SMARTFARMER

IOT ENABLED SMART FARMING APPLICATIONS

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1. INTRODUCTION

- **PROJECT OVERVIEW**

Smart farming is about using the new technologies which have arisen at the dawn of theFourth Industrial Revolution in the areas of agriculture and cattle production to increaseproduction quantity and quality, by making maximum use of resources and minimizing the environmental impact. IoT based Smart Farming improves the entire Agriculture system by monitoring the field in real-time. With the help of sensors and interconnectivity, the Internet of Things in Agriculture has not only saved the time of the farmers but has also reduced the extravagant use of resources such as Water and Electricity. 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. Smart farming reduces the ecological footprint of farming. Minimized or site-specific application of inputs, such as fertilizers and pesticides, in precision agriculture systems will mitigate leaching problems as well as the emission of greenhouse gases (6)."Smart farming" is an emerging concept that refers to managing farms using technologies like IoT, robotics, drones and AI to increase the quantity and quality of products while optimizing the human labor requiredby production. IoT in agriculture is designed to help farmers monitor vital information like humidity, air temperature and soil quality using remote sensors, and to improve yields, plan more efficient irrigation, and make harvest forecasts. One of the largest livelihood providers in India is Agriculture.

Agriculture plays an essential role in support in human life. The rise in population is proportional to the increase in agriculture production. Basically, Agriculture production depends upon the seasonal situations which do not have enough water sources. To get beneficial results in agriculture and to overcome the problems, IoT based smart agriculture system is employed. Global and regional scale agricultural monitoring systems aim to provide up-to-date information regarding food production. In IoT-based smart farming, a system is built for monitoring the crop field with the help of sensors like light, humidity, temperature, soil moisture, etc. The farmers can monitor the field conditions from anywhere. IoT-based smart farming is highly efficient when compared with the conventional approach.

- **PURPOSE**

By making farming more connected and intelligent, precision agriculture helps reduce overall costs and improve the quality and quantity of products, the sustainability of agriculture and the experience for the consumer. Increasing control over production leads to better cost management and waste reduction. The ability to trace anomalies in crop growth or livestock health, for instance, helps eliminate the risk of losing yields. Additionally, automation boosts efficiency. With smart devices, multiple processes can be activated at the same time, and automated services enhance product quality and volume by better controlling production processes.

Smart farming systems also enable careful management of the demand forecast and delivery of goods to market just in time to reduce waste. Precision agriculture is focused on managing the supply of land and, based on its condition, concentrating on the right growing parameters – for example, moisture, fertilizer or material content – to provide production for the right crop that is in demand. The types of precision farming systems implemented depend on the use of software for the management of the business. Control systems manage sensor input, delivering remote information for supply and decision support, in addition to the automation of machines and equipment for responding to emerging issues and production support. Smart farming and IoT- driven agriculture are laying the groundwork for a “third green revolution,” which refers to the combined application of information and communications technologies. This includes devices such as precision equipment, IoT sensors and actuators, geo- positioning systems, unmanned aerial vehicles (UAVs) and robots. IoT technology helpsbetter control agricultural processes to reduce production risks and enhances the ability to foresee production results, which helps farmers better plan and distribute product. Data about exact batches of crops and the quantity of crops to harvest can help farmers cut down on labor and waste, for example. Additionally, in a number of sectors.

Due to the recent advances in sensors for the smart farming systems for agriculture and the evolution of WSN and IoT technologies, these can be applied in the development of automatic irrigation systems. The system will determine the parameters that are monitored in irrigation systems regarding water quantity and quality, soil characteristics, weather conditions, and fertilizer usage and provide an overview of the most utilized nodes and wireless technologies employed to implement WSN and IoT based smart farming system.

2. LITERATURE SURVEY

- **EXISTING PROBLEM**

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. Even if the farmers adopt IoT technology they won't be able to take benefit of this technology due to poor communication infrastructure. Farms are located in remote areas and are far from access to the internet. A farmer needs to have access to crop data reliably at any time from any location, **so** connection issues would cause an advanced monitoring system to be useless. Equipment needed to implement IoT in agriculture is expensive. However sensors are the least expensive component, yet outfitting all of the farmers' fields to be with them would cost more than a thousand dollars. Automated machinery cost more than manually operated machinery as they include cost for farm management software and cloud access to record data. To earn higher profits, it is significant for farmers to invest in these technologies however it would be difficult for them to make the initial investment to set up IoT technology at their farms. Since IoT devices interact with older equipment they have access to the internet connection, there is no guarantee that they would be able to access drone mapping data or sensor readouts by taking benefit of public connection. An enormous amount of data is collected by IoT agricultural systems which is difficult to protect. Someone can have unauthorized access IoT providers database and could steal and manipulate the data.

- **REFERENCES**

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- **PROBLEM STATEMENT DEFINITION**

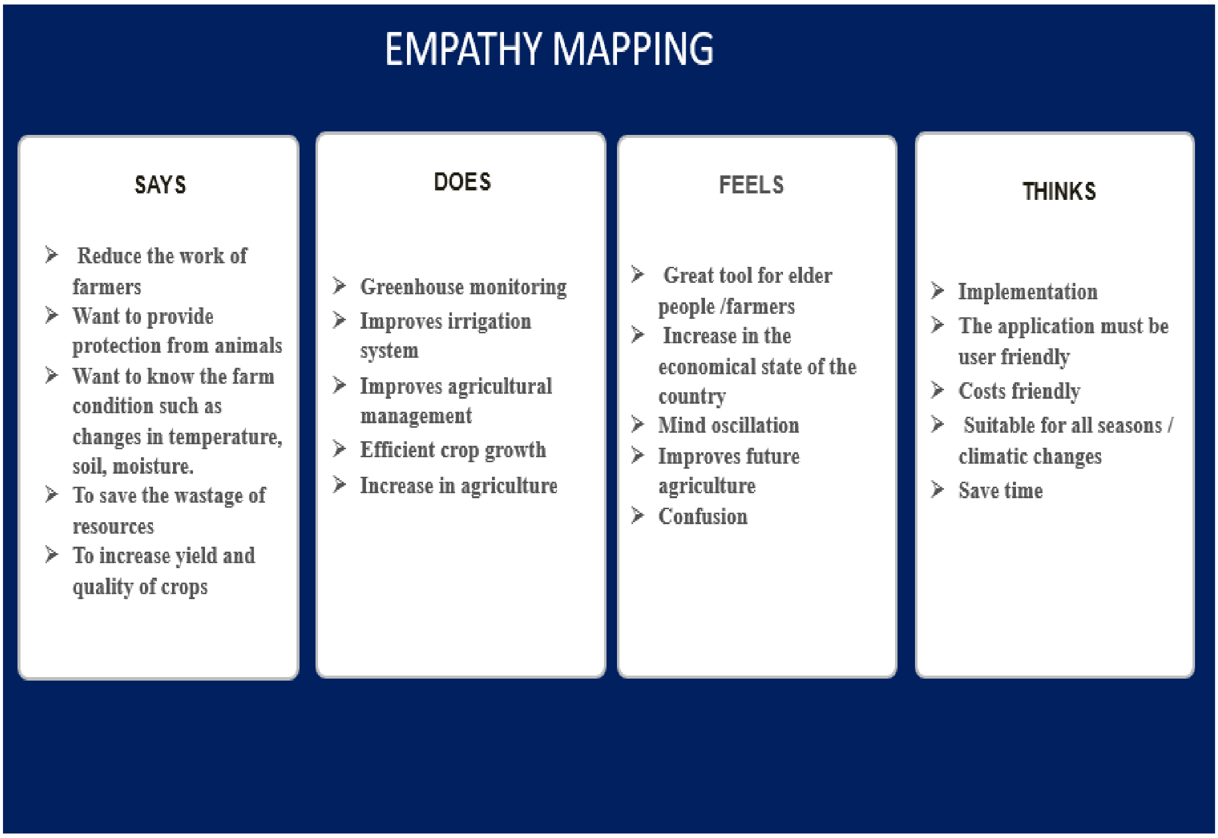
Agriculture is the Backbone of Our Country. Traditional methods that are used for irrigation. They results in a lot of wastage of water. About 85% of total available water resources across the world are solely used for the irrigation purpose. In upcoming years this demand is likely to increase because of increasing population. To meet this demand we must adopt new techniques which will conserve need of water for irrigation process.In this paper proposed system is based on IoT that uses real time input data. This Water Level Monitoring Irrigation system the excess availability of water in crop is monitored through sensors and reduces the water consumption. This idea is also to focus on parameters such as temperature and soil moisture. The main objective of this project is to control reduce the water supply, save the crops and monitor the plants. The system is implemented using an ultrasonic sensor which is connected to Arduino UNO as to monitor Farm Field level. In this system, Farm Field depth level will be sent via ArduinoEthernet Shield with an Internet connection to the IBM IoT Cloud. The IBM Cloud store the collected Farm field level data into IoT database and display the Farm Field depth level on online dashboard for real-time visualization. The IBM Event manager invoke a notification alert to the Owner of the farmer mobile phone via a SMS when thefarm field is nearly filled and It automatically Switch Off the Water Motor. Therefore, the Irrigation became more effective and systematic. To provide efficient decision web using wireless sensor network which handle different activities of farm and provides useful information associated with farm. Information associated with Soil moisture, Temperature and Humidity content. To provide efficient decision web using wireless sensor network which handle different activities of farm and provides useful information associated with farm. Information associated with Soil moisture, Temperature and Humidity content. Due to the atmospheric condition, water level increasing Farmers get lot of distractions which isn't good for Agriculture. Water level is managed by farmers in both Automatic/Manual using that mobile application. it'll make easier to farmers. Performing agriculture is incredibly much time consuming, It should utilize minimum resources in terms of hardware and value. This overcomes the manual operations required to observe and maintain the agricultural farms in both automatic and manual modes. It should be able to measure the rise or decrease in level of water yet as moisture within the soil.

3. IDEATION & PROPOSED SOLUTION

- **EMPATHY MAP CANVAS**

DEFINE PROBLEM STATEMENT

It should utilize minimum resources in terms of hardware and value. This overcomes the manual operations required to observe and maintain the agricultural farms in both automatic and manual modes. It should be ableto measure the rise or decrease in level of water yet as moisture within the soil.



- **IDEATION &BRAINSTORMING:**

BRAINSTORM:

KAVIGURU

- Using Agriculture drones
- Smart Greenhouse
- Developing an IoT based Sensor Station
- Livestock monitoring and management

MUTHU SUBATHRA

- End to end form management systems
- Sensors to track the temperature of livestock
- Analytics for smart farming
- Cattle monitoring and management

SANTHOSH

- Sensor flow weather station predicts rainfall intensity
- Monitor and control your irrigation system with a mobile app
- Monitoring of climate conditions
- Indoor vertical farming

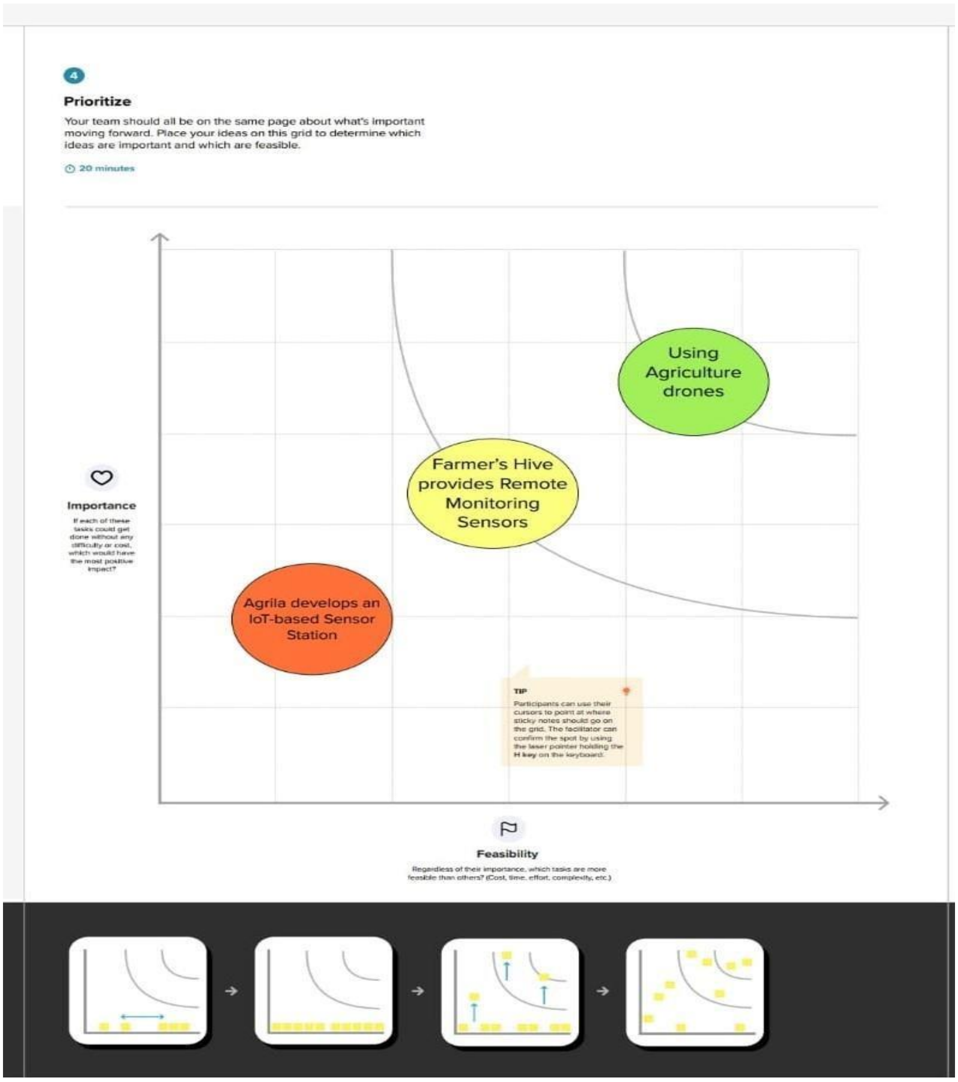
SHANKAR NARAYANAN

- Precision Agriculture
- Bee vectoring technologies
- Farmer’s Hive provide Remote Monitoring sensor

` GROUP IDEAS

- Develops an Iot based sensor Station
- Farmers Hive provides Remote monitoring sensors
- Using Agriculture Drones
- Sensor Flow Weather Station Predicts Rainfall Intensity
- Sensors to track the temperature of livestock.

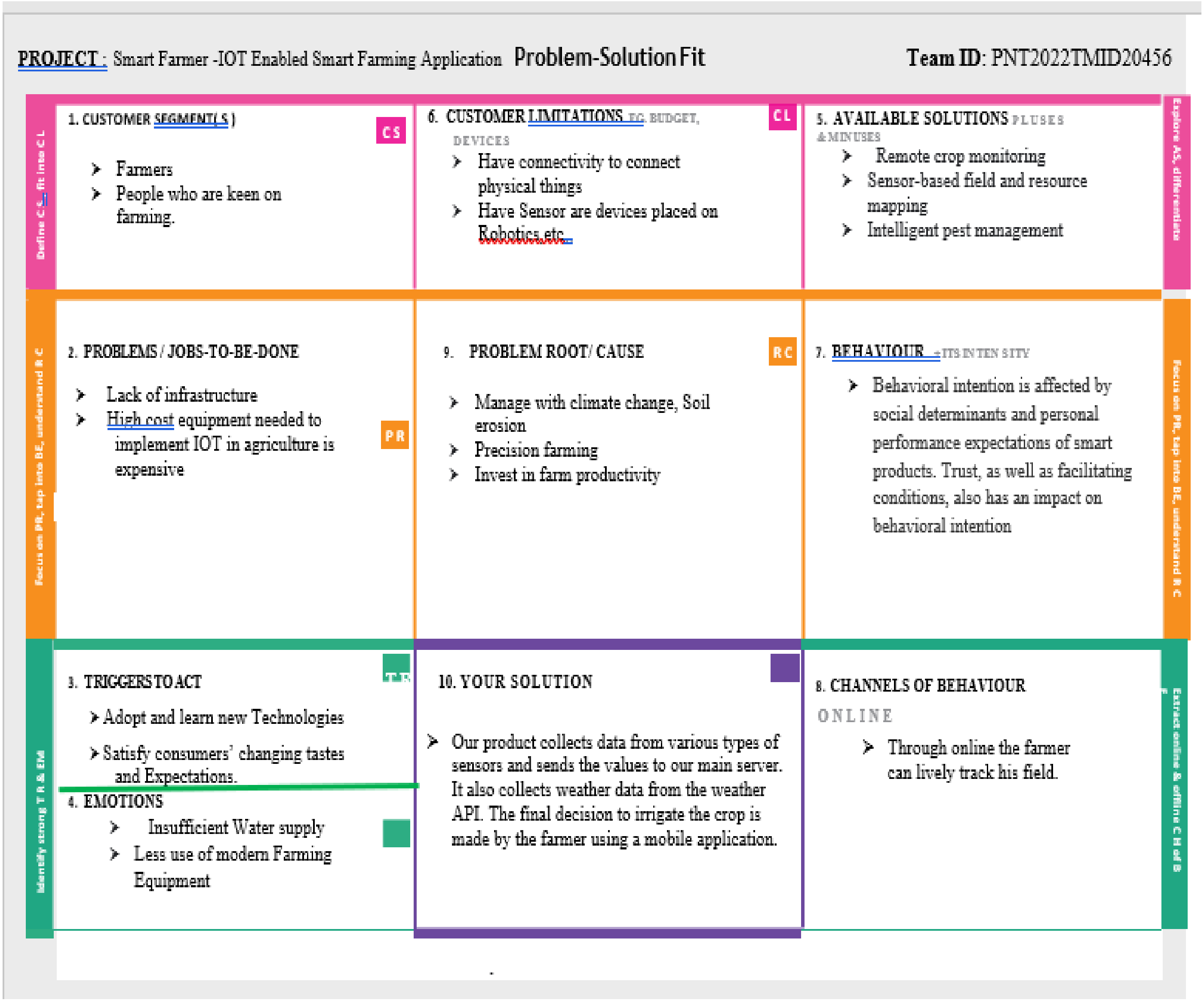
PRIORITIZE:



- **PROPOSED SOLUTION**

S.No	Parameter	Description
1.	Problem Statement	Our project will give solution to the problem statement given with an additional advantage of IoT Monitoring Facilities. Lack of Proper maintenance, correct level of watering to each and every individual crops.
2.	Idea/Solution description	The mostly used applications in the field of agriculture are drones which were used for Spraying pesticides and monitoring the field , overview of the field.
3.	Novelty/Uniqueness	Smart farming, which involves the application of sensors and automated irrigation practices, can help monitor agricultural land, temperature, soil moisture, etc. This would enable farmers to monitor crops from anywhere
4.	Social Impact / Customer Satisfaction	Reduced man power and Increased production: the optimisation of all the processes related to agriculture. By the concept of water saving with the use of weather forecasts and sensors that measure soil moisture helps to watering only when the water is needed to maintain the moisture level .
5.	Business Model(Revenue Model)	Smart Farming agriculture model is a pathway towards development and food security mainly focusing on increase in efficiency and incomes, enhancing resilience of livelihoods and ecosystems and also helps in reducing the wastages and natural resources
6.	Scalability of the Solution	Smart Farming Agriculture systems uses latest technology to increase the quality and quantity of agricultural products with tracking and Geo fencing of stocks , Smart Monitoring management and Remote controlling systems.

- **PROBLEM SOLUTION FIT:**



4. REQUIREMENT ANALYSIS

- **FUNCTIONAL REQUIREMENT**

Following are the functional requirements of the proposed solution.

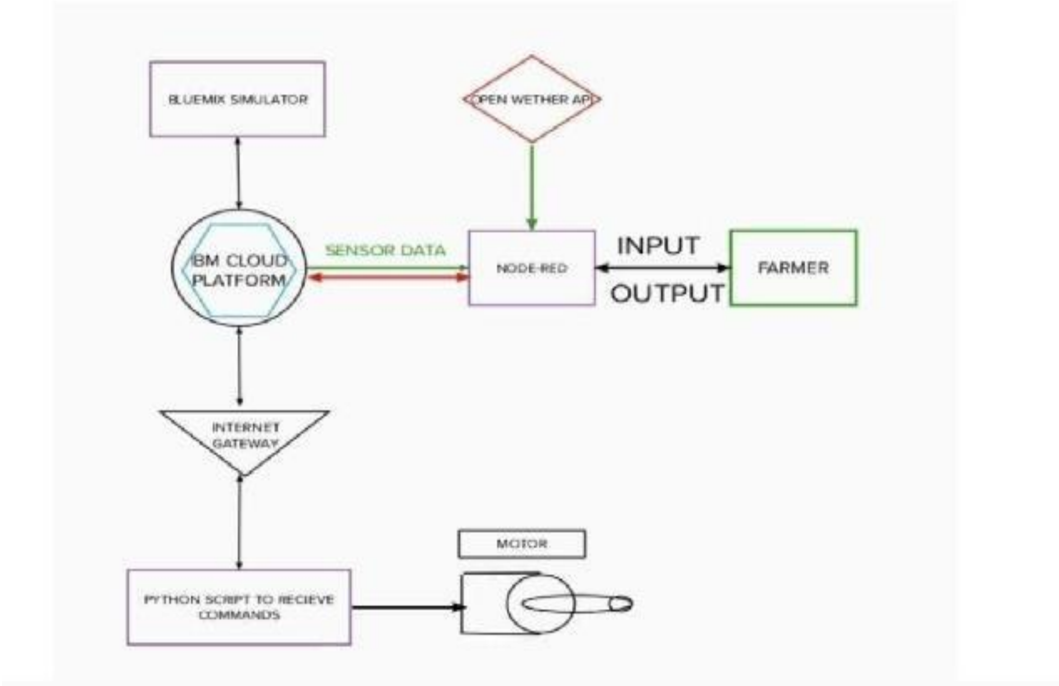
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Log in to system	Check Credentials Check Roles of Access.
FR-4	Manage Modules	Manage System Admins Manage Roles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

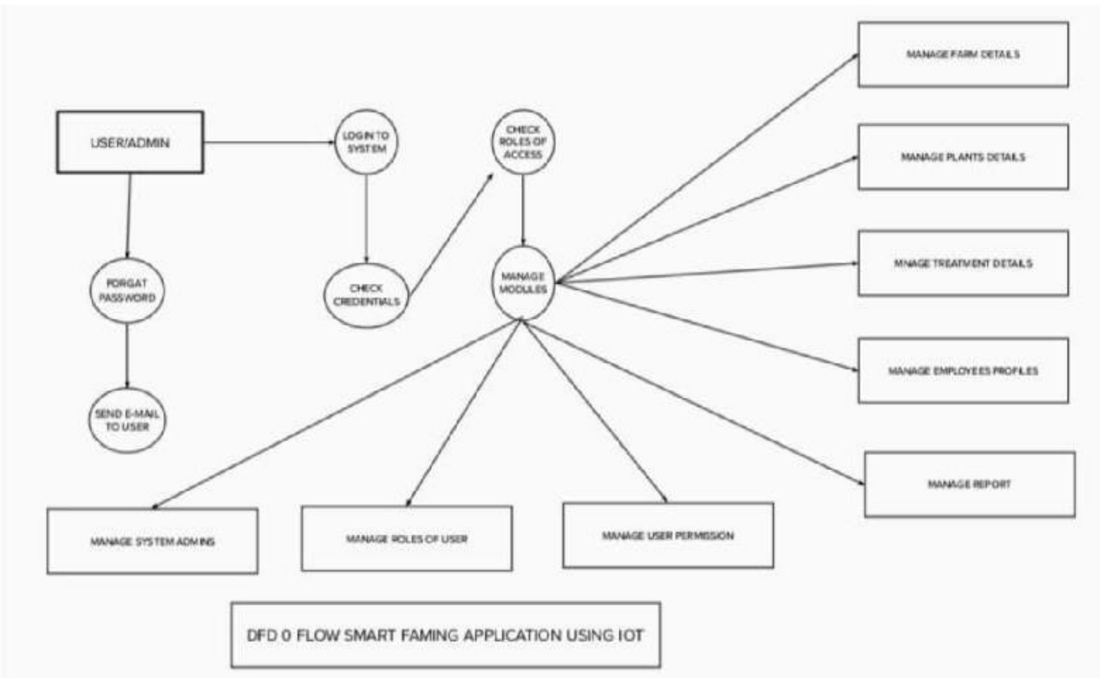
- **NON-FUNCTIONAL REQUIREMENT**

FR NO	**NON-FUNCTIONAL REQUIREMENT**	**DESCRIPTION**
NFR-1	Usability	Usability includes easy learn ability,efficiency in use,remember ability, lack of errors in operation and subjective pleasure.
NFR-2	Security	Sensitive and private data must beprotected fromtheir production until the decision-making and storage stages.
NFR-3	Reliability	The shared protection achieves a better trade-off between costs and reliability.The model uses dedicated and shared protectionschemes to avoid farm service outages.
NFR-4	Performance	The idea of implementing integrated sensors with sensing soil and environmental or ambientparameters in farming will be more efficient for overall monitoring.
NFR-5	Availability	Automatic adjustment of farming equipment made possible by linking information like crops/weather and equipment toauto-adjust temperature, humidity, etc.
NFR-6	Scalability	Scalability is a major concern for IoT platforms. It has shown that different architectural choices of IoT platforms affect system scalability and that automatic real time decision-making is feasible inan environment composed of dozens of thousand.

5. PROJECT DESIGN:

- **DATA FLOW DIAGRAM:**





- **USER STORIES:**

USER TYPE	**FUNCTIONAL REQUIREMENT**	**USER STORY NUMBER**	**USER STORY,TASK**	**ACCEPTANCE CRITERIA**	**Priority**
Customer (Mobile user) and (Web user)	Registration	USN-1	As a user, I can register my account by entering my email, password, and confirming my password.	I can access myaccount / dashboard	High
		USN-2	As a user, I willreceive confirmation emailonce I have registered myself	I can receive confirmation email & click confirm	High
		USN-3	As a user, I can register for the application through apple facebook	I can register & access the dashboard withfacebook	low
		USN-4	As a user, I can log into the application byentering user id & password		Medium
	Login	USN 5	As a user,I can log into the application by entering email andpassword		High

Customer Care Executive	Login		As I enter I canview the workingof the applicationand scan for any glitchesand monitor the operation and check if all the users are authorized.	I can login onlywith my provided credenti als	High
Administrator	Login		Maintaining and making sure the databasecontai ning the locations are secure and accurate	I can login onlywith my provided credenti als	High

6. PROJECT PLANNING & SCHEDULING

- **SPRINT PLANNING &ESTIMATION:**

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 Gmail, email then you can received the OTP or Verification Code.	2	High	Kaviguru M Muthu subathra L Santhosh M Shankarnarayanan M
Sprint-1		USN-2	As a user, I will receive confirmation Gmail or email once I have registered for the application.	1	High	Kaviguru M Muthu subathra L Santhosh M Shankarnarayanan M
Sprint-2		USN-3	As a user, I can register for the application through Gmail and phone number.	2	Low	Kaviguru M Muthu subathra L Santhosh M Shankarnarayanan M
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	Kaviguru M Muthu subathra L Santhosh M Shankarnarayanan M
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	Kaviguru M Muthu subathra L Santhosh M Shankarnarayanan M

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint 3	Dashboard	USN-6	Once confirmation message received after login the system and Check Credentials Once check the credentials after go to the Manage modules.	2	High	Kaviguru M Muthu subathra L Santhosh M Shankarnarayanan M
		USN-7	In this manage modules described the below functions like Manage System Admins Manage Roles of User Manage User permission and etc..	2	Medium	Kaviguru M Muthu subathra L Santhosh M Shankarnarayanan M
Sprint 4	Logout	USN-8	Then check Temperature, humidity and moisture after then logout or exist the application.	1	Medium	Kaviguru M Muthu subathra L Santhosh M Shankarnarayanan M

SPRINT DELIVERY SCHEDULE:

SPRINT	TOTAL STORY POINT	DURATION	SPRINT START DATE	SPRINT END DATE
Sprint-1	20	6 days	24 Oct 2022	29 Oct 2022
Sprint-2	20	6 days	05 Nov 2022	10 Nov 2022
Sprint-3	20	9 days	06 Nov 2022	14 Nov 2022
Sprint-4	20	9 days	06 Nov 2022	14 Nov 2022

7. **TESTING**

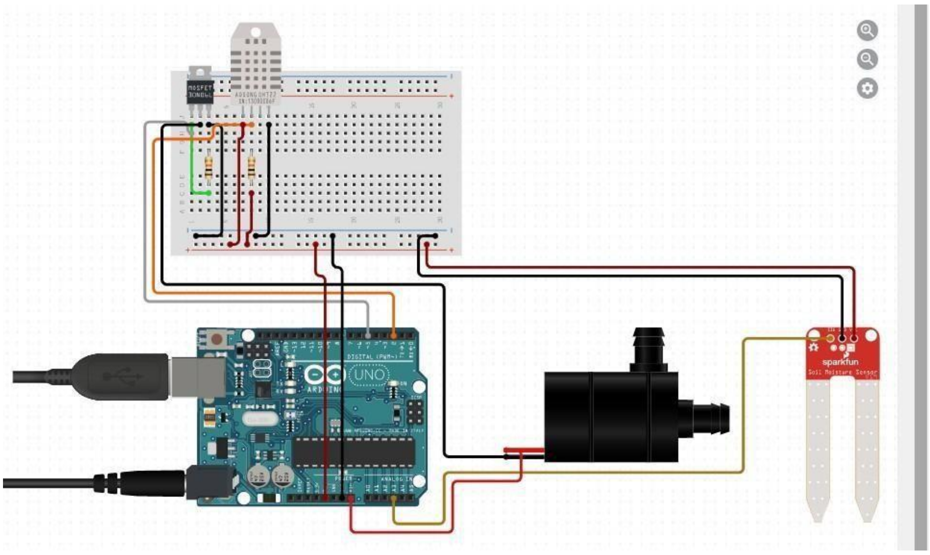
- **SPRINT 1**

Connecting Sensors with Arduino

```
#include "Arduino.h" #include
"dht.h" #include "SoilMoisture.h"
#define dht_apin A0

const int sensor_pin = A1; //soil moisture int pin_out = 9;dht DHT;
int c=0; void setup()
{
pinMode(2, INPUT); //Pin 2 as INPUT pinMode(3, OUTPUT); //PIN
3 as OUTPUT pinMode(9, OUTPUT);//output for pump
}
void loop()

{
  if (digitalRead(2) == HIGH)
  {
  digitalWrite(3, HIGH);            // turn the LED/Buzz ON delay(10000);
   // wait for 100 msecond digitalWrite(3, LOW); // turn theLED/Buzz OFF
  delay(100);
  }
   Serial.begin(9600);delay(1000);
    DHT.read11(dht_apin);          //temperature    Float
  h=DHT.humidity;
```

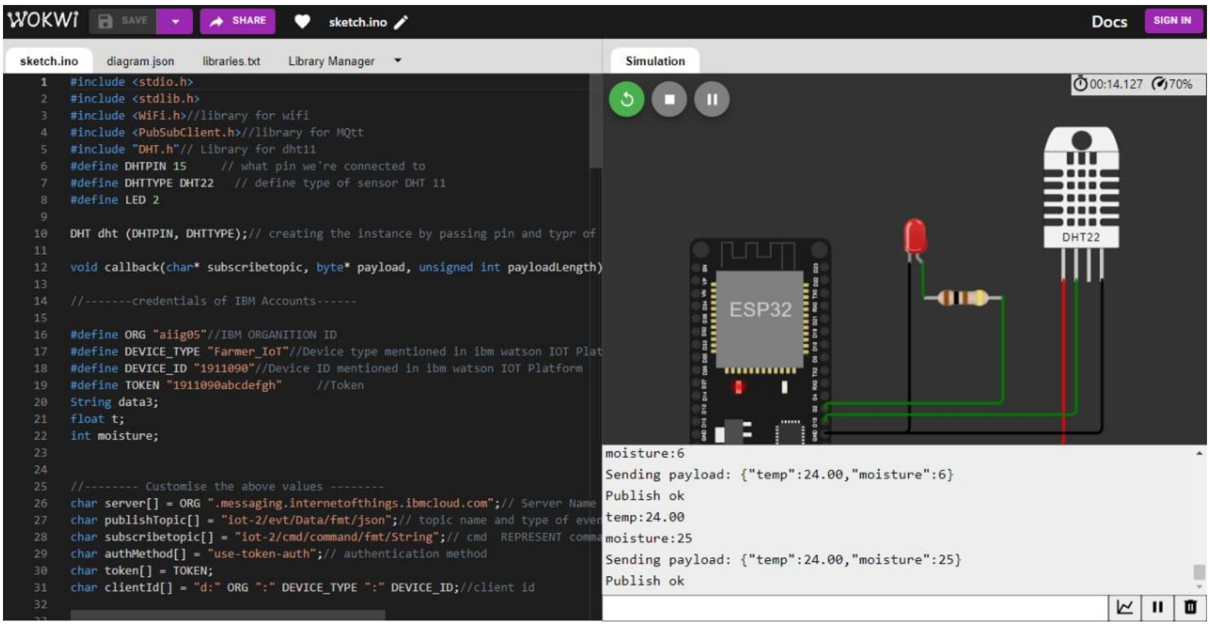
```
Float t=DHT.temperature; delay(5000);

Serial.begin(9600);

float moisture_percentage;

    int sensor_analog;

sensor_analog=analogRead

(sensor_pn);

moisture_percentage = ( 100 - ( (sensor_analog/1023.00) * 100 ) );

float m=moisture_percentage; delay(1000); if(m<40)//pump

{ while(m<40)

{
digitalWrite(pin_out,HIGH);

//open pump sensor_analog =analogRead(sensor_pin);

moisture_percentage = ( 100 - ( (sensor_analog/1023.00) * 100 )

);

 m=moisture_percentage; delay(1000);

}

digitalWrite(pin_out,LOW);                    //closepump

} if(c>=0)

{

mySerial.begin(9600);                     delay(15000);

Serial.begin(9600); delay(1000);

Serial.print("\r"); delay(1000);


Serial.print((String)"update-
>"+(String)"Temprature="+t+(String)"Humidity="+h+(String
)"Moisture="+m); delay(1000);

    }

}
```

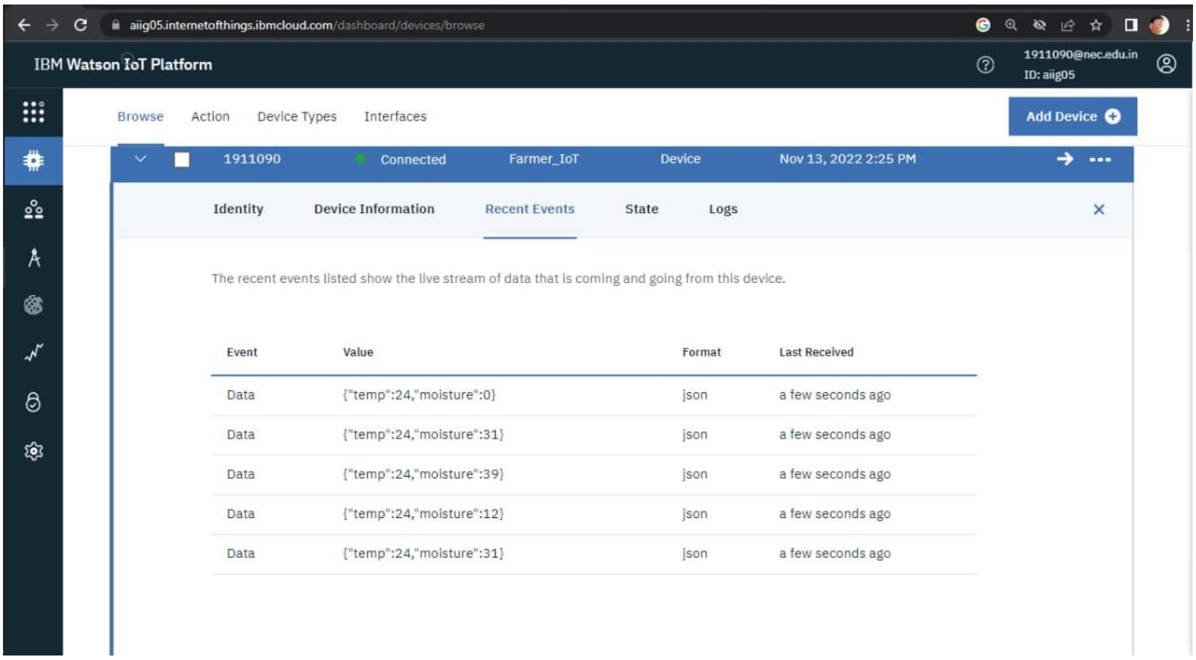
CIRCUIT DIAGRAM

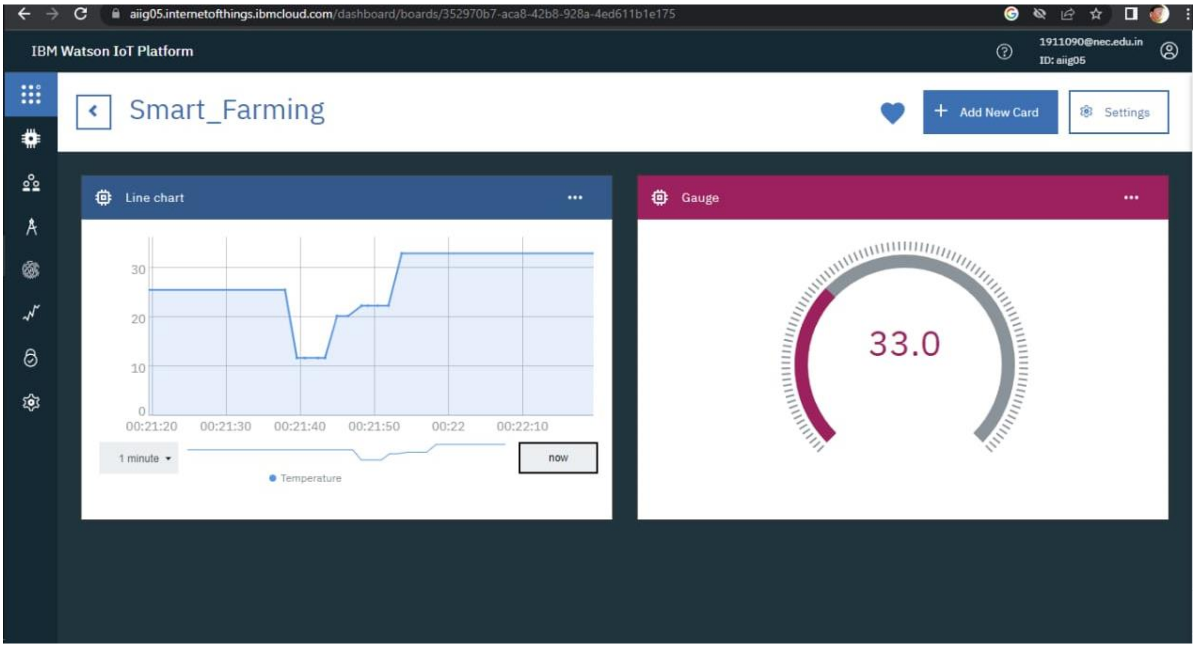


- **SPRINT 2**

Simulation of sensors on IBM Watson IOT platform







CODE

```
#include <stdio.h>
#include <stdlib.h>
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include "DHT.h"// Library for dht11
#define DHTPIN 15     // what pin we're connected to
#define DHTTYPE DHT22   // define type of sensor DHT 11
#define LED 2
```

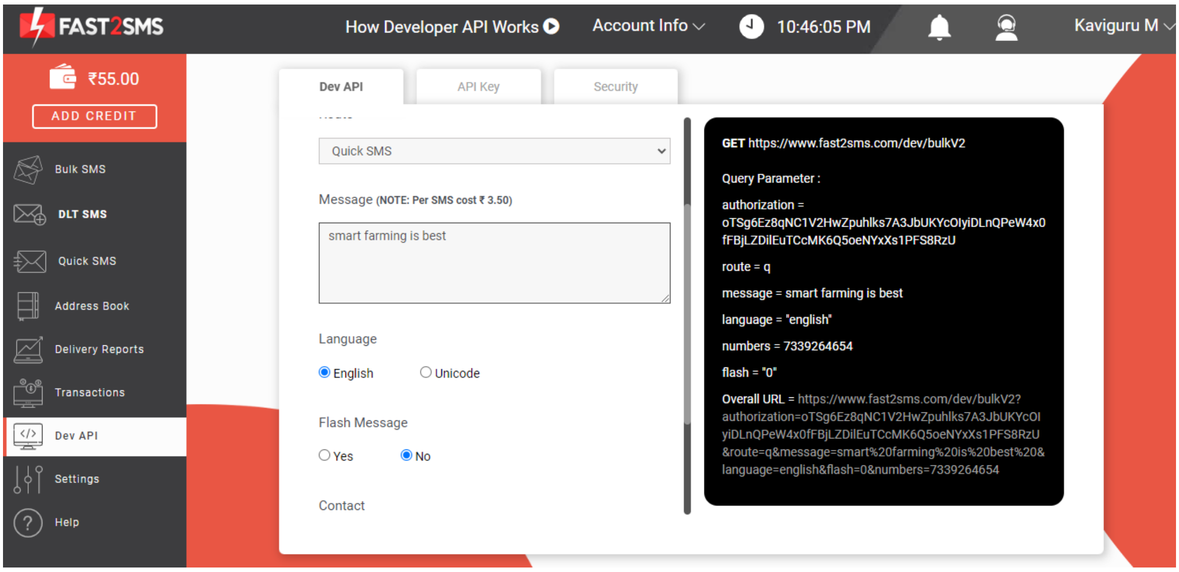
```
DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of dht connected
void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);
//-------credentials of IBM Accounts------
#define ORG "aiig05"//IBM ORGANITION ID
#define DEVICE_TYPE "Farmer_IoT"//Device type mentioned in ibm watson IOT Platform
#define DEVICE_ID "1911090"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "1911090abcdefgh"     //Token
String data3;
float t;
int moisture;
//-------- Customise the above values --------
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";// Server Name
char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type of event perform and format in which data to be send
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd  REPRESENT command type AND COMMAND IS TEST OF FORMAT STRING
char authMethod[] = "use-token-auth";// authentication method
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id
//-----------------------------------------
WiFiClient wifiClient; // creating the instance for wificlient
PubSubClient client(server, 1883, callback ,wifiClient); //calling the predefined client id by passing parameter like server id,portand wificredential
void setup()// configureing the ESP32
{
  Serial.begin(115200);
  dht.begin();
  pinMode(LED,OUTPUT);
  delay(10);
  Serial.println();
  wificonnect();
	mqttconnect();
}
void loop()// Recursive Function
{
  moisture = random(0,50);
  t = dht.readTemperature();
  Serial.print("temp:");
  Serial.println(t);
  Serial.print("moisture:");
  Serial.println(moisture);
  PublishData(t, moisture);
  delay(1000);
  if (!client.loop()) {
```

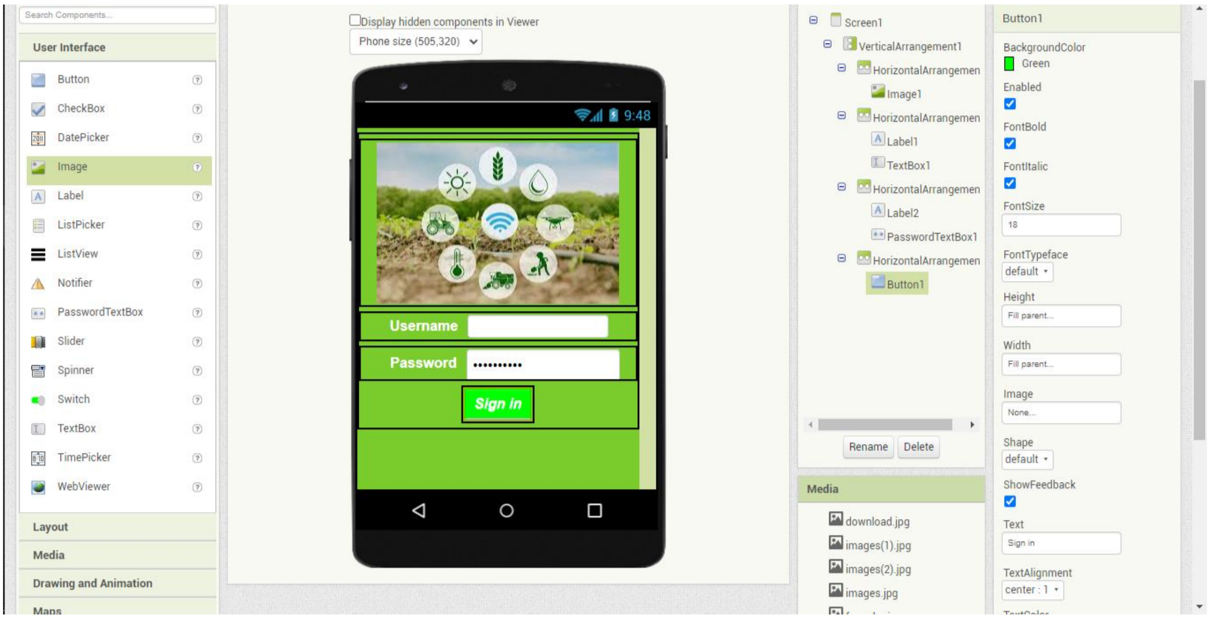
```
    mqttconnect();
  }
}
/....................................retrieving to Cloud.............................../
void PublishData(float temp, int moisture) {
  mqttconnect();//function call for connecting to ibm
  /*
     creating the String in in form JSon to update the data to ibm cloud
  */
  String payload = "{\"temp\":";
  payload += temp;
  payload += "," "\"moisture\":";
  payload += moisture;
  payload += "}";
  Serial.print("Sending payload: ");
  Serial.println(payload);
  if (client.publish(publishTopic, (char*) payload.c_str())) {
    Serial.println("Publish ok");// if it sucessfully upload data on the cloud then it will print
publish ok in Serial monitor or else it will print publish failed
  } else {
    Serial.println("Publish failed");
  }
}
void mqttconnect() {
  if (!client.connected()) {
    Serial.print("Reconnecting client to ");
    Serial.println(server);
    while (!!!client.connect(clientId, authMethod, token)) {
      Serial.print(".");
      delay(500);
    }
      initManagedDevice();
     Serial.println();
  }
}
void wificonnect() //function defination for wificonnect
{
  Serial.println();
  Serial.print("Connecting to ");

  WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to establish the
connection
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
```

```
  Serial.println("");
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
}

void initManagedDevice() {
  if (client.subscribe(subscribetopic)) {
    Serial.println((subscribetopic));
    Serial.println("subscribe to cmd OK");
  } else {
    Serial.println("subscribe to cmd FAILED");
  }
}

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength)
{
  Serial.print("callback invoked for topic: ");
  Serial.println(subscribetopic);
  for (int i = 0; i < payloadLength; i++) {
    //Serial.print((char)payload[i]);
    data3 += (char)payload[i];
  }
  Serial.println("data: "+ data3);
  if(data3=="lighton")
  {
Serial.println(data3);
digitalWrite(LED,HIGH);
  }
  else
  {
Serial.println(data3);
digitalWrite(LED,LOW);
  }
data3="";
}
```

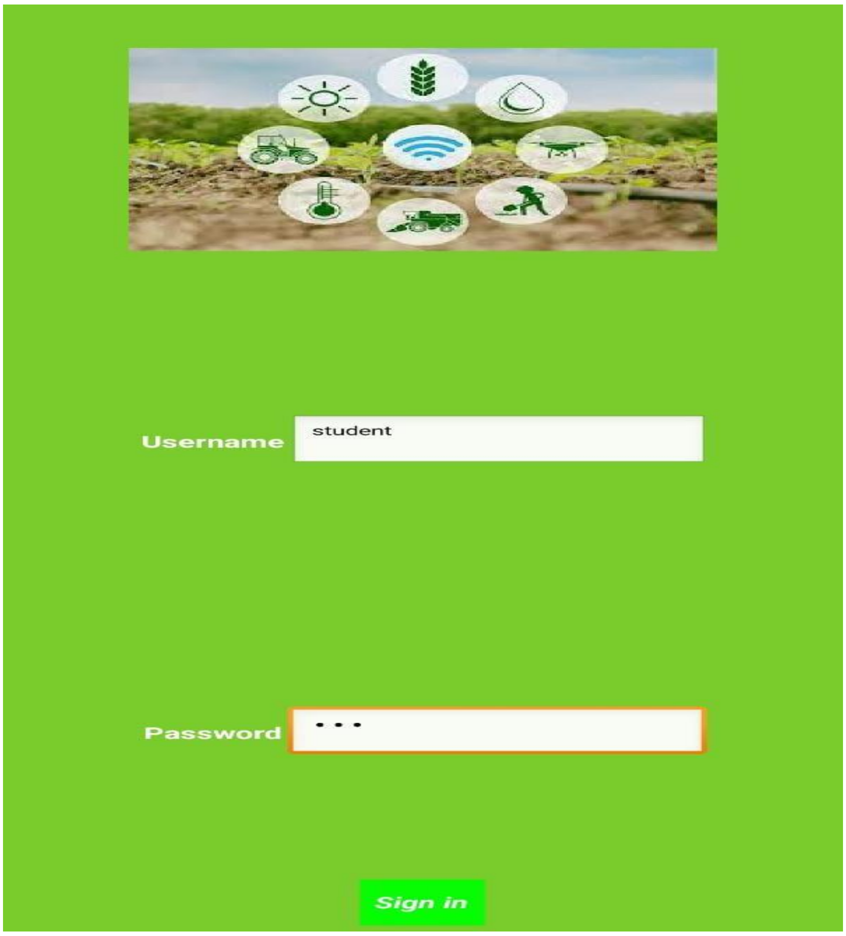
- **SPRINT-3**

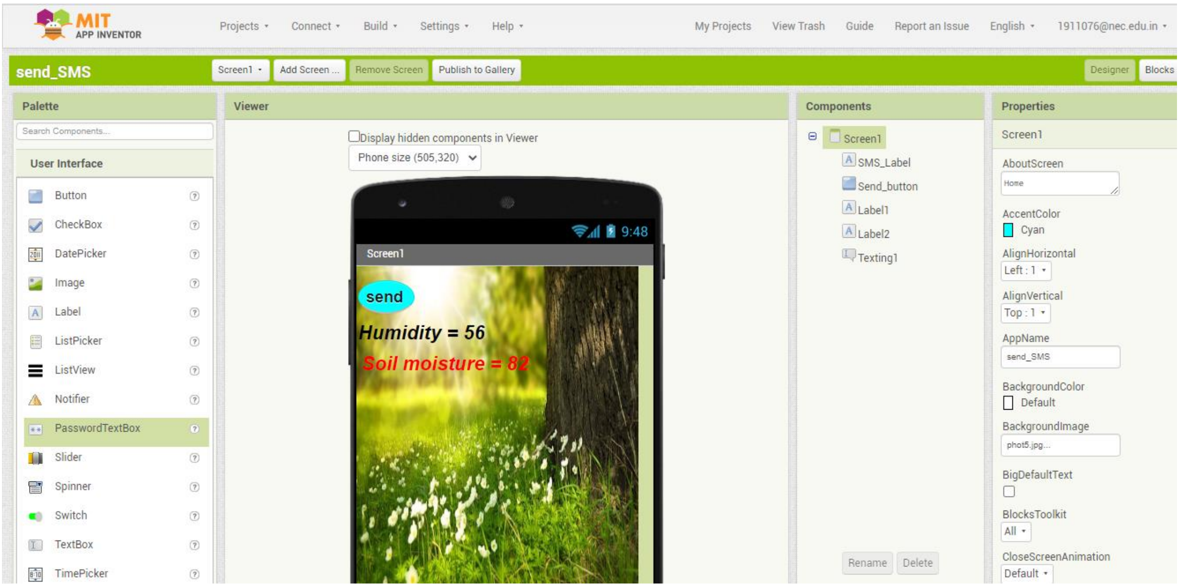
Configuration of Fast2SMS and MIT APP invertor






MIT APP INVENTOR
Projects
Connect
Build
Settings
Help
My Projects
View Trash
Guide
Report an Issue
English
skvasan29@gmail.com
IBM
Screen1
Add Screen ...
Remove Screen
Publish to Gallery
Designer
Blocks
Blocks
Viewer
Built-in
Control
Logic
Math
Text
Lists
Dictionaries
Colors
Variables
Procedures
Screen1
VerticalArrangement1
HorizontalArrangen
Image1
HorizontalArrangen
Label1
TextBox1
when Button1 .Click
do if
TextBox1 . Text = " student "
and
PasswordTextBox1 . Text = " 123 "
then open another screen screenName Screen2
else close screen with plain text text " Invalid Credentials "
Show Warnings

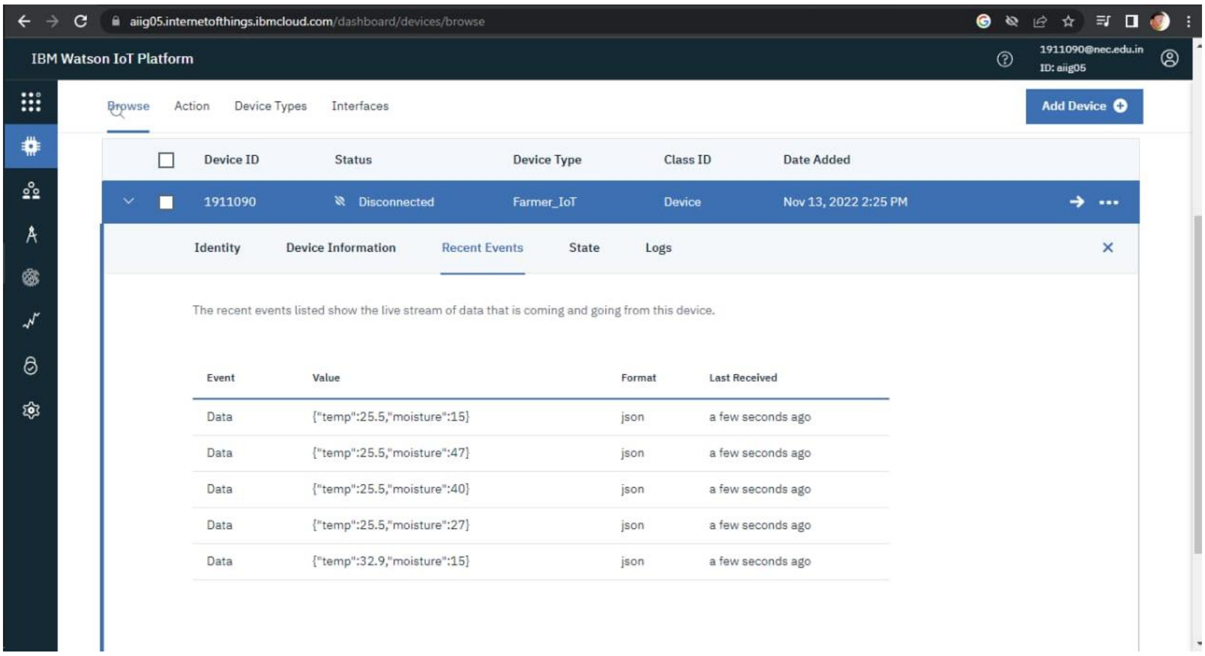

Username
student
Password
Sign in

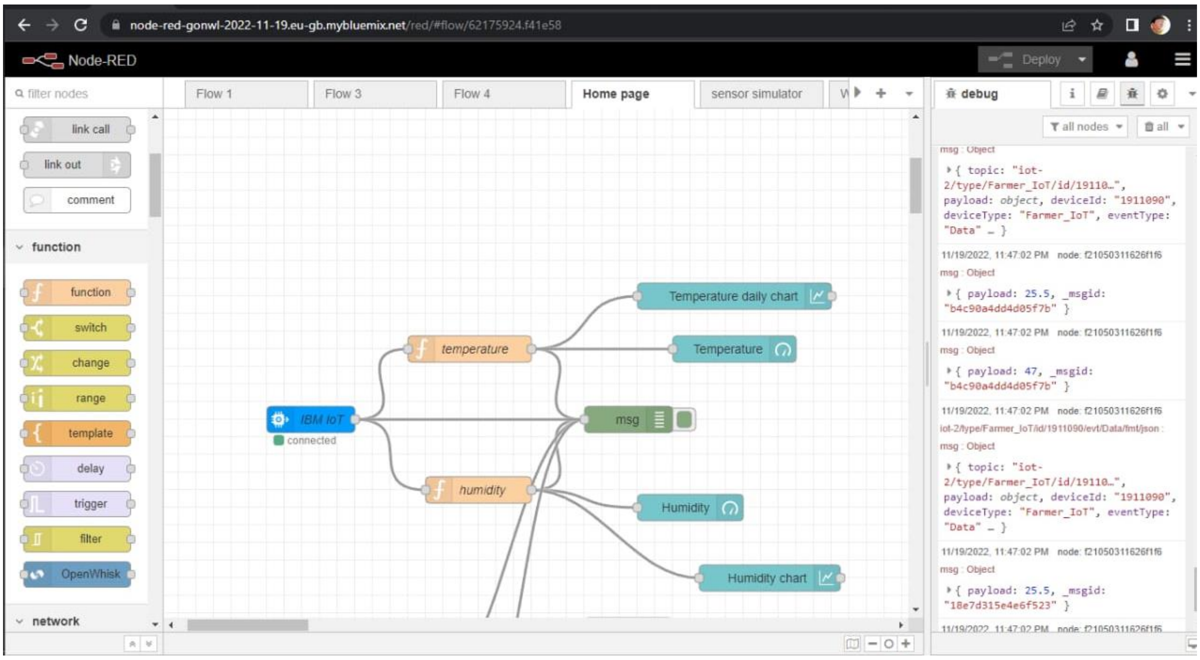

MIT APP INVENTOR
Projects
Connect
Build
Settings
Help
My Projects
View Trash
Guide
Report an Issue
English
send_SMS
Screen1
Add Screen ...
Remove Screen
Publish to Gallery
Designer
Blocks
Palette
User Interface
Button
CheckBox
DatePicker
Image
Label
ListPicker
ListView
Notifier
PasswordTextBox
Slider
Spinner
Switch
TextBox
TimePicker
Viewer
Display hidden components in Viewer
Phone size (505,320)
send
Humidity = 56
Soil moisture = 82
Components
Screen1
SMS_Label
Send_button
Label1
Label2
Texting1
Rename
Delete
Properties
AboutScreen
AccentColor
Cyan
AlignHorizontal
Left : 1
AlignVertical
Top : 1
AppName
send_SMS
BackgroundColor
Default
BackgroundImage
BigDefaultText
BlocksToolkit
All
CloseScreenAnimation
Default

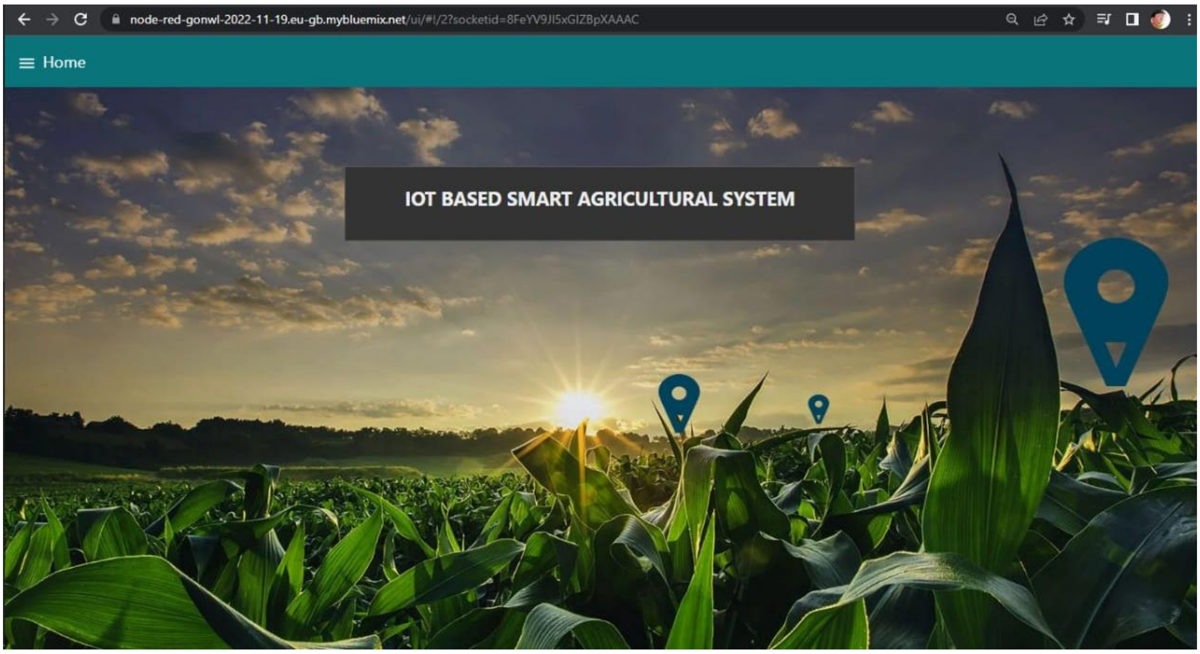

10:27
Screen1
send
Humidity = 56
Soil moisture = 82

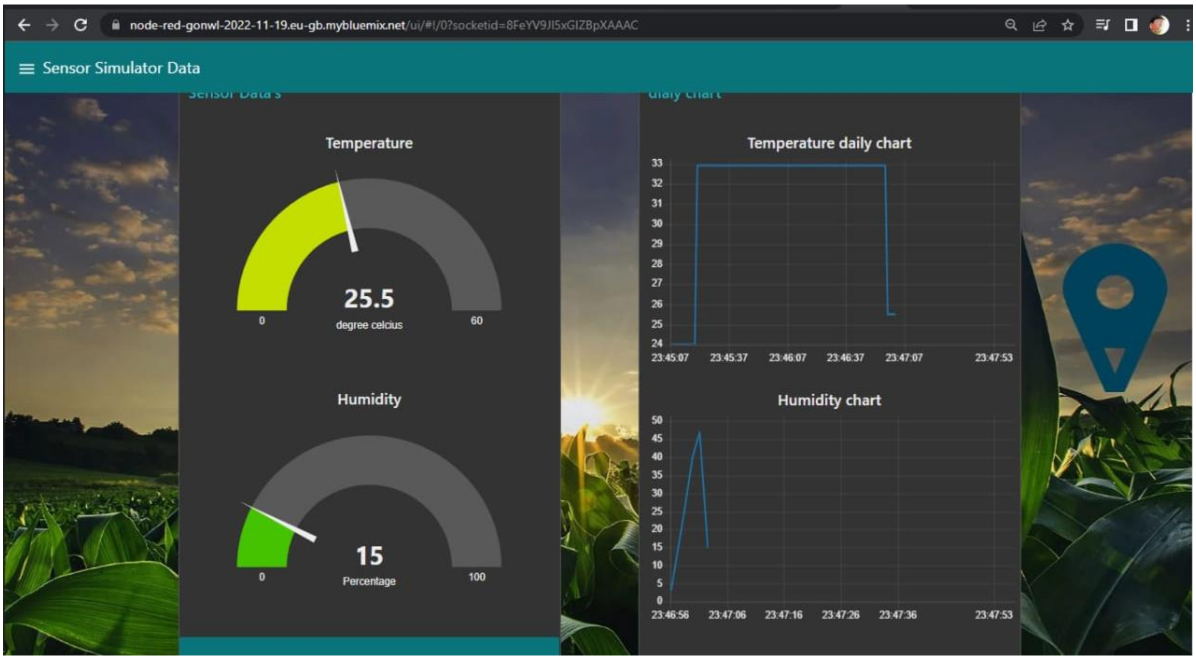
- **SPRINT-4**

Simulation on Node-Red with IOT Watson platform






node-red-gonwl-2022-11-19.eu-gb.mybluemix.net/ui/#!/2?socketid=8FeYV9JI5xGIZBpXAAAC
Home
IOT BASED SMART AGRICULTURAL SYSTEM


node-red-gonwl-2022-11-19.eu-gb.mybluemix.net/ui/#!/0?socketid=8FeYV9JI5xGIZBpXAAAC
Sensor Simulator Data
Temperature
25.5
degree celcius
0
60
Humidity
15
Percentage
0
100
Temperature daily chart
Humidity chart

8. RESULTS

- **PERFORMANCE METRICS:**

By making farming more connected and intelligent, precision agriculture helps reduce overall costs and improve the quality and quantity of products, the sustainability of agriculture and the experience for the consumer. Increasing control over production leads to better cost management and waste reduction. The ability to trace anomalies in crop growth or livestock health, for instance, helps eliminate the risk of losing yields. Additionally, automation boosts efficiency. With smart devices, multiple processes can be activated at the same time, and automated services enhance product quality and volume by better controlling production processes.

Smart farming systems also enable careful management of the demand forecast and delivery of goods to market just in time to reduce waste. Precision agriculture is focused on managing the supply of land and, based on its condition, concentrating on the right growing parameters – for example, moisture, fertilizer or material content – to provide production for the right crop that is in demand. The types of precision farming systems implemented depend on the use of software for the management of the business. Control systems manage sensor input, delivering remote information for supply and decision support, in addition to the automation of machines and equipment for responding to emerging issues and production support.

9. ADVANTAGES:

1. **Increase productivity:** The use of Smart Agriculture helps in producing moreand better quality nutritious food and helps in increasing the income and employment rate by 60 percent for those who live in rural areas and are completely dependent on agriculture for their livelihood.
2. **Reduce harmful emissions:** Smart agriculture helps in reducing the impacts ofharmful gases, avoids deforestation, and absorbs carbon dioxide from the atmosphere.

3. **Sensors:** Various sensors involved in the system helps in monitoring the soilmoisture, soil temperature, solar radiation, atmospheric pressure, air temperature, air humidity, soil oxygen level, soil water potential, luminosity,etc.

4. More benefits of using smart agriculture are **Fast response, User-friendly,Efficient, Low-cost design, etc.**

DISADVANTAGES:

1. These days the topic of the Internet of Things is a trending one. But many are not familiar with this concept.
2. Internet of things is basically the internet connection between things, people, process, animals, surrounding etc. in a virtual way.
3. In the concept of the Internet of Things, almost everything in our surroundings will be able to communicate with one another without the help of humans.
4. This concept will be highly beneficial in various sectors. But like any other technology, this concept has its own challenges.
5. It also has some issues which have to be tracked properly in order to attain the full benefit of it.
6. Some disadvantages of using this modern technology in the field of agriculture are listed below.

10. CONCLUSION:

IoT based SMART FARMING SYSTEM for Live Monitoring of Temperature and Soil Moisture has been proposed using Arduino and Cloud Computing . The System has high efficiency and accuracy in fetching the live data of temperature and soil moisture. The IoT based smart farming System being proposed via this report will assist farmers in increasing the agriculture yield and take efficient care of food production as the System will always provide helping hand to farmers for getting accurate live feed of environmental temperature and soil moisture with more than 99% accurate results. IoT will help to enhance smart farming. Using IoT the system can predict the soil moisture level and humidity so that the irrigation system can be monitored and controlled.

IoT works in different domains of farming to improve time efficiency, water management, crop monitoring, soil management and control of insecticides and pesticides. This system also minimizes human efforts, simplifies techniques of farming and helps to gain smart farming. Besides the advantages provided by this system, smart farming can also help to grow the market for farmer with single touch and minimum effect.

11. FUTURE SCOPE:

Fetch more data especially with regard to Pest Control and by also integrating GPS module in this system to enhance this Agriculture IoT Technology to full-fledged Agriculture Precision ready product. IoT will help to enhance smart farming. Using IoT the system can predict the soil moisture level and humidity so that the irrigation system can be monitored and controlled.

The project has vast scope in developing the system and making it more user friendly and the additional features of the system like:

1) By installing a webcam in the system, photos of the crops can be captured and the data can be sent to database.

2) Speech based option can be implemented in the system for the people who are less literate.

3) GPS (Global Positioning System) can be integrated to provide specific location of the farmer and more accurate weather reports of agriculture field and garden.

Regional language feature can be implemented to make it easy for the farmers who are aware of only their regional