SMARTFARMER- IOT ENABLED SMART FARMING APPLICATION

IBM-Project-5276-1658755062

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

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A PROJECT REPORT
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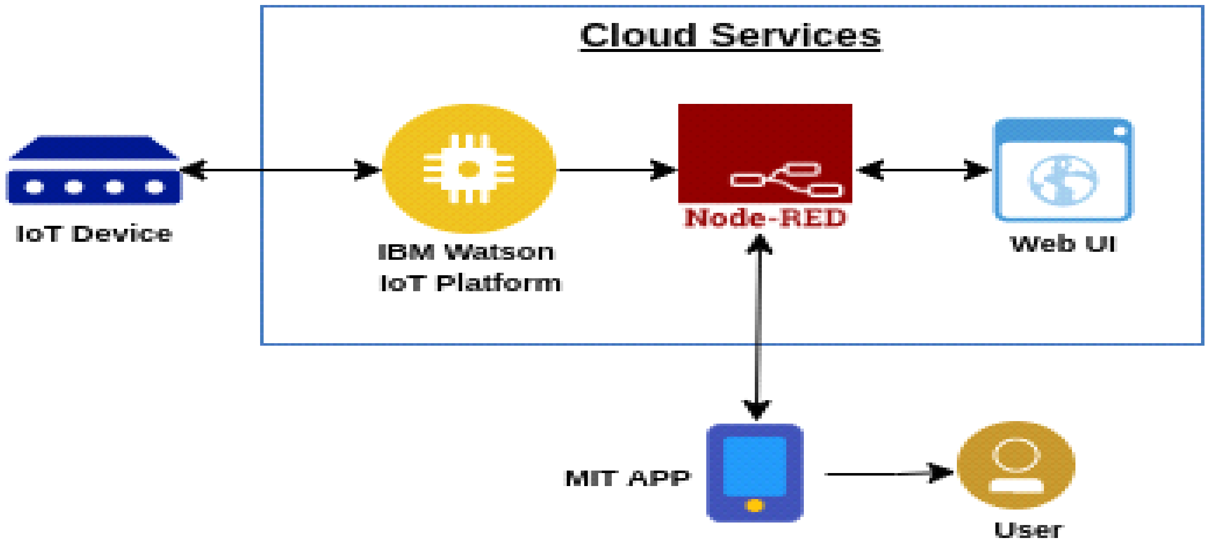
1. INTRODUCTION

a. Project Overview

The global agriculture industry contributes USD 2.4 trillion, making the agriculture field as important as any other industry in the world. All around the world, 45 percentage of people are reliant on agriculture for their livelihood an in India almost 60 percentage of the population are involved in agriculture and related activities. The agriculture sector, currently valued at US$ 370 billion, is one of the major sectors in the Indian economy. According to the Economic Survey 2020-21, GDP contribution by the agriculture sector is likely to be 19.9% in 2020-21, increasing from 17.8% recorded in 2019-20. So these facts prove that agriculture is inevitable process as everyone still eats food.

But nowadays agriculture itself has become a tedious task due to climate change, natural calamities, water scarcity etc… These things make agriculture a big challenge and force the farmers to quit. Using technologies would be an solution for making agriculture easier and help the farmers increase their productivity. There are many existing technologies and methods to enhance farming but these are not feasible. But this scenario should change and farmer should become smart and take the help of technology to overcome these challenges. Hence we have come with a solution SmartFarmer an Iot enabled smart farming application which helps the farmer to monitor the soil and weather conditions and can water the crops remotely.

With rising population, there is a need for increased agricultural production. In order to support greater production in farms, the requirement of the amount of fresh water used in irrigation also rises. Currently, agriculture accounts 83% of the total water consumption in India. Unplanned use of water inadvertently results in wastage of water. Watering of crops is also decided by the soil moisture level, weather conditions and amount of water content in air.



b. Purpose

To efficiently water crops we need to monitor the soil moisture, temperature and humidity. In our project we accomplish the task of monitoring the parameter by deploying various sensors and farmers can 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. Implementing these technological solutions enable reliable management and monitoring of farms. As farmers get a complete digital analysis of farms in real-time, they can act accordingly. The advantages of the system are

- Increases agriculture productivity and lowers production cost
- Inhibits soil degradation
- Promotes effective and efficient use of water resources
- Uplifts socio-economic statuses of farmers
- Reduces environmental and ecological impacts
- Augments worker safety

2. LITERATURE SURVEY

a. Existing Solutions and Problems

Prathibha S R et al. [1] offered a system that uses a CC3200 microcontroller unit and also employed a GPRS module to send the air temperature values and air humidity values using temperature and humidity sensors to the farmer via MMS. It also has a camera which takes pictures and sends the images to the farmer. According to their approach, the system can be only implemented for green house and temperature dependent plants which is a major drawback. The system only sends the details of the sensors to the farmer but is not capable of taking actions such as automatic irrigation based on the values of the sensors.

Rahul Dagar et al. [2] have offered a model which can only be implemented in Poly Houses (closed spaces), which uses a number of sensors such as water volume sensor, pH sensor, moisture sensor, temperature sensor and motion detector sensor. This system takes actions according to the values produced by the sensors. But, their system has no benchmarks produced for the values under which the server takes appropriate actions. Each crop has different threshold values which need to be satisfied for better yield. Also, the system works only for closed spaces under their proposed strategy.

Vaishali Puranik et al. [3] proposed a method that incorporates two sensors. Soil moisture sensor measures the moisture and if less than threshold value it irrigates the crops. They have also developed a rectification process of any error in the irrigation system by notifying the farmer and technician if the irrigation system is not working properly. The second sensor, pH sensor measures the Nitrogen value of the soil and compares with the threshold value. If there is any deficiency or excess, the system sends an alert to the farmer. The model was unreliable because it is using the same threshold value for all crops but each crop has a different level of moisture and fertilizers needed. Also the number of sensors used is very minimal and is not sufficient to increase the crop yield for the farmers.

Abhiram MSD et al. [4] have elucidated an approach by using NodeMCU and moisture, temperature, humidity and rain intensity sensors. The system is connected with the Blynk application where the farmer can see the readings and actions of the sensor. The major limitation of the proposed method was that the threshold values must be manually set by the farmer who may or may not know the accurate values for getting better crop yields. Also the rain intensity sensor can provide false positives in cases where it is not raining and the water from the pump motor is detected wrongly as rain water.

Nor Adni Mat Leh et al. [5] have proposed a model in which Arduino Mega is connected with a soil sensor and DHT11 sensor. The sensor values are sent to the Blynk application using the Internet where the farmer can see the readings. According to the values from the sensors, water pumps are turned on. The suggested approach has a drawback because the system is wholly dependent only on the soil moisture and a fixed threshold value.

A. Anitha et al. [6] have offered a system that uses an Arduino UNO microcontroller unit employed with an ESP8266 WiFi module to send the values of the sensor readings to a cloud storage ThingSpeak. Here, the farmer can view the reading using the Internet. Based on manually fixed threshold values the motor pumps are switched on or off automatically. The major drawback of this system is the manually fixed thresholds which are kept common for all crops. Each plant variety requires different types of conditions to produce more yield.

Sameer Qazi et al. [7] have done a survey on IoT-Equipped and AI-Enabled Next Generation Smart Agriculture which discusses about the available advancements in the field of smart agriculture systems through IoT technologies and AI techniques in detail and have done a critical review of these two available technologies and challenges in their widespread deployment; and an in-depth discussion about the future trends including both technological and social, when smart agriculture systems will be widely adopted by the farmers globally . The authors of the paper have also discussed wireless sensor network (WSN) technology and use-cases of IoT in SAS and the smart irrigation technologies used currently in the world. They have also presented an overview of the use of UAVs, which is a current driving force behind AI-powered solutions for SAS and discussed these solutions in detail, which are possible via DL applications.

Muhammad Ayaz et al. [8] have published the journal, Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk. This journal is a compendium of knowledge that can help the researchers and agriculture engineers implementing the IoT-based technologies to achieve the desired smart agriculture .It discusses about the role of IoT in advanced agriculture practices, like vertical farming (VF), hydroponics, and phenotyping, to manage the issues of increased urban population and highlights various technologies and equipment, like sensors, robots, tractors, and communication devices, being used to implement IoT in this industry. It also explores scenarios which cannot be handled even by using the latest technologies.

Muhammad Shoaib Farooq et al. [9] have done a Survey on the Role of IoT in Agriculture for the Implementation of Smart Farming . This paper presents major components of IoT based smart farming along with relevant technologies and a detailed discussion on network architecture of IoT that involves network architecture and layers, network topologies used; and devices and protocols used in agriculture IoT . The authors have also covered the security and privacy issues in IoT based agriculture and also the open issues and challenges to improve IoT based agricultural technologies from different aspects.

Maanak Gupta et al. [10] have published the journal, Security and Privacy in Smart Farming: Challenges and Opportunities. This journal presents a holistic study on security and privacy in a smart farming ecosystem. The journal also outlines a multi-layered architecture relevant to the precision agriculture domain and discusses the security and privacy issues in this dynamic and distributed cyber physical environment. It identifies potential cybersecurity issues in smart farming and illustrates scenario specific cyber attacks, which have been categorized into data, network, supply chain, and other common attacks. It presents an extensive evaluation of the current cybersecurity research, countermeasures in smart farming, and also enlists the focus, contributions and weaknesses of current research works. It provides a clear view of the open security research challenges in different areas including next generation network security, trustworthy supply chain and compliance, adversarial machine learning and AI, and access control, trust and information sharing.

S. No.	Authors	Title	Hardware Used	Proposed Work	Disadvantages
1	Prathibha S R, Anupama Hongal, Jyothi M P	IoT Based Monitoring System In Smart Agriculture	CC3200 microcontroller unit, GPRS module, temperature, humidity sensors and camera	Offered a system that uses a CC3200 microcontroller unit and also employed a GPRS module to send the air temperature values and air humidity values using temperature and humidity sensors to the farmer via MMS. It also has a camera which takes pictures and sends the images to the farmer.	The system can be only implemented for green house and temperature dependent plants which is a major drawback. The system only sends the details of the sensors to the farmer but is not capable of taking actions such as automatic irrigation based on the values of the sensors.
2	Rahul Dagar, Subhranil Som, Sunil Kumar Khatri	Smart Farming – IoT in Agriculture	Water volume sensor, pH sensor, moisture	Offered a model which can only be implemented in Poly Houses (closed spaces),	The system has no benchmarks produced for the values under which the server

			sensor, temperature sensor and motion detector sensor	which uses a number of sensors such as water volume sensor, pH sensor, moisture sensor, temperature sensor and motion detector sensor. This system takes actions according to the values produced by the sensors.	takes appropriate actions. Each crop has different threshold values which need to be satisfied for better yield. Also, the system works only for closed spaces under their proposed strategy.
3	Mrs. Vaishali Puranik, Mrs. Sharmila, Mr. Ankit Ranjan, Ms. Anamika Kumari	Automation in Agriculture and IoT	Arduino UNO, Soil moisture sensor, pH sensor, temperature sensor, humidity sensor and GSM module	Proposed a method that incorporates two sensors. Soil moisture sensor measures the moisture and if less than threshold value it irrigates the crops. They have also developed a rectification	The model was unreliable because it is using the same threshold value for all crops but each crop has a different level of moisture and fertilizers needed. Also the number of sensors used is very minimal and is not sufficient to

				process of any error in the irrigation system by notifying the farmer and technician if the irrigation system is not working properly. The second sensor, pH sensor measures the Nitrogen value of the soil and compares with the threshold value. If there is any deficiency or excess, the system sends an alert to the farmer.	increase the crop yield for the farmers.
4	Abhiram MSD, Jyothsnavi Kuppili, N.Alivelu Manga	Smart Farming System using IoT for Efficient Crop Growth	NodeMCU, moisture, temperature, humidity and rain intensity sensors.	Elucidated an approach by using NodeMCU and moisture, temperature, humidity and rain intensity	The major limitation of the proposed method was that the threshold values must be manually set by the farmer who may or may

				sensors. The system is connected with the Blynk application where the farmer can see the readings and actions of the sensor.	not know the accurate values for getting better crop yields. Also the rain intensity sensor can provide false positives in cases where it is not raining and the water from the pump motor is detected wrongly as rain water.
5	Nor Adni Mat Leh, Muhammad Syazwan Ariffuddin Mohd Kamaldin, Zuraida Muhammad, Nur Atharah Kamarzaman	Smart Irrigation System Using Internet of Things	Arduino Mega, soil sensor and DHT11 sensor	Proposed a model in which Arduino Mega is connected with a soil sensor and DHT11 sensor. The sensor values are sent to the Blynk application using the Internet where the farmer can see the readings. According to the values from the	The suggested approach has a drawback because the system is wholly dependent only on the soil moisture and a fixed threshold value.

				sensors, water pumps are turned on.	
6	A. Anitha, N. Sampath and M. A. Jerlin, "Smart Irrigation system using Internet of Things," 2020 International Conference on Emerging Trends in Information Technology and Engineering (ic-ETITE), 2020, pp. 1-7, doi: 10.1109/ic-ETITE47903.2020.271.	Smart Irrigation system using Internet of Things	Arduino UNO, ESP8266 WiFi module, DHTll temperature and humidity sensor, water level sensor, soil moisture sensor.	Offered a system that uses an Arduino UNO microcontroller unit employed with an ESP8266 WiFi module to send the values of the sensor readings to a cloud storage ThingSpeak. Here, the farmer can view the reading using the Internet. Based on manually fixed threshold values the motor pumps are switched on or off automatically.	The major drawback of this system is the manually fixed thresholds which are kept common for all crops. Each plant variety requires different types of conditions to produce more yield.

b. References

1. S. R. Prathibha, A. Hongal and M. P. Jyothi, "IOT Based Monitoring System in Smart Agriculture," 2017 International Conference on Recent Advances in Electronics and Communication Technology (ICRAECT), 2017, pp. 81-84, doi: 10.1109/ICRAECT.2017.52.

2. R. Dagar, S. Som and S. K. Khatri, "Smart Farming – IoT in Agriculture," 2018 International Conference on Inventive Research in Computing Applications (ICIRCA), 2018, pp. 1052-1056, doi: 10.1109/ICIRCA.2018.8597264.

3. V. Puranik, Sharmila, A. Ranjan and A. Kumari, "Automation in Agriculture and IoT," 2019 4th International Conference on Internet of Things: Smart Innovation and Usages (IoT-SIU), 2019, pp. 1-6, doi: 10.1109/IoT-SIU.2019.8777619.

4. M. S. D. Abhiram, J. Kuppili and N. A. Manga, "Smart Farming System using IoT for Efficient Crop Growth," 2020 IEEE International Students' Conference on Electrical,Electronics and Computer Science (SCEECS), 2020, pp. 1-4, doi: 10.1109/SCEECS48394.2020.147.

5. N. A. M. Leh, M. S. A. M. Kamaldin, Z. Muhammad and N. A. Kamarzaman, "Smart Irrigation System Using Internet of Things," 2019 IEEE 9th International Conference on System Engineering and Technology (ICSET), 2019, pp. 96-101, doi: 10.1109/ICSEngT.2019.8906497.

6. A. Anitha, N. Sampath and M. A. Jerlin, "Smart Irrigation system using Internet of Things," 2020 International Conference on Emerging Trends in Information Technology and Engineering (ic-ETITE), 2020, pp. 1-7, doi: 10.1109/ic-ETITE47903.2020.271.

7. S. Qazi, B. A. Khawaja and Q. U. Farooq, "IoT-Equipped and AI-Enabled Next Generation Smart Agriculture: A Critical Review, Current Challenges and Future Trends," in IEEE Access, vol. 10, pp. 21219-21235, 2022, doi: 10.1109/ACCESS.2022.3152544.

8. M. Ayaz, M. Ammad-Uddin, Z. Sharif, A. Mansour and E. -H. M. Aggoune, "Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk," in IEEE Access, vol. 7, pp. 129551-129583, 2019, doi: 10.1109/ACCESS.2019.2932609.

9. M. S. Farooq, S. Riaz, A. Abid, K. Abid and M. A. Naeem, "A Survey on the Role of IoT in Agriculture for the Implementation of Smart Farming," in IEEE Access, vol. 7, pp. 156237-156271, 2019, doi: 10.1109/ACCESS.2019.2949703.

10. M. Gupta, M. Abdelsalam, S. Khorsandroo and S. Mittal, "Security and Privacy in Smart Farming: Challenges and Opportunities," in IEEE Access, vol. 8, pp. 34564-34584, 2020, doi: 10.1109/ACCESS.2020.2975142.

c. Problem Statement Definition

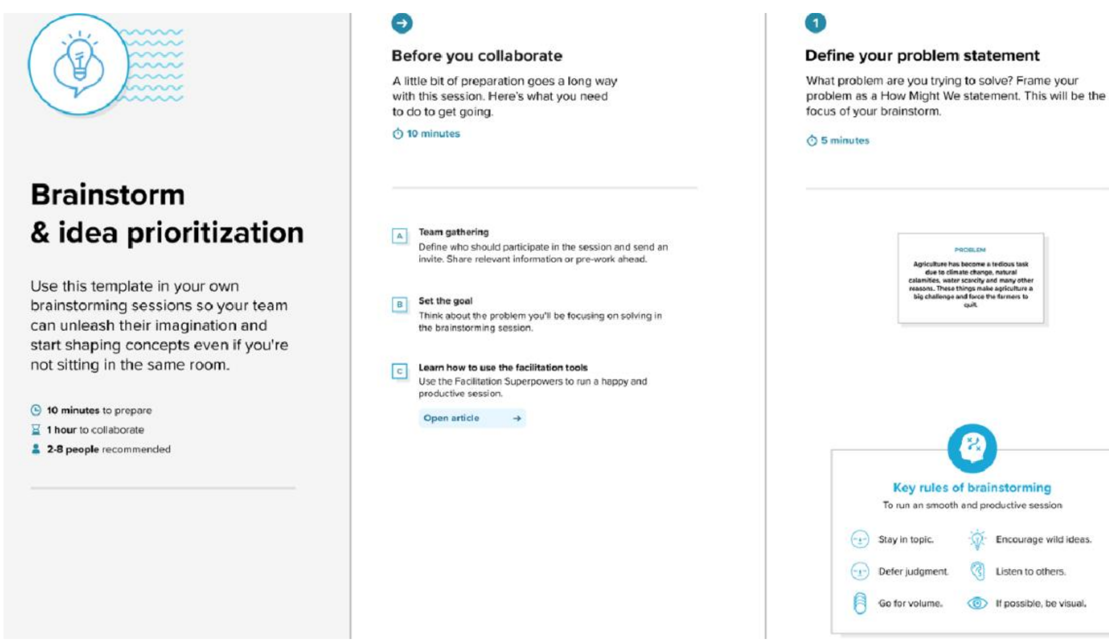
The soil moisture sensor measures wetness content in the soil. The Arduino UNO microcontroller used to receive input from a various sensors and it can be controlled automatically. When soil moisture sensor goes low the water pump will be on and it exceeds defined levels of the water motor will turn off automatically. We can constantly monitor the growth of a crop using ultrasonic sensor. PIR sensor detects the motion or unusual movement in the agricultural land. This device his very helpful to the former to monitor and control environmental parameters at their field. The farmers did not go to theirfield, they can remotely monitor and control using cloud.

3. IDEATION & PROPOSED SOLUTION

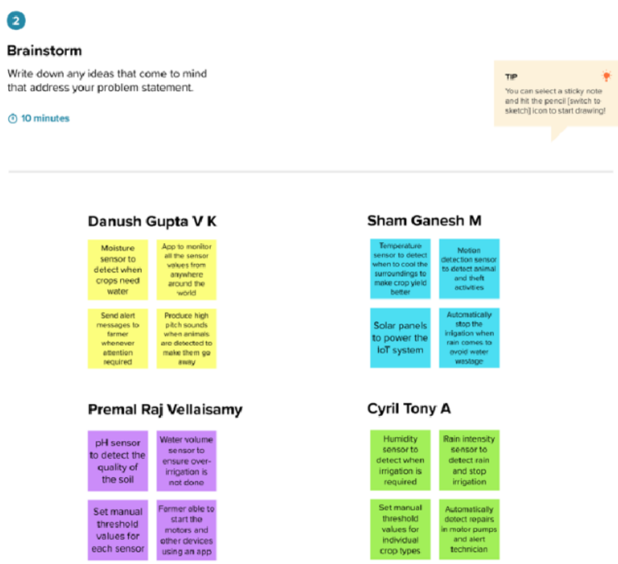
a. Empathy Map Canvas

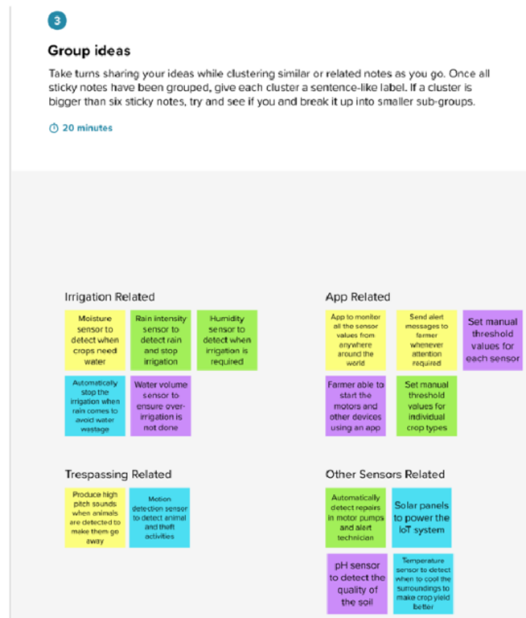
b. Ideation and Brainstorming

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



- Step 2: Brainstorm, Idea Listing and Grouping





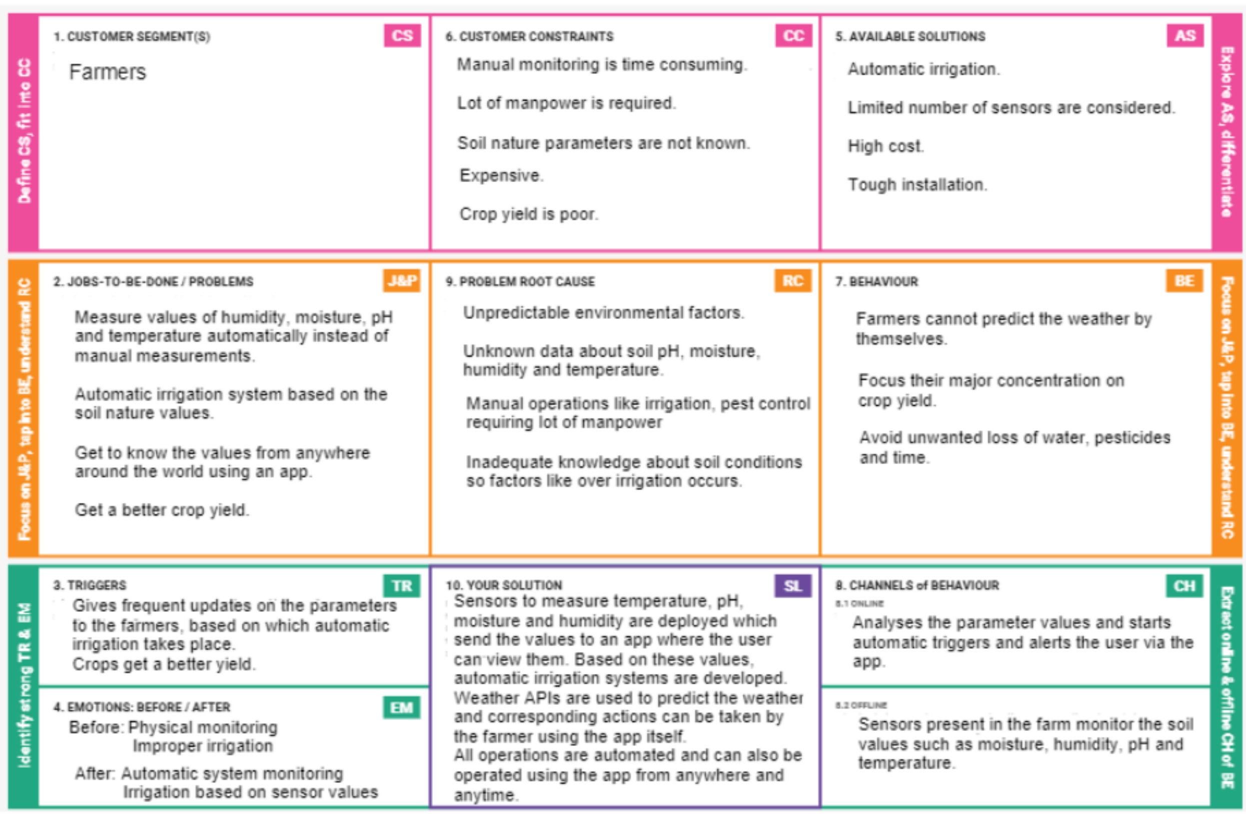
- Step 3: Idea Prioritization

c. Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to besolved)	• Remote irrigation considering various parameters like temperature, soil moisture andhumidity. • Efficient usage of water such as to maximise theyield.
2.	Idea / Solution description	• IoT enabled Smart Farming using various sensors which helps to make the decision moreprecise.
3.	Novelty / Uniqueness	• Considering weather forecast and making accurate decision. • Using solar energy to power IoT device andsensors. • Alert farmers when attention is required andalso notify if any fault occurs in the motor.
4.	Social Impact / Customer Satisfaction	• Reduces Human effort and almost saves seventypercent of time of farmers. • Eco-friendly and reduces the water wastage. • Automate the process and makes the farmers toget used to technology.
5.	Business Model (Revenue Model)	• Subscription based model, charges for predictingand suggesting precise decision. • Charging for installation and replacement ofsensors and other hardware.

6.	Scalability of the Solution	• Easily scalable even for huge farms just by increasing the number of sensor and changingthe communication medium. • Analysis of data is also scalable and different decisions can be made for different regions ofthe same farm. • System is dynamic and can be customised foreach crop accordingly.

d. Problem solution fit



4. REQUIREMENT ANALYSIS

a. 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 Create an username and password
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Log in	Checking for valid user credentials
FR-4	Sensor values	View the values provided by different types of sensors such as humidity, moisture, pH,…
FR-5	Manage motors and sprinklers	Automatically operate the switches of motors and sprinklers whenever required
FR-6	Log out	Exit

b. Non-functional Requirements:

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

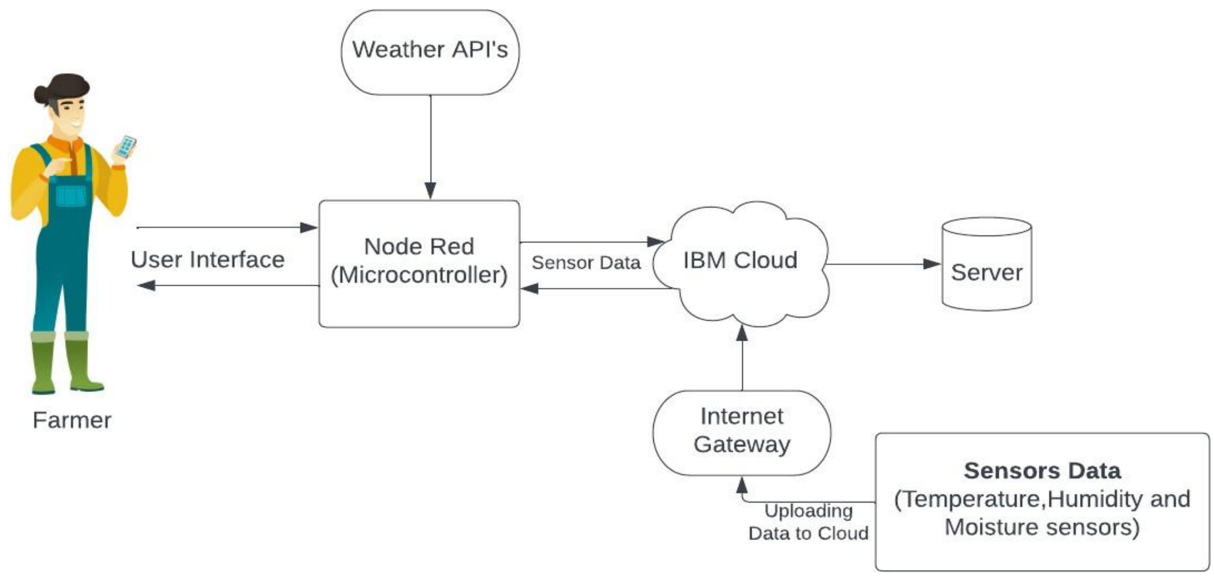
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It is very user friendly. People with less knowledge can also easily understand. Remote Management. With farms being in far-off areas and distant lands, farmers enable this for better solution.

NFR-2	**Security**	Smart farming, which involves the application of sensors and automated irrigation practices, can helpmonitor agricultural land, temperature, soil moisture, etc. This would enable farmers to monitor crops from anywhere.
NFR-3	**Reliability**	It has good consistency and accuracy as it activelyhelps farmers to understand better about the important factors such as water level, weather, humidity, and soil moisture.
NFR-4	**Performance**	The performance of smart farming is high, and it isvery efficient as it is very easy to understand and has high security and scalability.
NFR-5	**Availability**	This smart farming is enabled at any system likelaptop, mobile phone, desktops and is very user friendly.
NFR-6	**Scalability**	Smart farming refers to the adaptability of a systemto increase the capacity, the number of technology devices such as sensors and actuators, while

5. PRODUCT DESIGN

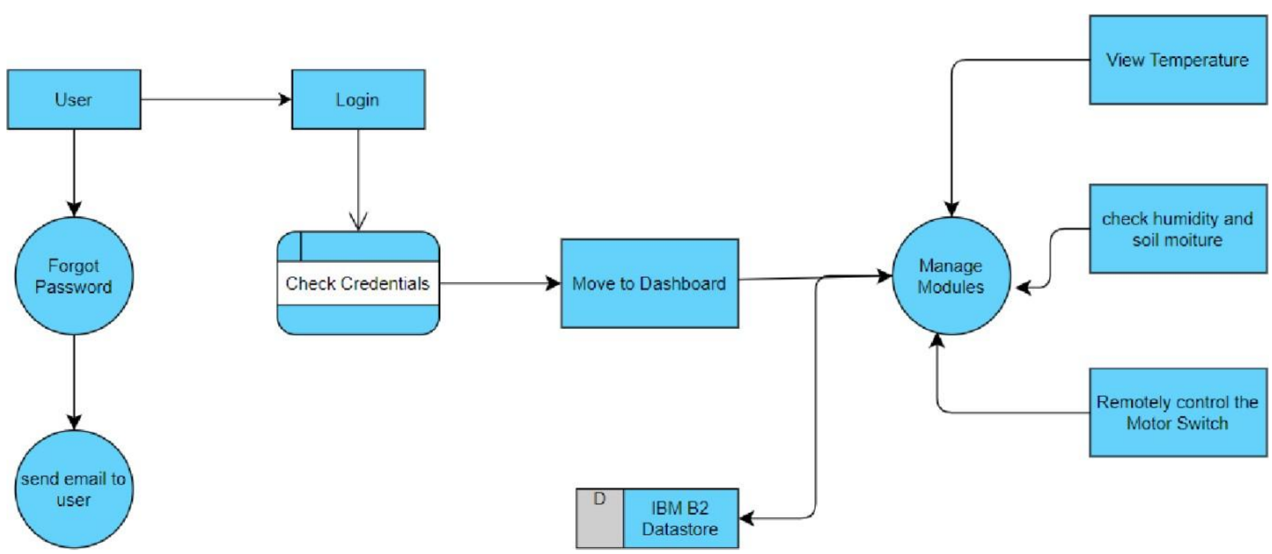
a. Data flow diagrams

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.

DFD Level0 (Industry Standard):



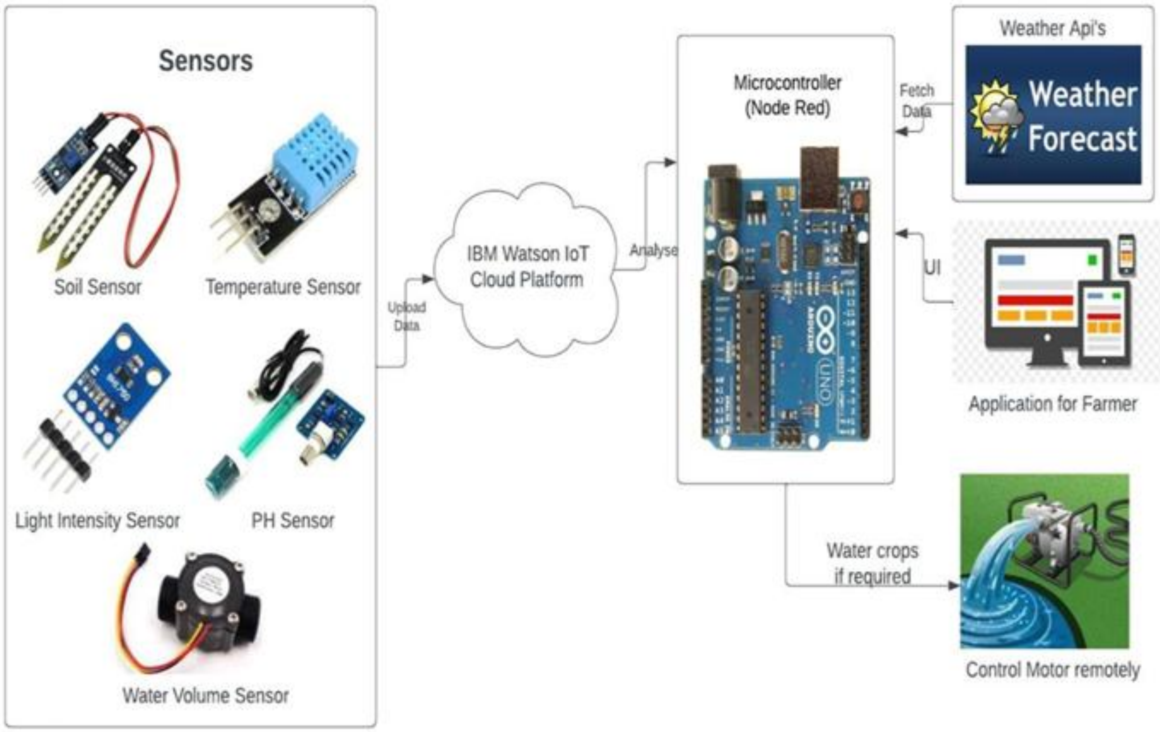
User Stories:

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 have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through 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	I can register & access the dashboard with Gmail Login	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can access dashboard with email login	High	Sprint-1
	Dashboard	USN-6	As a user I can enter into dashboard by using navigation panel	I can access the dashboard by using navigation panel	High	Sprint-1
Customer (Web user)	Registration	USN-1	As a user, I can register for the web application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-2
		USN-2	As a user, I will receive confirmation email once I have registered for the web application	I can receive confirmation email & click confirm	High	Sprint-2

	Login	USN-3	As a user, I can log into the web application by entering email & password	I can access dashboard with email login	High	Sprint-2
	Dashboard	USN-4	As a user I can enter into web dashboard by using navigation panel	I can access into dashboard by using navigation panel	High	Sprint-2
Customer Care Executive	Registration	USN-1	As a user I can contact the customer care service through phone or mail medium	I can receive confirmation SMS or email	High	Sprint-3
		USN-2	As a user I want customer care to answer the questions related to product and services	I can get the problem solved within a day	High	Sprint-3
		USN-3	As a user I want customer care to register my complaints	I can receive a confirmation message stating my complaint is registered	High	Sprint-3
		USN-4	As a user I want customer care to collect and analyse consumer feedback	I can get the status of my feedback	High	Sprint-3
		USN-5	As a user I want customer care to troubleshoot technical problems	I can get the problem solved within a day	High	Sprint-3
Administrator		USN-1	As a user I want the administrator to use good working hardware	I can get a guarantee and warranty card	High	Sprint-4
		USN-2	As a user I want the administrator to sell the product in a reasonable rate	I can get the cost of bill of materials	High	Sprint-4
		USN-3	As a user I want the administrator to refund my amount if I am not satisfied with the product	I can get an assurance stating I will get my amount back	High	Sprint-4

b. Solution and Technical Architecture

Solution Architecture Diagram:



- Solution Architecture:
  - Various sensors such as soil moisture sensor, temperature and humidity sensor, PH sensor and light intensity records values and upload it to cloud.
  - These sensors data are considered as parameters and also weather forecast data is also fetched using weather API's. These data act as input for the Arduino UNO.
  - Arduino UNO is used as a processing unit which processes the data obtained from sensors and weather data from weather API. Based on these values the farmers are suggested with possible decisions.
  - Farmer can control the motor remotely using the application developed using MIT App inventor.
  - If the farmer wants to water the crop then the Arduino switches on the motor and the water volume sensor ensures that the crops are not watered excessively.
  - The application also alerts the farmer at necessary situation.

Technical Architecture:

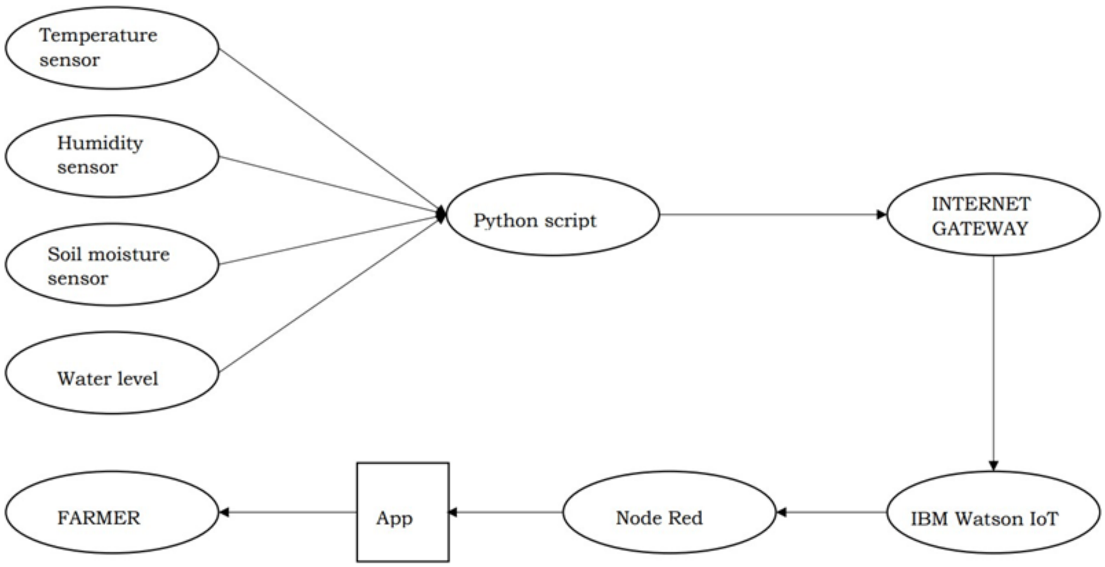


Table-1: Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Web UI, Node-RED, MIT app	MIT App Inventor
2.	Arduino UNO	It is used as a processing unit.	Python
3.	Sensors	Temperature, humidity and moisture sensors, whichsends data for the application.	Python
4.	MQTT Protocol	The data to be collected and sent to farmer via MQTT protocol providing the data to easily monitor the crops.	IBM Watson IoT, IBM Watson Assistance
5.	Application Logic-1	Controlling the water pumps remotely.	IBM Watson, IBM Cloudant service, IBM Node-Red
6.	Application Logic-2	Notifying the farmer based on water requirementsand based on weather.	Python
7.	Application Logic-3	Allowing the farmer to customise his field based ondifferent crops.	Python
8.	Database	Data Type, Configurations etc.	MySQL

9.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant
10.	File Storage	System Storage.	IBM Block Storage
11.	External API	Using this IBM Weather API we can track the weather in the agriculture land and based on the weather reading the sensors will activate.	IBM Weather API
12.	Machine Learning Model	To predict the yield based on the crop growth.	Crop prediction model.
13.	Infrastructure (Server / Cloud)	Application Deployment on Local System / CloudCloud Server Configuration.	IBM Cloudant, IBM IoT Platform

Table-2: Application Characteristics:

S.No	**Characteristics**	**Description**	**Technology**
1.	Open-Source Frameworks	Python, Arduino and MIT app Inventor	MIT License
2.	Security Implementations	Sensitive and private data must be protected from their production until the decision-making and storage stages.	Encryptions, IBM Controls
3.	Scalable Architecture	Scalable for more number of devices and for morearea of the farm.	Node Red Service
4.	Availability	Mobile, laptop, desktop.	MIT app, Web UI
5.	Performance	Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN).	MIT app inventor.

6. PROJECT PLANNING AND SCHEDULING

Product Backlog, Sprint Schedule, and Estimation:

Sprint	Functional Requirement(Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Simulation creation	USN-1	Connect Sensors and Arduino with python code	2	High	Danush Gupta V K, Sham Ganesh M, Premal Raj Vellaisamy, Cyril Tony A
Sprint-2	Software	USN-2	Creating device in the IBM Watson IoT platform, workflow for IoTscenarios usingNode-Red	2	High	Danush Gupta V K, Sham Ganesh M, Premal Raj Vellaisamy, Cyril Tony A
Sprint-3	MIT App Inventor	USN-3	Develop an application for the Smart farmer project using MITApp Inventor	2	High	Danush Gupta V K, Sham Ganesh M, Premal Raj Vellaisamy, Cyril Tony A
Sprint-3	Dashboard	USN-3	Design the Modules and test the app	2	High	Danush Gupta V K, Sham Ganesh M, Premal Raj Vellaisamy, Cyril Tony A
Sprint-4	Web UI	USN-4	To make the user to interact with software.	2	High	Danush Gupta V K, Sham Ganesh M, Premal Raj Vellaisamy, Cyril Tony A

Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned EndDate)	Sprint Release Date (Actual)
Sprint-1	20	7 Days	30 Oct 2022	06 Nov 2022	20	29 Oct 2022
Sprint-2	20	9 Days	31 Oct 2022	09 Nov 2022	20	05 Oct 2022
Sprint-3	20	6 Days	06 Nov 2022	13 Nov 2022	20	12 Oct 2022
Sprint-4	20	6 Days	11 Nov 2022	17 Nov 2022	20	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

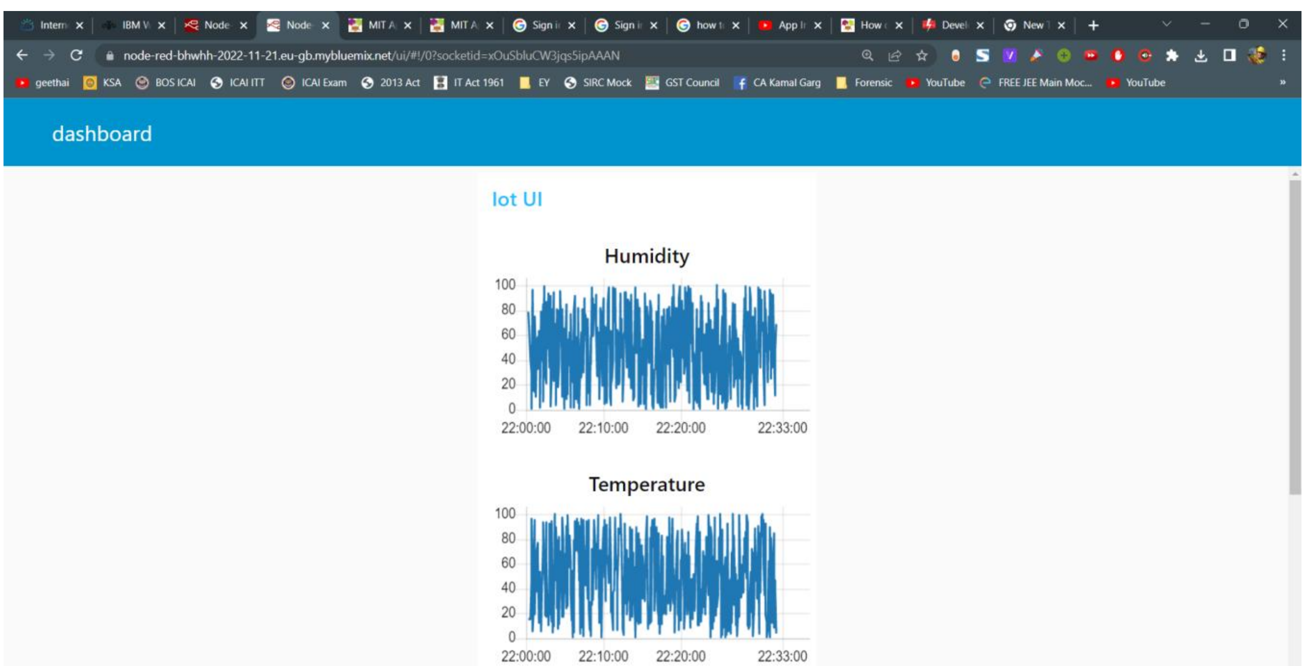
```
import wiotp.sdk.device
import time
import os
import datetime
 import random
myConfig = {
"identity": {
     "orgId": "ir6i2l",
     "typeId": "DeviceNode",
     "deviceId": "73585"
     },
     "auth": {
           "token": "43218765"
      }
}
client = wiotp.sdk.device.DeviceClient (config=myConfig,
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 (" ")
```

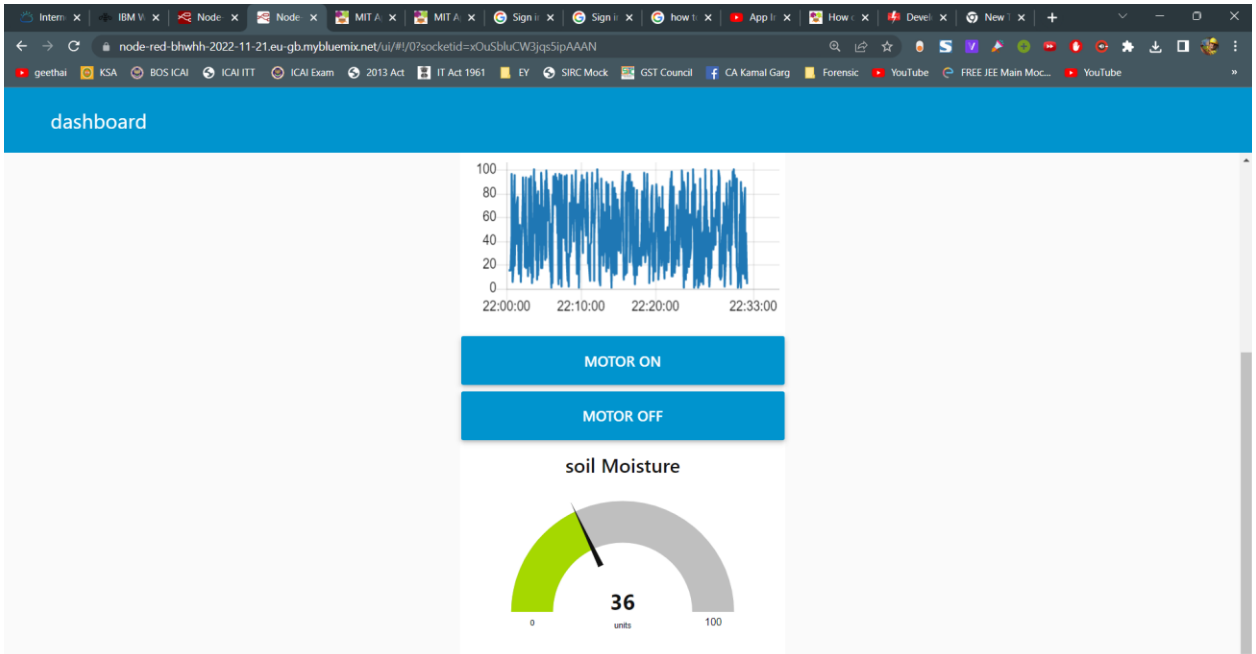
```
while True:

      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 ()
```

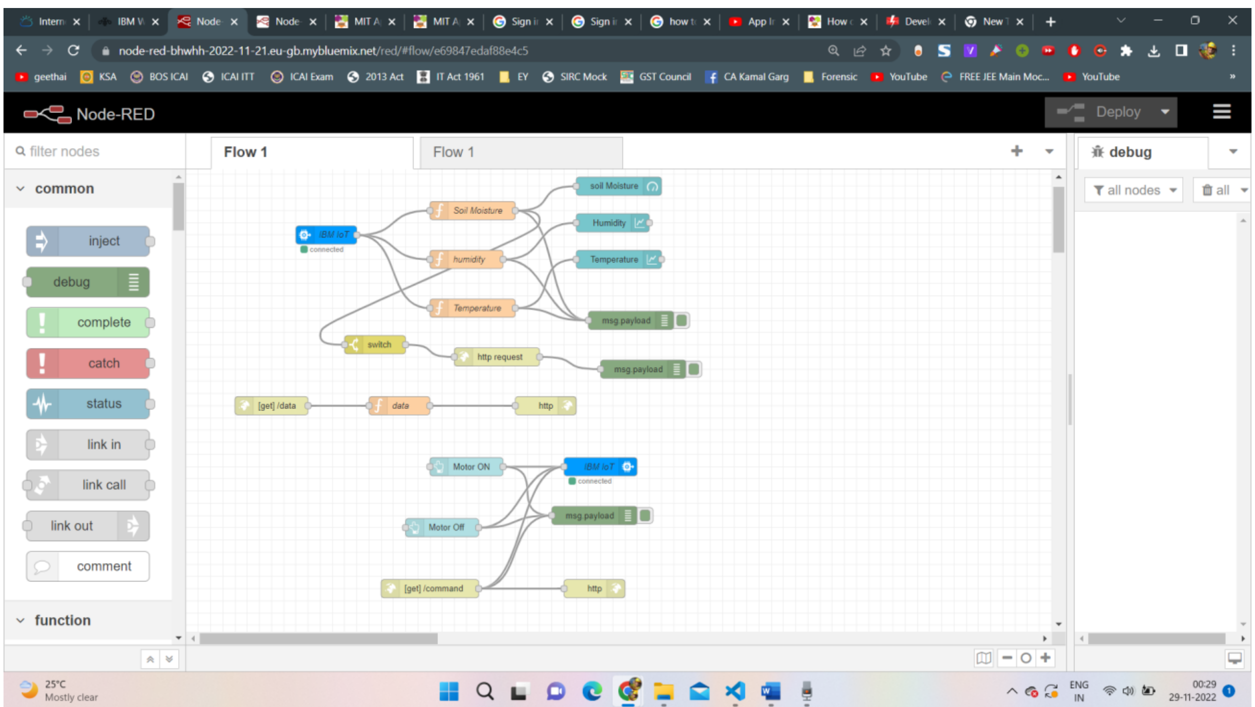
8. TESTING

Test case

Web application using Node Red

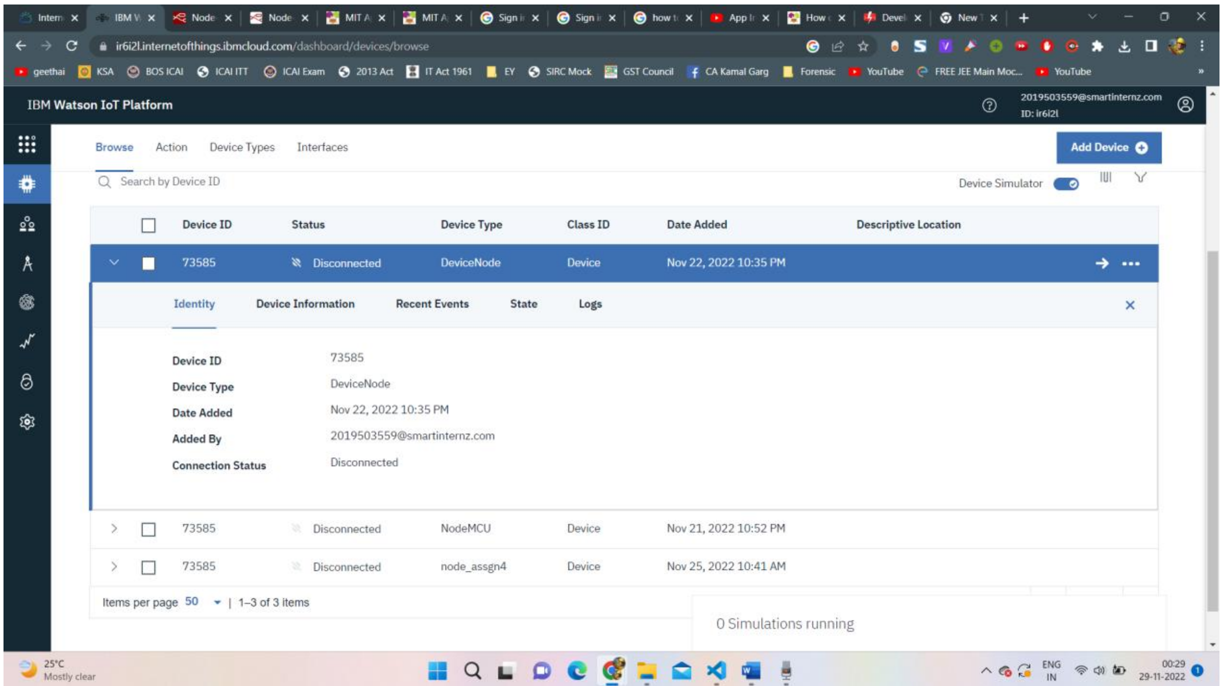



dashboard
100
80
60
40
20
0
22:00:00
22:10:00
22:20:00
22:33:00
MOTOR ON
MOTOR OFF
soil Moisture
36
units
0
100

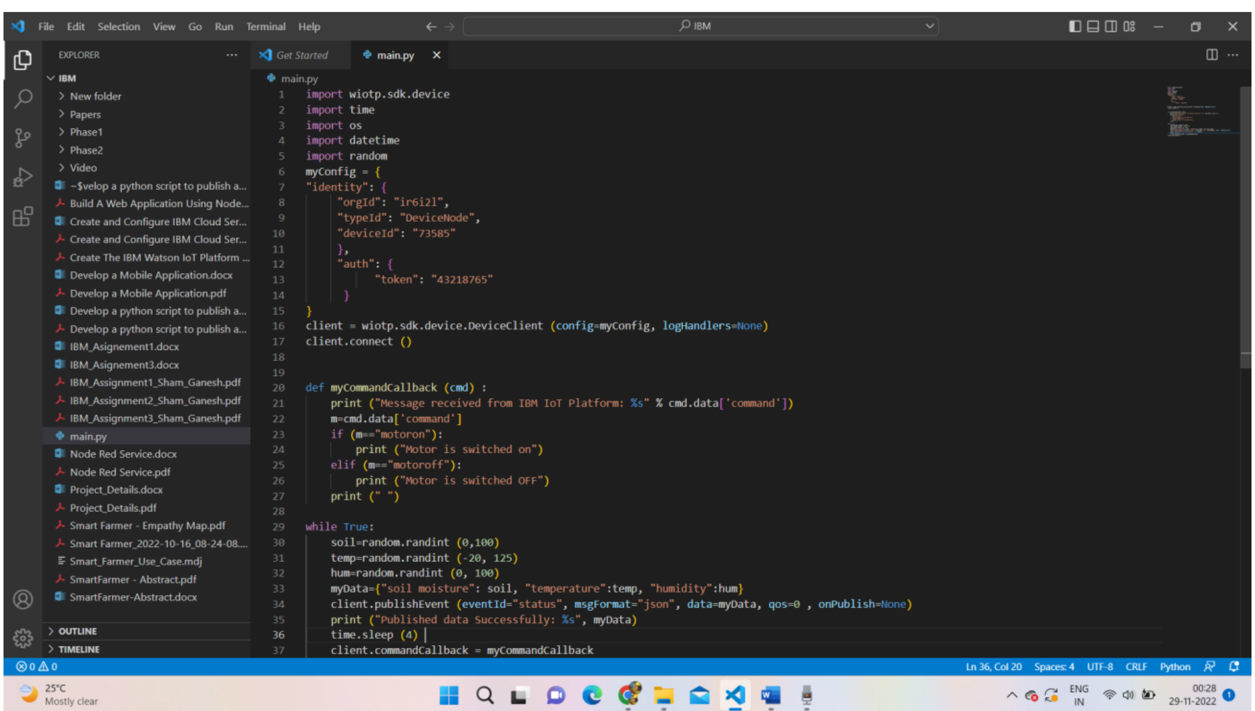

Node-RED
Deploy
filter nodes
Flow 1
Flow 1
debug
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
all nodes
all
soil Moisture
Soil Moisture
Humidity
IBM IoT
connected
humidity
Temperature
Temperature
msg.payload
switch
http request
msg.payload
[get] /data
data
http
Motor ON
IBM IoT
connected
msg.payload
Motor Off
[get] /command
http

IoT Watson Platform

Device creation and connection to node-red

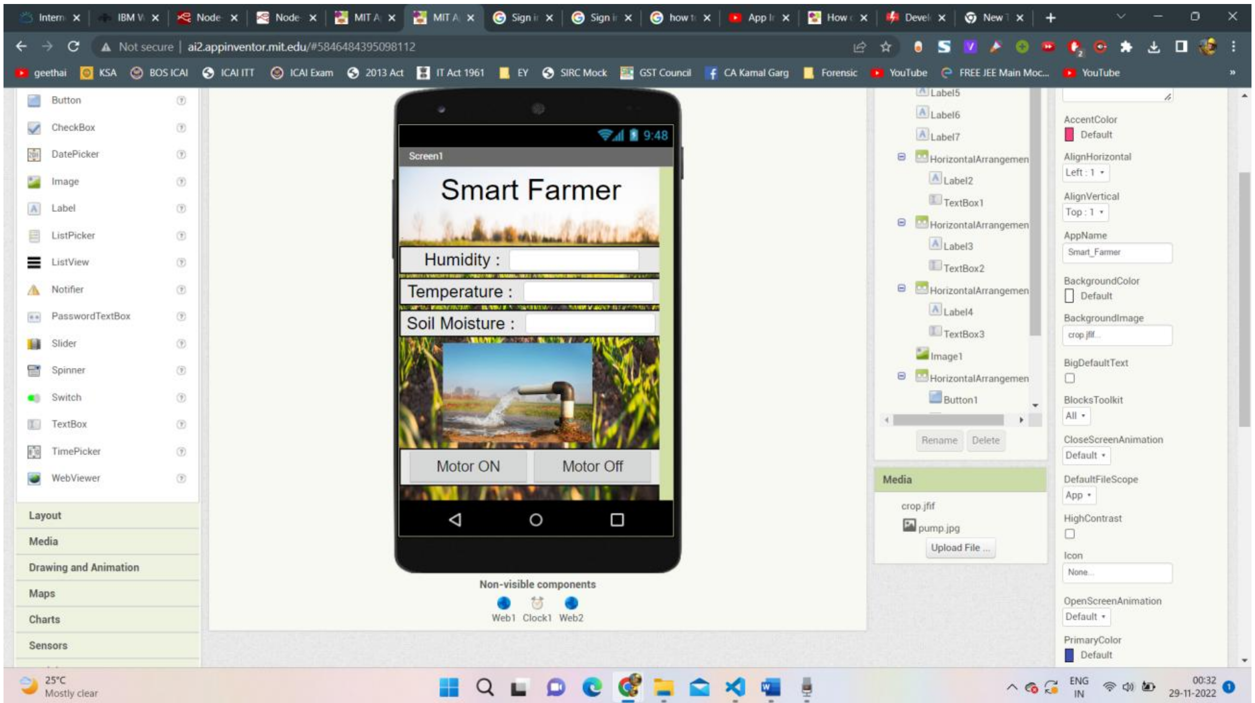


Python code connected to Iot watson platform



9. RESULTS

a. Performance Metrics



10.Advantages and disadvantages

a. Advantages:

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

b. Disadvantages:

- The smart agriculture needs availability of internet continuously. Rural part of most of the developing countries does 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 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": "ir6i2l",
     "typeId": "DeviceNode",
     "deviceId": "73585"
     },
     "auth": {
```

```
            "token": "43218765"
      }
}
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 ()
```

DEMO VIDEO LINK :

https://drive.google.com/file/d/1gCMWTlDmOyfcEq10csHek4iPRkN7_9pN/view?usp=share_link