SMARTFARMER – IOT ENABLED SMART FARMING APPLICATION

TEAM ID: PNT2022TMID11119

TEAM MEMBERS:

- Venkatesh.R
- Sudhersun.S
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SMARTFARMER – IOT ENABLED SMART FARMING APPLICATION

Software Required:

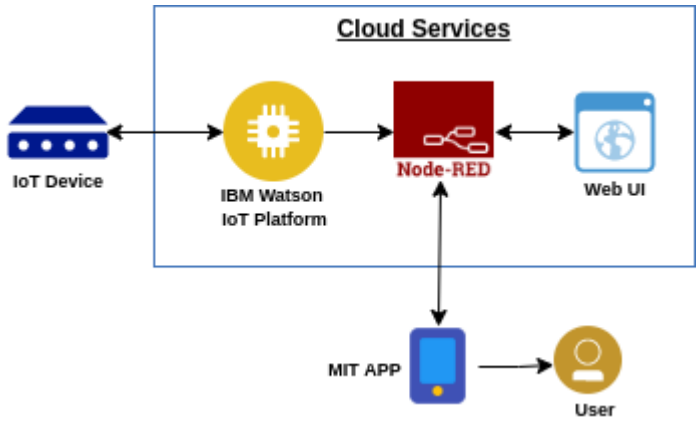
Python IDLE

System Required:

RAM-Minimum 4GB Processor-Min. Configuration OS-Windows/Linux/MAC

- IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, temperature, and humidity using some sensors.
- Farmers can monitor all the sensor parameters by using a web or mobile application even if the farmer is not near his field. Watering the crop is one of the important tasks for the farmers.
- They can make the decision whether to water the crop or postpone it by monitoring the sensor parameters and controlling the motor pumps from the mobile application itself.

Technical Architecture:



IDEATION PHASE

Literature Survey:

- According to Abimanyuh Pandit, the majority of farmers use huge tracts of land, making it quite challenging to get to all of their corners and keep track of them. Uneven water drops are a possibility occasionally. This causes crops to be of poor quality, which further causes financial losses. The Smart Irrigation System, which makes use of the most recent IoT technology, is beneficial in this situation and makes farming easier.

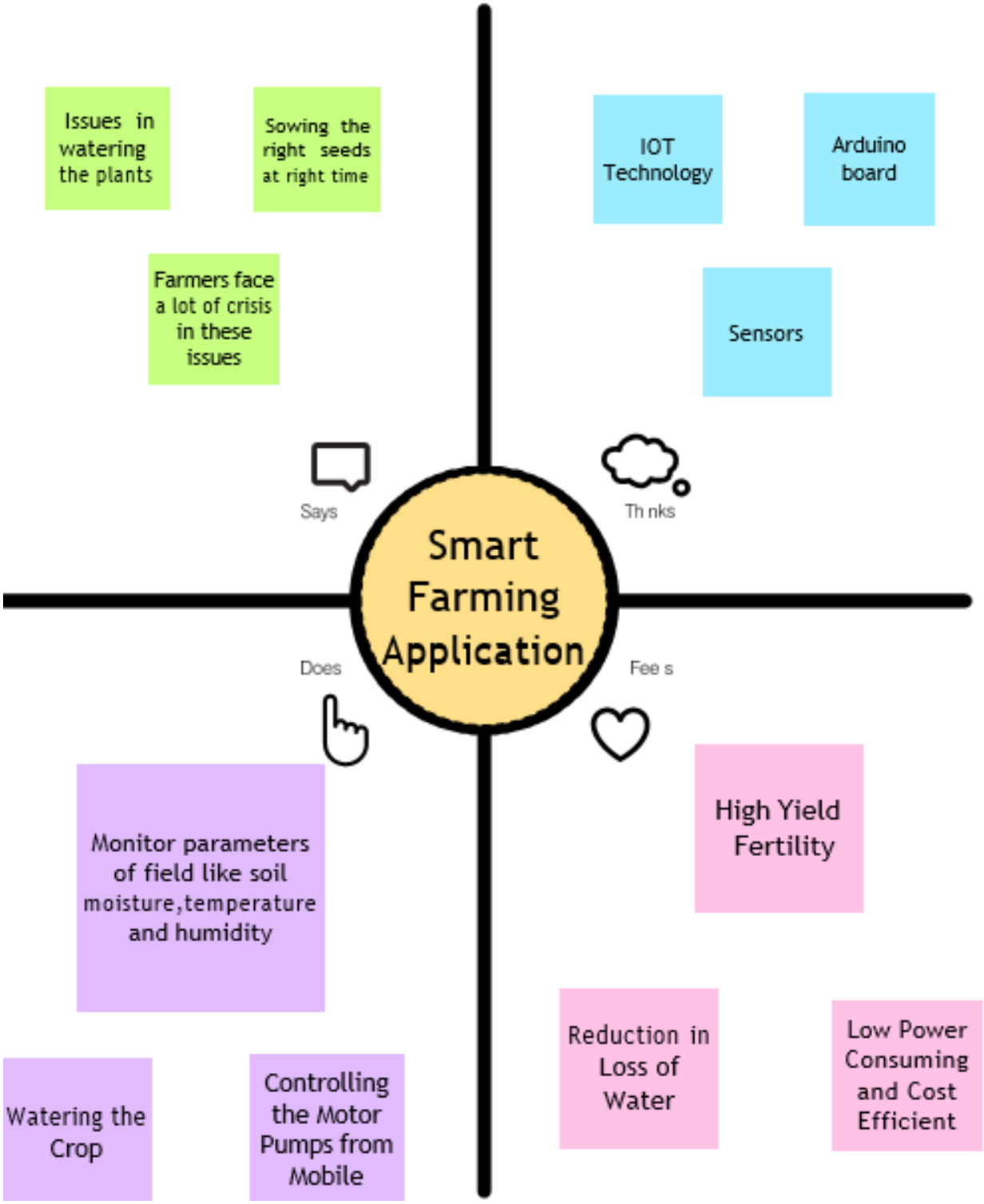
- According to Madhu, this project is about the Nodemcu ESP8266-based IoT-based Smart Agriculture & Automatic Irrigation System. The development of agricultural nations depends heavily on agriculture. Some agricultural-related concerns have consistently slowed down the nation's progress. Therefore, updating the current traditional methods of agriculture is the only way to solve this issue. Therefore, the approach involves using automation and IoT technology to make agriculture smart. The Internet of Things (IoT) provides a number of applications, including automatic irrigation decision support, crop growth monitoring and selection, etc. To modernise and boost crop yield, we suggested an ESP8266 IoT automatic irrigation system.

- According to Srishti Rawal, Automation of farm activities can transform agricultural domain from being manual and static to intelligent and dynamic leading to higher production with lesser human supervision. This paper proposes an automated irrigation system which monitors and maintains the desired soil moisture content via automatic watering. Microcontroller ATMEGA328P on arduino uno platform is used to implement the control unit. The setup uses soil moisture sensors which measure the exact moisture level in soil. This value enables the system to use appropriate quantity of water which avoids over/under irrigation. IOT is used to keep the farmers updated about the status of sprinklers.

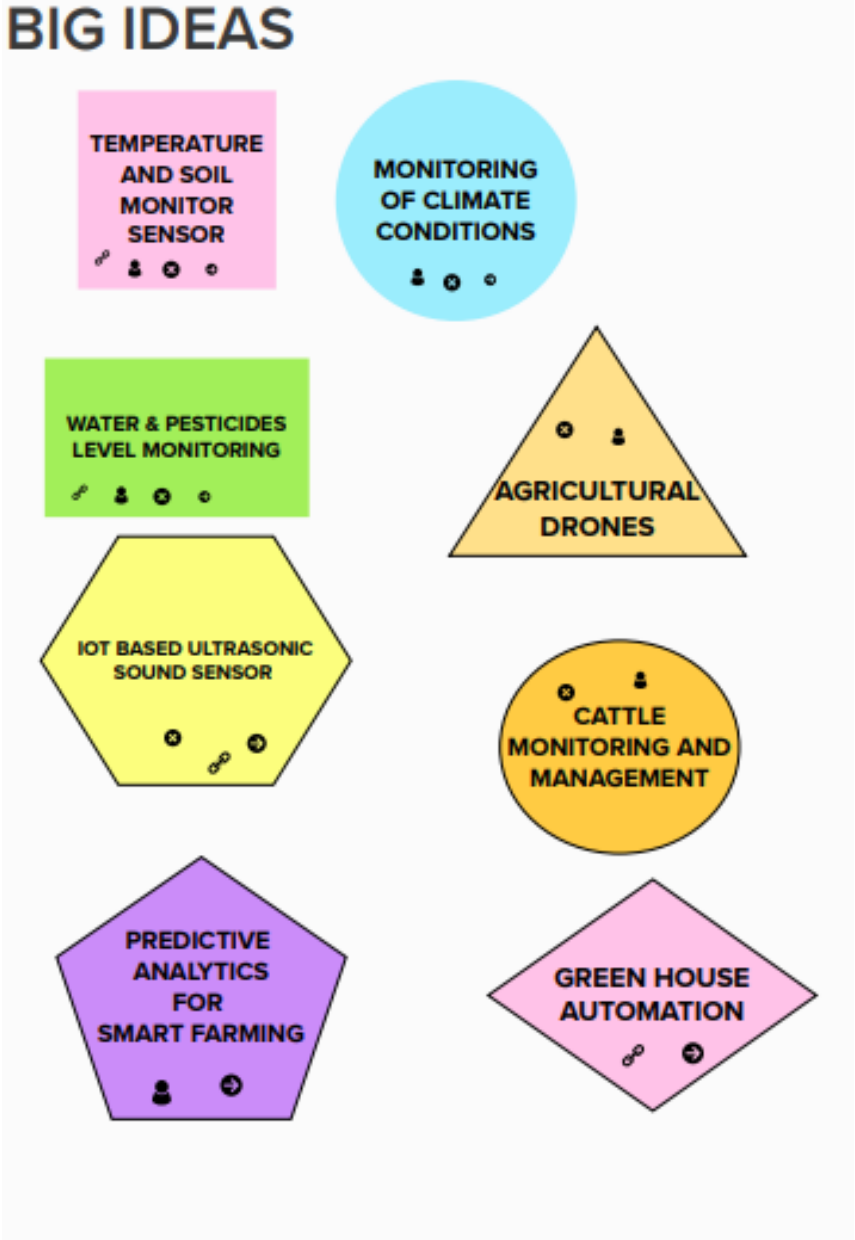
- According to MD Safayet Ahmad, Agriculture is the most important sector for humankind to survive their existence .It enhances a big concern to manage food for people all over the world. Most of the farmers follow very traditional methods to cultivate their crops. They used to be present physically on their farm to monitor crops. Use of technology can make this job easier and time efficient. Internet of things (IoT) is a technology which can send or receive any data to a server using the Internet. Using this technology, farmers can monitor the actual condition of the crops without being present in their field. In this paper, we have proposed a system to monitor the farming field with the help of IoT technology. This system allows various devices and sensors to send data over the Internet. It enables farmers to monitor their field remotely from their home by using a smartphone or a computer .Almost every field embraces the Internet of things (IoT) revolution [1]. Agri-culture has seen many transformations and has adopted many machines to improve the yield. Field (soil and environmental parameters) and crop health monitoring are important factors for the yield to be of better quality. In recent years, there have been many technological advancements in agriculture which have led to an increase in productivity and immunity of the crops. About 70% of the freshwater available in the world is consumed by the agriculture sector [2], with the help of soil moisture sensor, we can optimize the irrigation process and use of water [3,4]. The technology which plays a key role in this is the Internet of things (IoT) [5]. Traditional agriculture is transforming into smart agriculture due to the penetration of the Internet of things (IoT) in the agricultural sector. The IoT networks are reducing human labour.

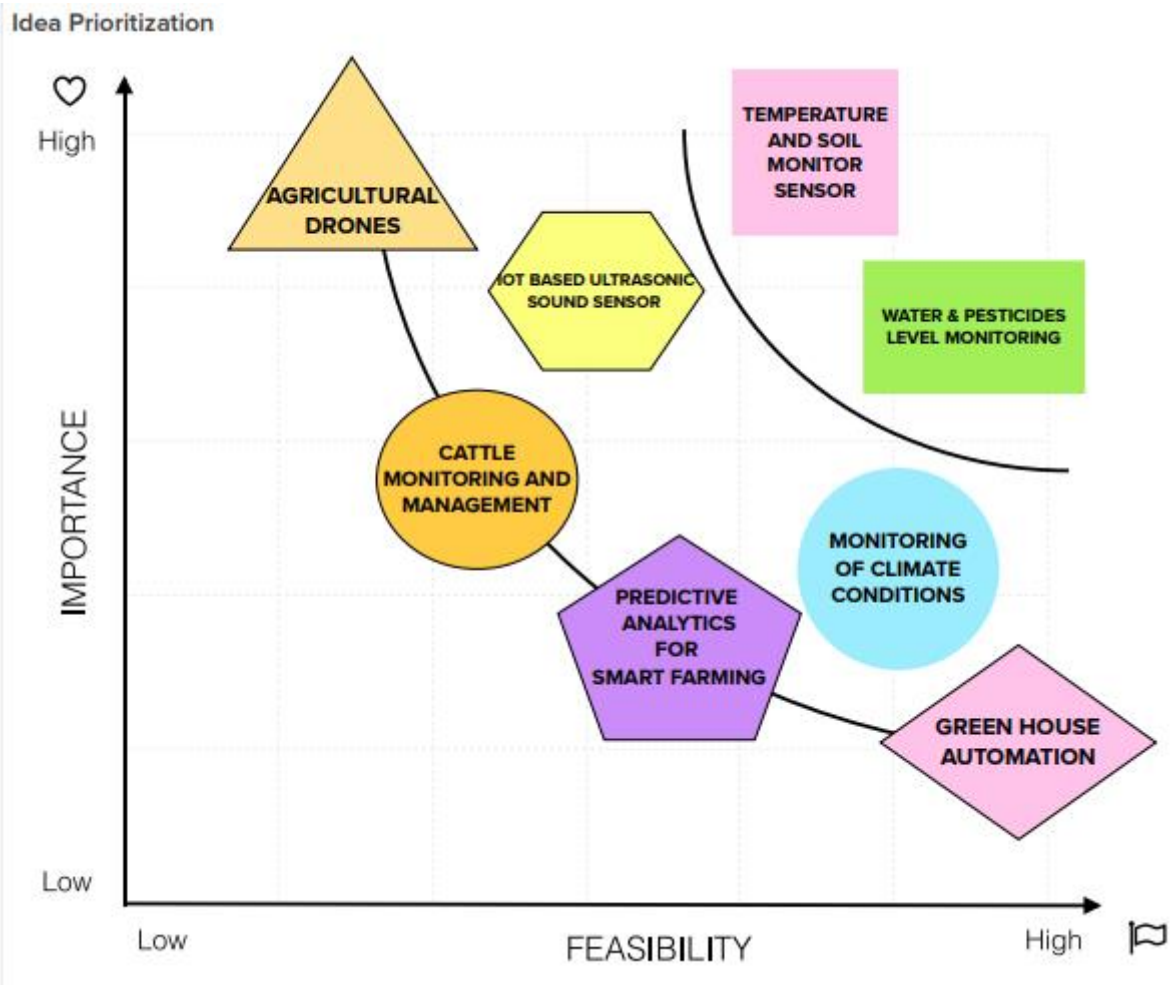
- According to Akhlak Uz Zaman, Internet of things (IoT) is one of the fastest-growing technologies in the last few years. This technology might be used widely in real-life agriculture. In this paper, we have proposed a low-cost and easy accessible IoT-based smart agriculture monitoring system along with double-tier data storage facility to store and secure such a huge volume of data by an IoT device. Tier-1 focuses on collecting data from different sensors and stores it locally using the SD card. Tier-2 uses a cloud server for storing the large volume of IoT sensors data. Farmer or analyser can be able to monitor the actual condition of the agricultural field remotely using a smartphone application or a computer. There exists a scope to store data for further analysis.

Empathy Map:


Issues in watering the plants
Sowing the right seeds at right time
IOT Technology
Arduino board
Farmers face a lot of crisis in these issues
Sensors
Says
Th nks
Smart Farming Application
Does
Fee s
Monitor parameters of field like soil moisture,temperature and humidity
High Yield Fertility
Watering the Crop
Controlling the Motor Pumps from Mobile
Reduction in Loss of Water
Low Power Consuming and Cost Efficient

Ideation:


BIG IDEAS
TEMPERATURE AND SOIL MONITOR SENSOR
MONITORING OF CLIMATE CONDITIONS
WATER & PESTICIDES LEVEL MONITORING
AGRICULTURAL DRONES
IOT BASED ULTRASONIC SOUND SENSOR
CATTLE MONITORING AND MANAGEMENT
PREDICTIVE ANALYTICS FOR SMART FARMING
GREEN HOUSE AUTOMATION



NEED STATEMENT

FARMER	needs a way to	INCREASE AND PROTECT THE CROP	so that	HIGH PROFIT

Farmers needs a way to protect the crops from various factors so that they can get high profit

PROJECT PHASE DESIGN- II

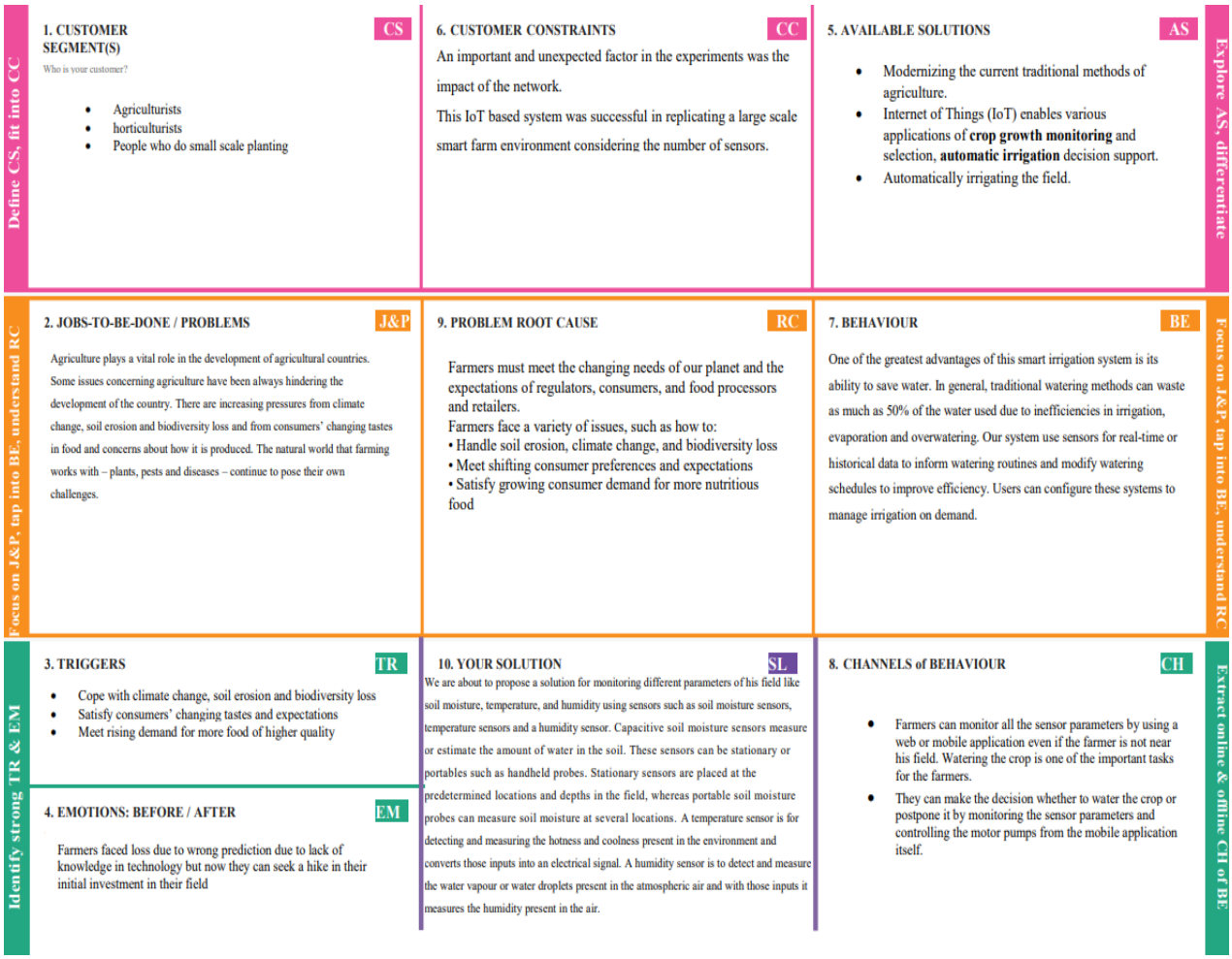
Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Agriculture plays a vital role for the economic growth of a country. Some issues concerning agriculture have been always hindering the development of the country. Farmers must meet the changing needs of our planet and the expectations of regulators, consumers, and food processors and retailers. There are increasing pressures from climate change, soil erosion and biodiversity loss and from consumers' changing tastes in food and concerns about how it is produced. And the natural world that farming works with – plants, pests and diseases – continue to pose their own challenges. Farmers need to deal with many problems, including how to: • Cope with climate change, soil erosion and biodiversity loss • Satisfy consumers' changing tastes and expectations • Meet rising demand for more food of higher quality
2.	Idea / Solution description	• We are about to propose a solution for monitoring different parameters of his field like soil moisture, temperature, and humidity using sensors such as soil

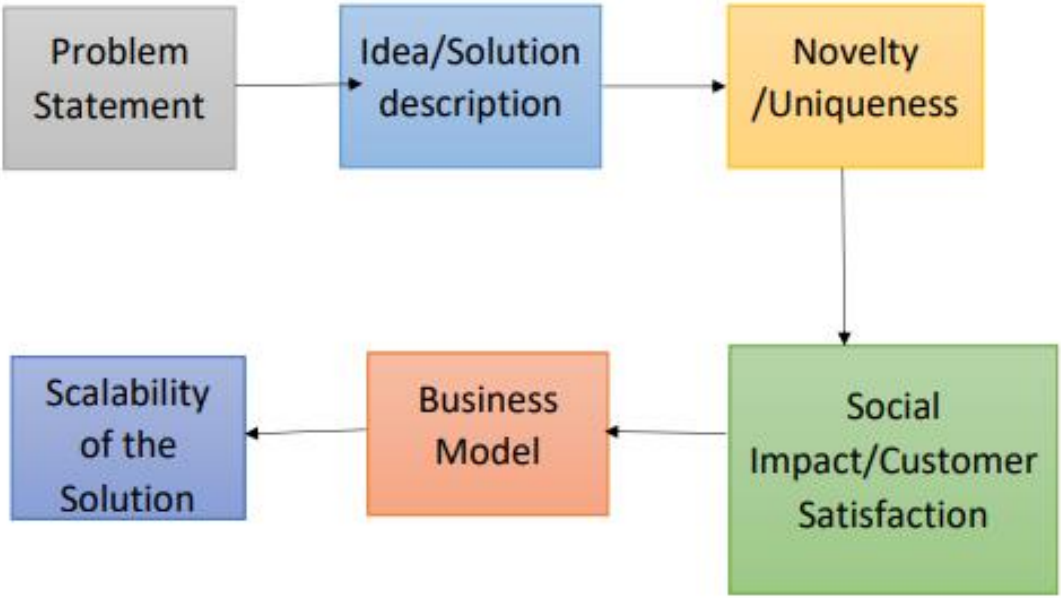
		moisture sensors, temperature sensors and a humidity sensor. • Capacitive soil moisture sensors measure or estimate the amount of water in the soil. • These sensors can be stationary or portables such as handheld probes. • Stationary sensors are placed at the predetermined locations and depths in the field, whereas portable soil moisture probes can measure soil moisture at several locations. • A temperature sensor is for detecting and measuring the hotness and coolness present in the environment and converts those inputs into an electrical signal. • A humidity sensor is to detect and measure the water vapour or water droplets present in the atmospheric air and with those inputs it measures the humidity present in the air. • Considering these parameters such as temperature, humidity, soil moisture as a basic inputs for watering the particular crop in the field or not is our proposing solution that we are about to solve for the farmers who are the constituents for our GDP as well as the backbone of our country
3.	Novelty / Uniqueness	• Modernizing the current traditional methods of agriculture. • Internet of Things (IoT) enables various applications of **crop growth monitoring** and selection, **automatic irrigation** decision support.

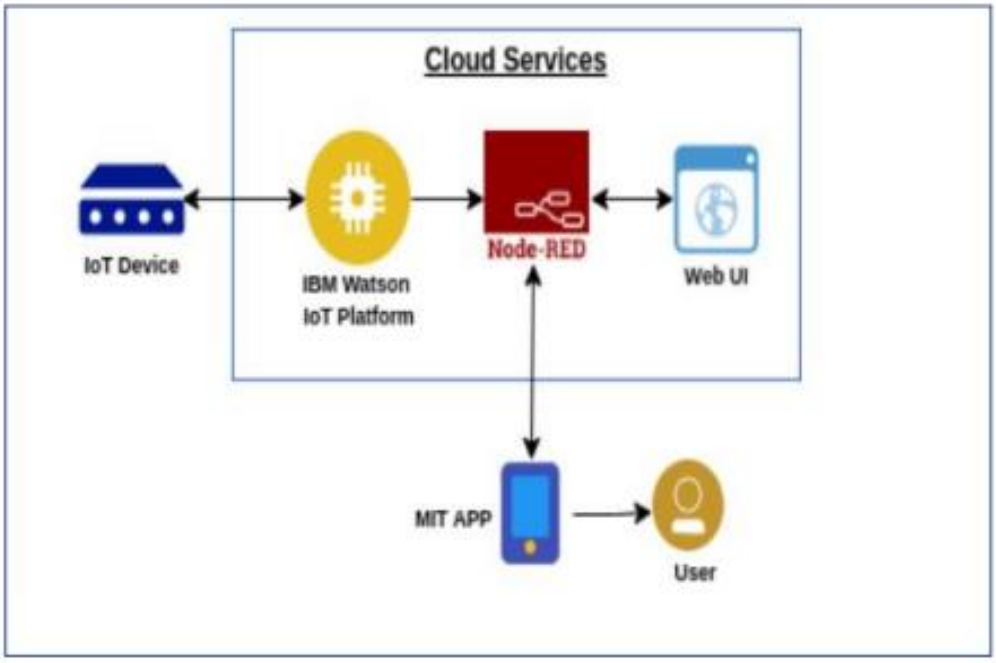
4.	Social Impact / Customer Satisfaction	• One of the greatest advantages of this smart irrigation system is its ability to save water. • In general, traditional watering methods can waste as much as 50% of the water used due to inefficiencies in irrigation, evaporation and overwatering. • Our system use sensors for real-time or historical data to inform watering routines and modify watering schedules to improve efficiency. • Users can configure these systems to manage irrigation on demand.
5.	Business Model (Revenue Model)	• Consequently, the solution to the problem addressed by in our problem statement is smart agriculture by modernizing the current traditional methods of agriculture. • **ESP8266 IoT Automatic irrigation system** to modernize and improve the productivity of the crop.
6.	Scalability of the Solution	• The impact of the network was a significant and unanticipated component. • Considering the quantity of sensors, these IoT-based systems were successful in simulating a large-scale smart agricultural setting. • Because of the price and scale of the farms, we anticipate having fewer sensors.

Problem Solution Fit:



Solution Architecture:





PROJECT PHASE DESIGN- II

Customer Journey:

PHASES	Motivation	Information gathering	Analyzes various products	chooses the most efficient product	Payment
Actions	wishes to ease concern about agricultural related issues	wishes to select an efficient product in order to improve agricultural profits	Other products available include circuits and sensors.	More efficient than traditional manual systems.	Following product satisfaction
Touchpoints	Buyers are delighted	The farmers will no longer have to be concerned aboutwatering crops after the installation.	The numerous features of our product entertain the user.	The farmers willnot be concerned about safety after receiving this.	Farmers will be satisfied by using our product
Customer Feeling					
Customer Thoughts	The customer believes it will assist them in plant watering	The customer believes it will last a long time.	The customer believes that a different option will be offered.	They will find it simple and easy to recognize our product.	They believe the product will be easy to use.
Opportunities	The customer benefits in lot of ways	The customer is aware of the product's manufacturing process	Other products will be made known to the	The buyer learns which product is	It's an user friendly product.

Functional Requirement:

Following are the functional requirements of the proposed solution.

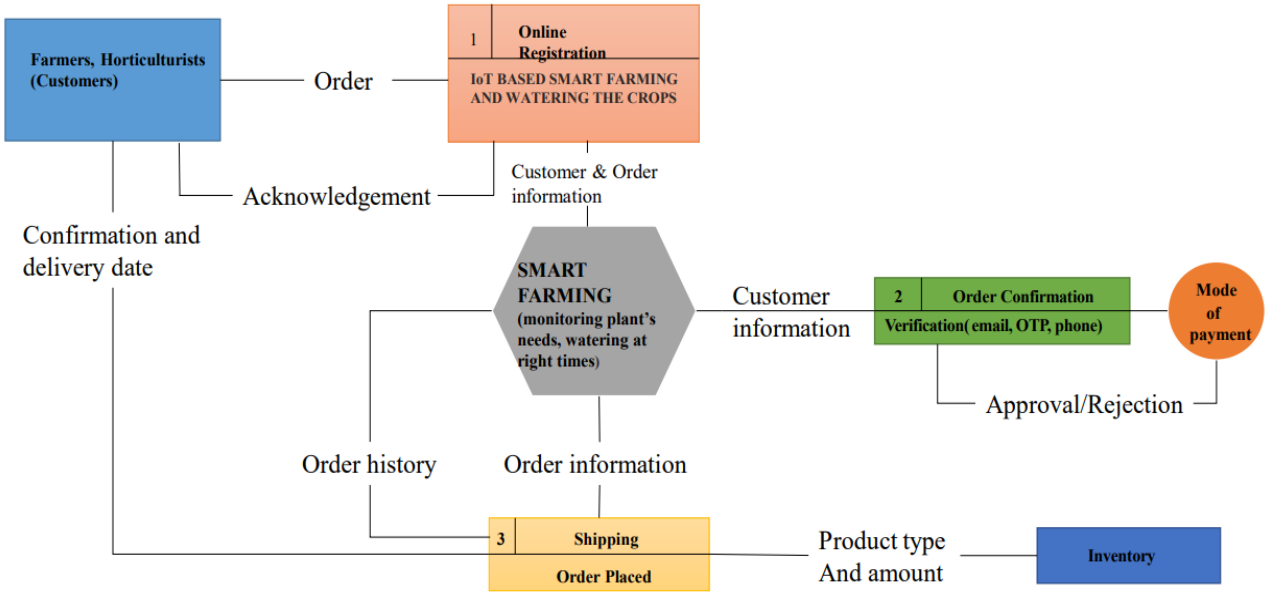
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	**User Requirements**	The Crop Protection Automatic Sprinkler System Tracks Temperature, Humidity, and Soil Moisture
FR-2	**User Registration**	Registration Manual Registration using a website Form-based registration Gmail-based registration
FR-3	**User Confirmation**	Phone confirmation Email confirmation required Reassurance via OTP
FR-4	**Payment Options**	On delivery of cash Net Banking, UPI Cards, Credit Cards, and ATMs
FR-5	**Product Delivery and Installation**	Door-to-door delivery Take out Totally free installation and a 12-month warranty
FR-6	**Product Feedback**	via a website Using Google forms and phone calls

Non-Functional Requirements:

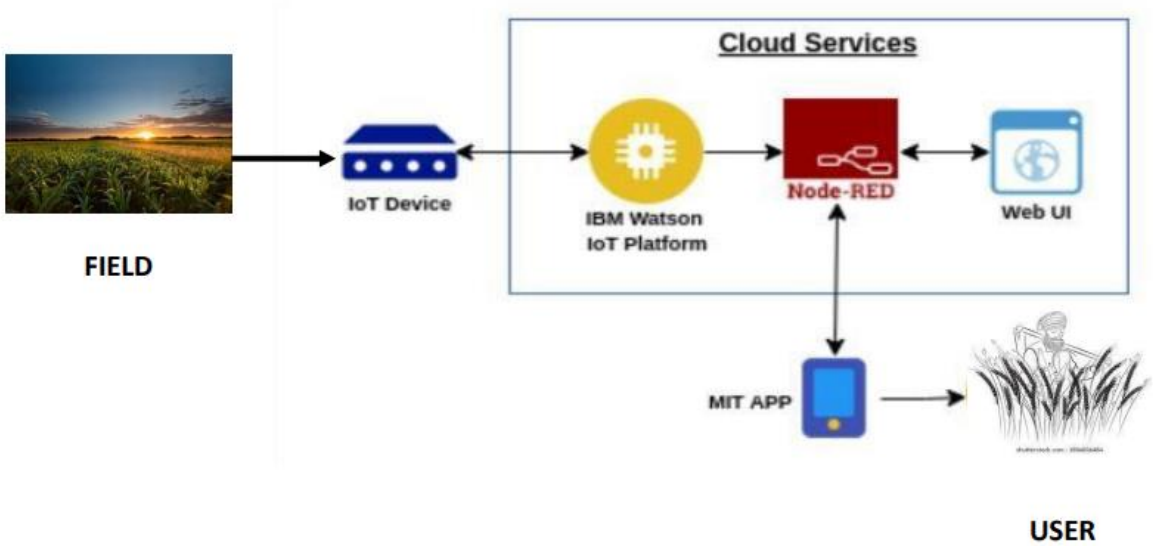
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Have an easy-to-understand guidebook. Simpler to use The product is easy to use even by farmers who are illiterate.
NFR-2	**Security**	Application security requires two-step authorization. The user's needs will determine how passwords and passkeys are assigned.
NFR-3	**Reliability**	Hardware needs to be checked and maintained regularly. Periodic software updates are possible. Any system breakdown will result in an immediate alarm.
NFR-4	**Performance**	The programme needs a good user interface. It should just demand a small amount of energy. It must conserve energy and water.
NFR-5	**Availability**	Every function will be accessible whenever the user needs it. It depends on the farmer's requirements and the level of customization the user has undertaken.
NFR-6	**Scalability**	Regardless of the size or area of a farm field, the product must cover the entire area of the ground.

Data Flow Diagrams:



Technology Architecture:



PROJECT PLANNING PHASE

Milestone And Activity List:

TITLE	DESCRIPTION	DATE
Literature Survey &InformationGathering	Literature survey on theselected project & gatheringinformation by referring the,technical papers, researchpublicationsetc. A Literature Surveyisacompilation summary ofresearch done previously in the given topic.	10September2022
PrepareEmpathyMap	EmpathyMapisavisualization tool which can be usedto getabetter insightofthecustomer. PrepareEmpathyMapCanvasto capture the user Pains &Gains, Prepare list of problemstatements.	11September2022
Brainstormingideas	Brainstorming is a groupproblem solving sessionwhereideas areshared, discussed and organizedamongtheteammembers. List the ideas by organizing thebrainstorming session andprioritize the top 3 ideas basedonthefeasibility&importance.	17September2022
DefineProblemStatement	A Problem Statement is aconcise description of theproblemorissuesaprojectseeksto address.Theproblemstatement identifies the currentstate,the desired future state andanygaps betweenthetwo.	17September2022

ProposedSolution	Proposed solution shows thecurrent solutionandithelpsisgoingtowards thedesiredresultuntilitisachieved. Prepare the proposed solutiondocument, which includes thenovelty, feasibility of idea,businessmodel,socialimpact,scalabilityof solution, etc.	30September2022
ProblemSolutionFit	Prepareproblem-solutionFitdocument. Thishelpsustounderstandthethoughts of the customer theirlikes, behavior,emotionsetc.	30September2022
SolutionArchitecture	PreparesolutionArchitecturedocument. Solution Architecture is a verycomplex process i.e it has a lotof sub-processes and branches.It helps in understanding thecomponentsand featurestocompleteourproject.	30September2022
CustomerJourney	Prepare the customer journeymaps to understand the userinteractions & experienceswiththeapplication. It helps us to analyze from theperspectiveofacustomer,who uses ourproject.	08October2022
FunctionalRequirement	Here functional and non-functional requirementsare briefed.It has specific features like usability,security,reliability,performance,availabilityand scalability. Prepare Functional Requirement Document.	15October2022

DataFlow Diagrams	Data Flow Diagram is agraphical or visualrepresentation using astandardizedsetofsymbols and notations to describe abusiness's operationsthroughdatamoveme nt. Draw the data flow Diagrams and submit forreview.	15October2022
TechnologyArchitecture	Technology Architecture is amore well defined version ofsolutionarchitecture.Ithelpsus analyze and understand varioustechnologies that needs to beimplementedinthe project. Prepare Architecturediagram.	15October2022
PrepareMilestone&Activit y List	PrepareMilestone&Activity List. It helps us to understand andevaluateourownprogressand accuracysofar.	1November2022
Sprint Delivery Plan	Prepare Sprint planning which is an event inscrumthatkicksoffthesprint.Th epurpose ofsprintplanning isto definewhatcanbedeliveredinthes printandhow that work will beachieved.	9 November2022
ProjectDevelopment Phase - Deliveryof Sprint-1,2,3,4	Develop & submit thedevelopedcodebytestingit.	In Progress.

Sprint Delivery Plan:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Venkatesh R
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Sudhersun S
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	Sridhar P
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	Santhosh D
Sprint-1	Login	USN-5	As a user, I can log into the application by Entering email & password	1	High	Venkatesh R

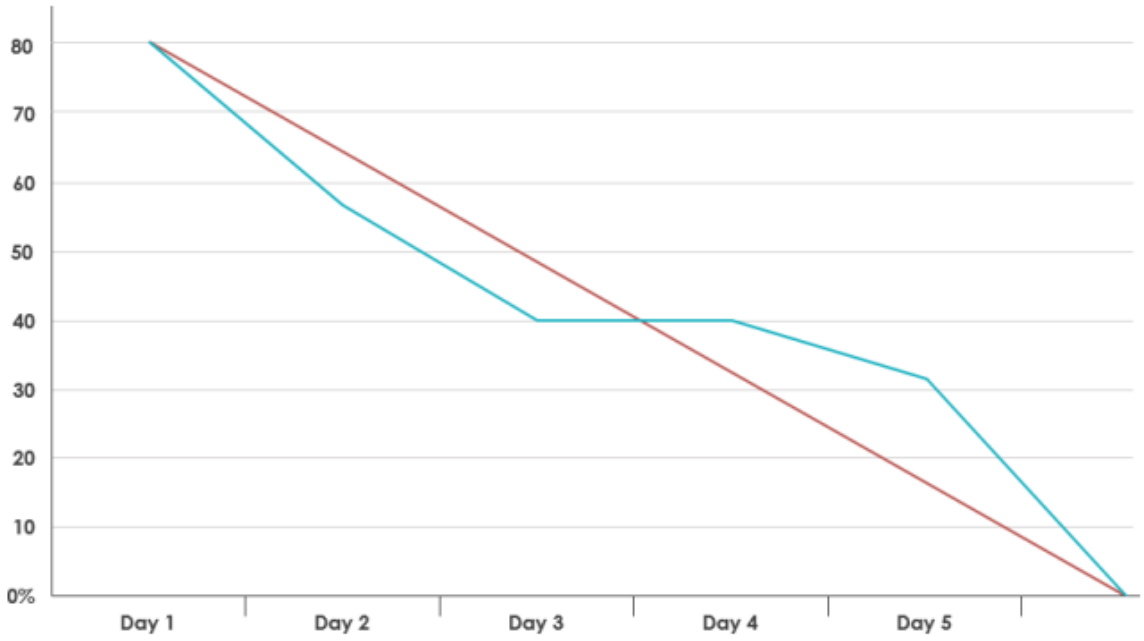
Project Tracker, Velocity & Burndown Chart:

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	05 Nov 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	30	08 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	49	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	50	19 Nov 2022

Velocity:

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

Burndown Chart:



PROJECT DEVELOPMENT PHASE

Delivery Of Sprint-1:

```
import wiotp.sdk.device
import time
import random
import requests, json
ms=0
api_key = "a0db30a689a774b93ffcb58ef2eddfda"
base_url = "http://api.openweathermap.org/data/2.5/weather?"
city_name = 'Chennai, IN'
complete_url = base_url + "appid=" + api_key + "&q=" + city_name
status='motor off'
myConfig = {
"identity": {
"orgId": "17lsro",
"typeId": "MyDeviceType",
"deviceId":"12345"
},
"auth": {
"token": "GkatKdiUS?UVHKvnAD"
}
}
def myCommandCallback(cmd):
print("Message received from IBM IoT Platform: %s" %
```

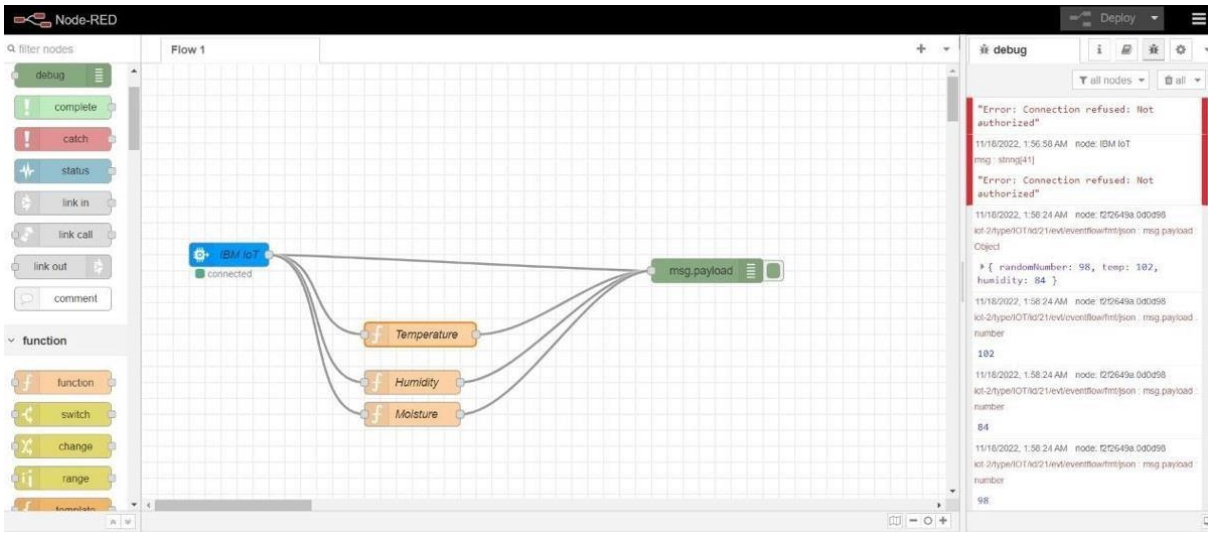
```
cmd.data['command'])
m=cmd.data['command']
if(m=="MOTOR ON"):
print("MOTOR IS ON")
global status
status='motor on'
myData={'temperature':temp,
'humidity':hum,'soilmoisture':sm_percentage,'status':status,'api_temperature':
api_temperature,'api_pressure':api_pressure,'api_humidity':api_humidity,'api
_weather_description':api_weather_description}
client.publishEvent(eventId="status", msgFormat="json", data=myData,
qos=0, onPublish=None)
print("Published data Successfully: %s", myData)
time.sleep(2)
elif(m=="MOTOR OFF"):
print("MOTOR IS OFF")
status='motor off'
myData={'temperature':temp,
'humidity':hum,'soilmoisture':sm_percentage,'status':status,'api_temperature':
api_temperature,'api_pressure':api_pressure,'api_humidity':api_humidity,'api
_weather_description':api_weather_description}
client.publishEvent(eventId="status", msgFormat="json", data=myData,
qos=0, onPublish=None)
print("Published data Successfully: %s", myData)
time.sleep(2)
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
```

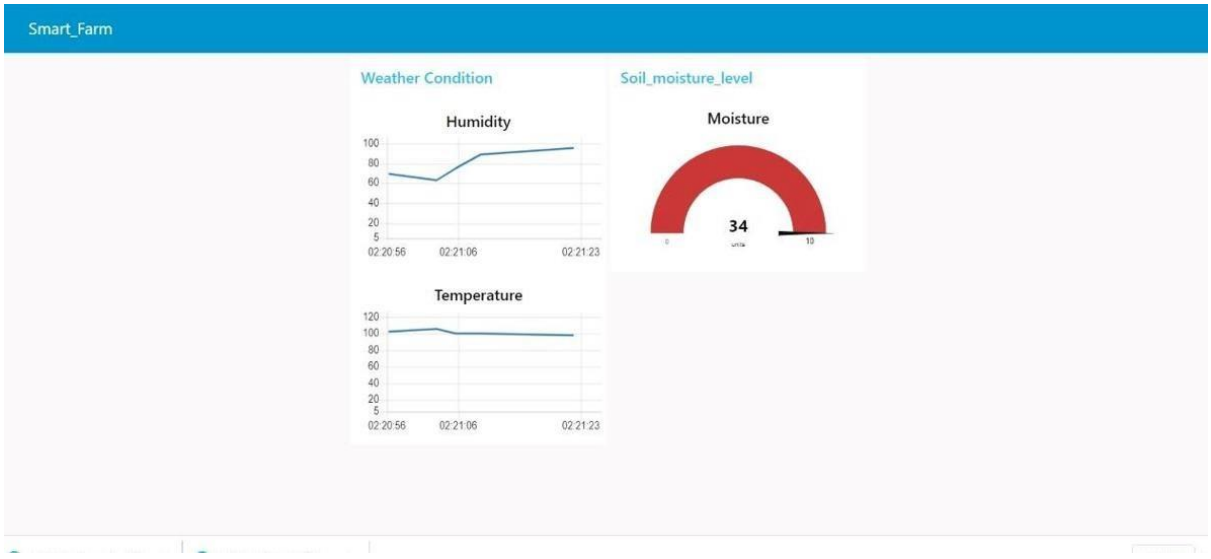
```
client.connect()
while True:
response = requests.get(complete_url)
x = response.json()
if x["cod"] != "404":
y = x["main"]
api_temperature = y["temp"]
api_pressure = y["pressure"]
api_humidity = y["humidity"]
z = x["weather"]
api_weather_description = z[0]["description"]
temp=random.randint(-20,125)
hum=random.randint(0,100)
soilmoisture=random.randint(0,1023)#analog sensor
sm_percentage=(soilmoisture/1023)*100
sm_percentage=int(sm_percentage)
myData={'temperature':temp,
'humidity':hum,'soilmoisture':sm_percentage,'status':status,'api_temperature':
api_temperature,'api_pressure':api_pressure,'api_humidity':api_humidity,'api
_weather_description':api_weather_description}
client.publishEvent(eventId="status", msgFormat="json", data=myData,
qos=0, onPublish=None)
print("Published data Successfully: %s", myData)
client.commandCallback = myCommandCallback
time.sleep(2)
time.sleep(2)
```

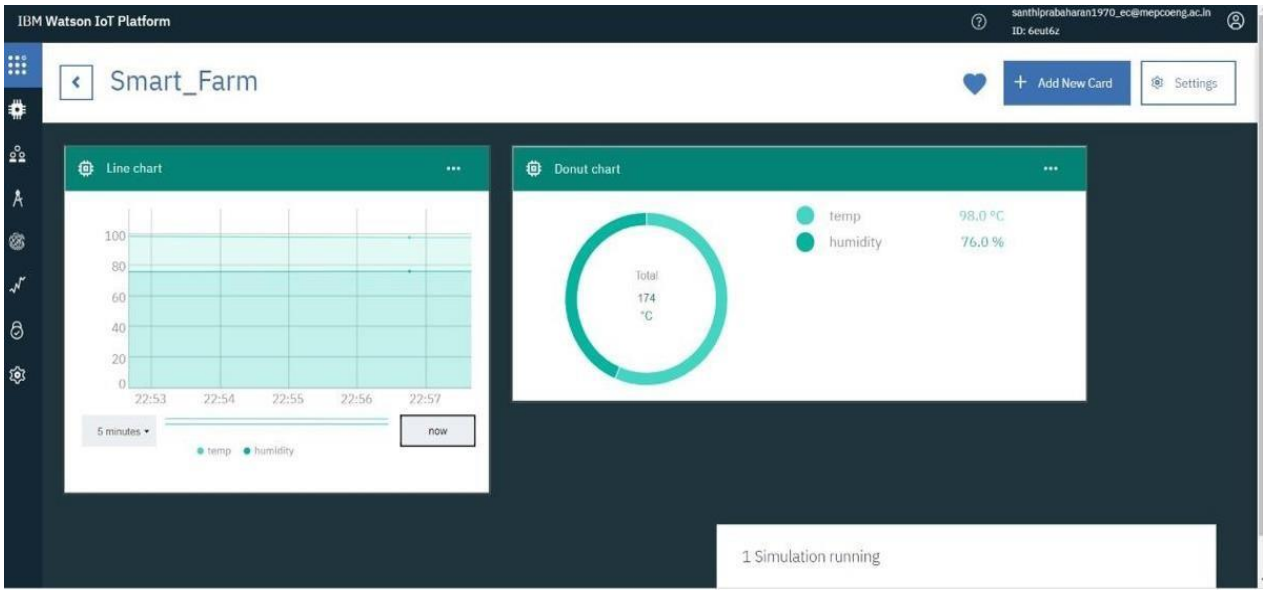
client.disconnect()

OUTPUT:

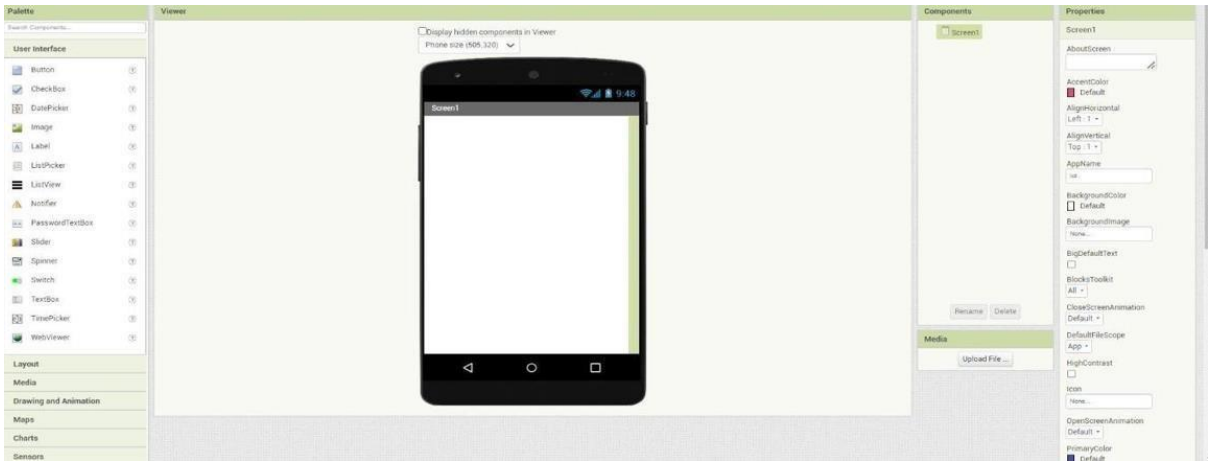
Delivery Of Sprint-2:

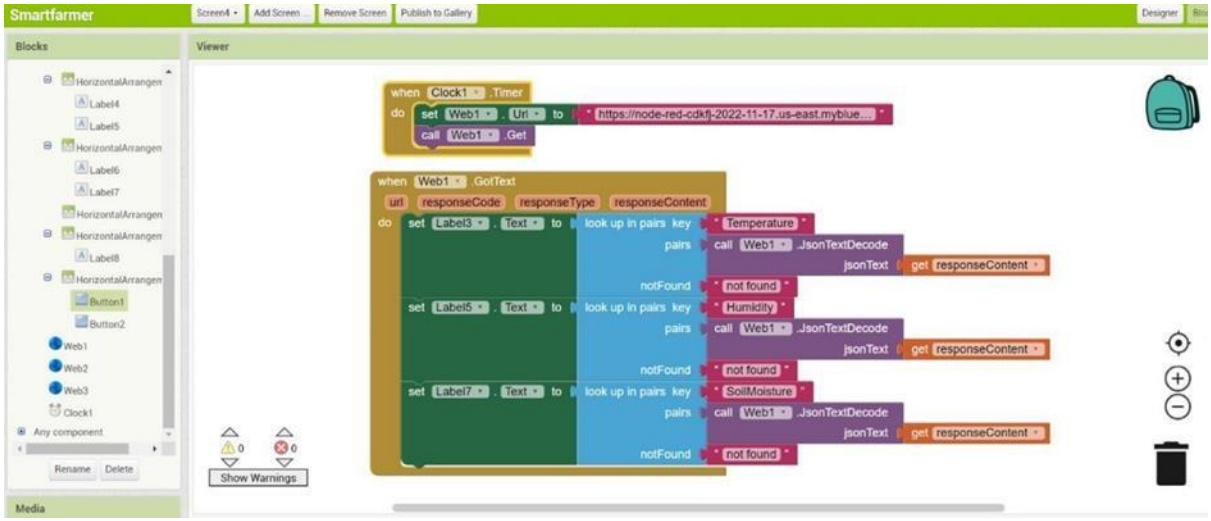


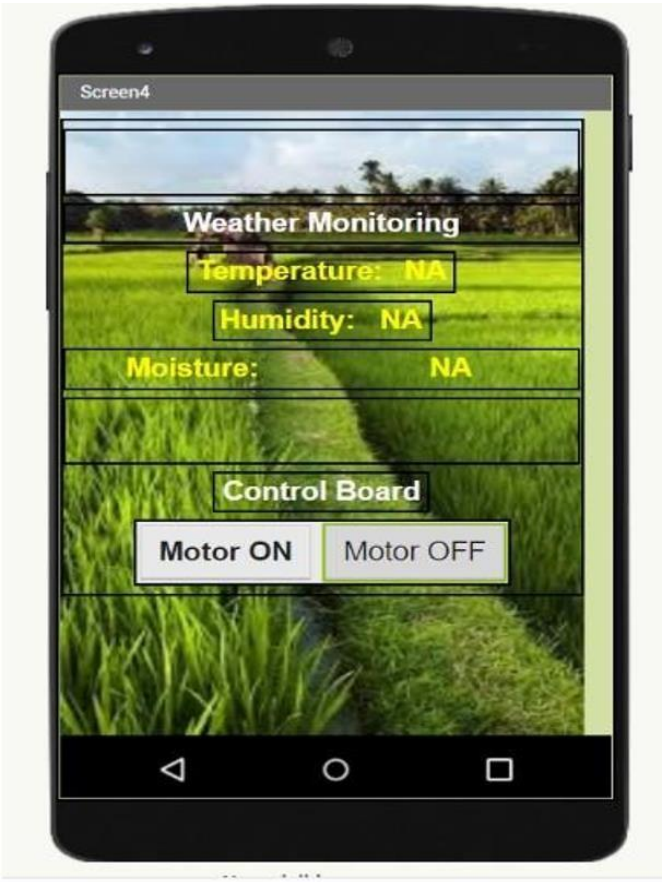



IBM Watson IoT Platform
santhiprabaharan1970_ec@mepcoeng.ac.in
ID: 6eut6z
Smart_Farm
Add New Card
Settings
Line chart
100
80
60
40
20
0
22:53
22:54
22:55
22:56
22:57
5 minutes
now
temp
humidity
Donut chart
Total
174
°C
temp
98.0 °C
humidity
76.0 %
1 Simulation running

Delivery Of Sprint-3:






Screen4
Weather Monitoring
Temperature: NA
Humidity: NA
Moisture: NA
Control Board
Motor ON
Motor OFF

Delivery Of Sprint-4: