flow 2:



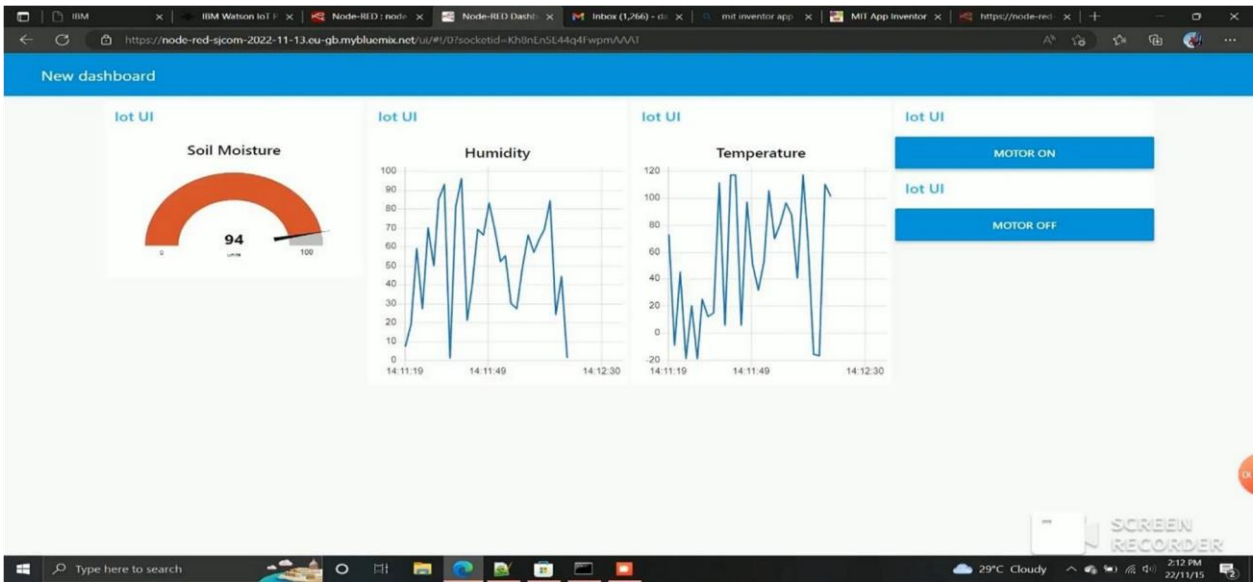


8.2 User Acceptance Testing



9.RESULTS

9.1 Performance Metrics



10.Advantages and disadvantages

Advantages:

- A remote control system can help in working irrigation system valves dependent on schedule. Irrigating remote farm properties can be exceptionally troublesome and

laborintensive. It gets hard to comprehend when the valves were started and whether the ideal measure of water was distributed.

- For situations where a quick reaction is required, manual valve actuation may not be conceivable constantly. Thus, remote observing and control of irrigation systems, generators or wind machines or some other motor-driven hardware become the next logical step.

- Various solutions are available to monitor engine statistics and starting or stopping the engine. When the client chooses to begin or stop the motor, the program transmits a sign to the unit within seconds by means of a mobile phone system.

- Submersible weight sensors or ultrasonic sensors can screen the degree of tanks, lakes, wells and different kinds of fluid stockpiling like fuel and compost. The product figures volume dependent on the tank or lake geometry after some time. It conveys alarms dependent on various conditions.

Disadvantages:

- The smart agriculture needs availability of internet continuously. Rural part of most of the developing countries do not fulfil this requirement. Moreover internet connection is slower.

- The smart farming based equipment require farmers to understand and learn the use of technology. This is major challenge in adopting smart agriculture farming at large scale across the countries.

11. CONCLUSION

Farmers can benefit greatly from an IoT-based smart agriculture system. As a result of the lack of irrigation, agriculture suffers. Climate factors such as humidity, temperature, and moisture can be adjusted dependent on the local environmental variables. This technology also detects animal invasions, which are a major cause of crop loss. This technology aids in the scheduling of irrigation based on present data from the field and records from a climate source. It helps in deciding the farmer to whether to do irrigation or not to do. Continuous internet connectivity is required for continuous monitoring of data from sensors. This also can be overcome by using GSM unit as an alternative of mobile app. By GSM, SMS can be sent to farmers phone.

12.Future scope

In the current project we have implemented the project that can protect and maintain the the crop. In this project the farmer monitor and control the field remotely. In future we can add or update few more things to this project

. • We can create few more models of the same project ,so that the farmer can have information of a entire.

- We can update the this project by using solar power mechanism. So that the power supply from electric poles can be replaced with solar panels. It reduces the power line cost. It will be a one time investment. We can add solar fencing technology to this project.

- We can use GSM technology to this project so that the farmers can get the information directly to his home through SMS. This helps the farmer to get information if there is a internet issues.

- We can add camera feature so that the farmer can monitor his field in real time. This helps in avoiding thefts.

13.Appendix

Source Code

```
import wiotp.sdk.device
import time
import os
import datetime
import random
myConfig = {
"identity": {
"orgId": "hjSfmy",
"typeId": "Devicelk",
"deviceId": "67890"
},
"auth": {
"token": "87654321"
}
}
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.randint (0,100)
temp=random.randint (-20, 125)
hum=random.randint (0, 100)
myData={'soil moisture': soil, 'temperature':temp, 'humidity':hum}
client.publishEvent (eventId="status", msgFormat="json",
data=myData, qos=0 , onPublish=None)
print ("Published data Successfully: %s", myData)
time.sleep (2)
client.commandCallback = myCommandCallback
client.disconnect ()
```

Github link: https://github.com/IBM-EPBL/IBM-Project-39472-1660450632.git

Project Demo link:

https://drive.google.com/file/d/1J4kkC5ZwiGOnLad6-IxoS-q7bIN7ymMP/view?usp=sharing