Smart Farmer - IoT Enabled Smart Farming Application

(TEAM ID: PNT2022TMID52627)

PROJECT REPORT

Submitted by

DAARANI S(1905071)
DINESHKUMAR S(1905077)
HITHESH R(1905085)
PRAVEENA P(1905105)

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COIMBATORE-641 014

ANNA UNIVERSITY - CHENNAI 600 025

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1.INTRODUCTION

1.1 PROJECT OVERVIEW

Agriculture is done manually from ages.As the world is trending into new technologies and implementations it is a necessary to trend up with agriculture also. Migration of people from rural to urban is a hindrance in agriculture. So to overcome this problem we have proposed an IOT and smart agriculture system. 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. It keeps various factors like humidity, temperature, soil etc. under check and gives a crystal clear real-time observation.

Smart agriculture is taking over farms of all sizes by rapid speed. It is becoming a part of a movement that is known as the third green revolution. It involves the use of modern IOT devices such as security cameras, sensors, drones and actuators to manage agricultural yields. Smart agriculture has increased in profitability by providing help to both farmers and consumers.

1.2 PURPOSE

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.Also it enables farmers to reduce waste and enhance productivity ranging from the quantity of fertilizer utilized to the amount of water used for irrigating a field. It further ensures that the farm produce is transported in the most optimal and transparent manner.

2.LITERATURE SURVEY

2.1 EXISTING PROBLEM:

- The most common challenge for the Internet of Things in agriculture is connectivity. Every area doesn't have proper internet connectivity.
- The second most common challenge for Internet of Things based Advanced Farming is the lack of awareness among consumers.
- Due to various service providers, it becomes really difficult to maintain interoperability between different IoT systems.

2.2 REFERENCES:

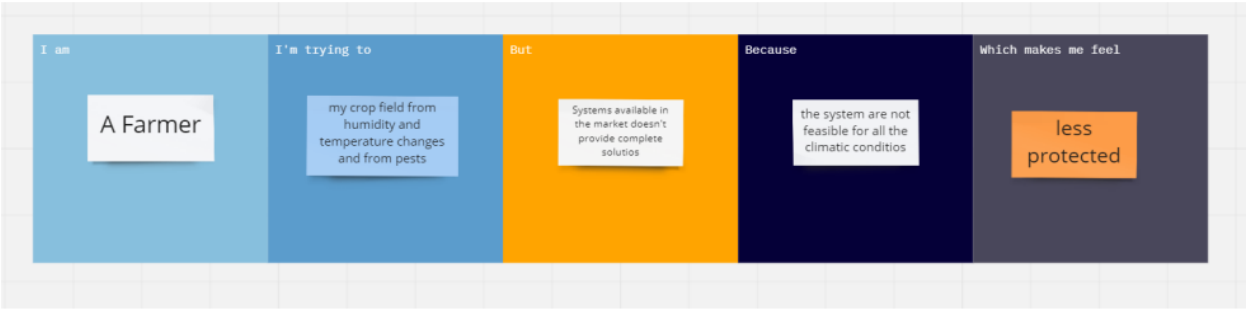
1) Smart agriculture management system using internet of things-Kaushik Sekaran1 , Maytham N. Meqdad2 , Pardeep Kumar3 , Soundar Rajan4 , Seifedine Kadry5
2) A RESEARCH PAPER ON SMART AGRICULTURE USING IOT- Ritika Srivastava1, Vandana Sharma2, Vishal Jaiswal3, Sumit Raj4
3) IoT in Agriculture : Smart Farming-Dr. S. Kanchana
4) Smart Agriculture System using IoT Technology-Adithya Vadapalli1 , Swapna Peravali2& Venkata Rao Dadi3
5) Smart Agriculture Using IoT Multi-Sensors: A Novel Watering Management System-Tran Anh Khoa 1,2 , Mai Minh Man 1,Tan-Y Nguyen 3,* , VanDung Nguyen 4 and Nguyen Hoang Nam 2
6) SMART AGRICULTURE USING IoT-Jayakumar R, Karthikeyan S N, Naveen Perumal M, Methini M
7) Smart Farming using IoT, a solution for optimally monitoring farming conditions- Jash Doshi, Tirthkumar Patel, Santosh kumar Bharti
8) IoT Enabled Smart Farming and Irrigation System- M. Rohith, R Sainivedhana, Dr. N. Sabiyath Fatima
9) Smart Farming System using IoT for Efficient Crop Growth- Abhiram MSD, Jyothsnavi Kuppili, N.Alivelu Manga

10) IOT BASED SMART FARMING-Dr.C.Mageshkumar , Ms. Sugunamuki.K.R

2.3 PROBLEM STATEMENT:

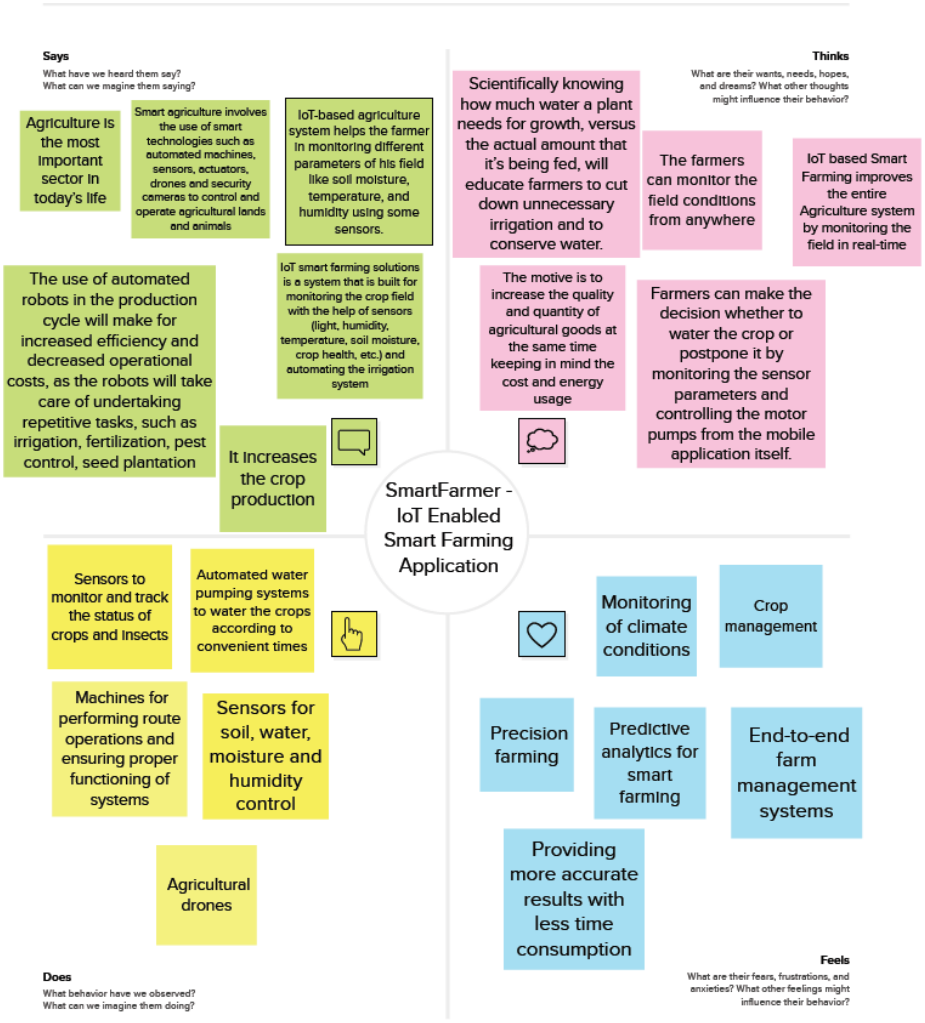
The traditional agriculture cannot meet the requirements of modern agriculture which requires high-yield, high quality and efficient output. Thus, it is very important to turn towards modernization of existing methods and using the information technology and data over a certain period to predict the best possible productivity and crop suitable on the very particular land. The adoptions of access to high-speed internet, mobile devices, and reliable, low-cost satellites (for imagery and positioning) are few key technologies characterizing the precision agriculture trend.

Customer Problem Statement Template:

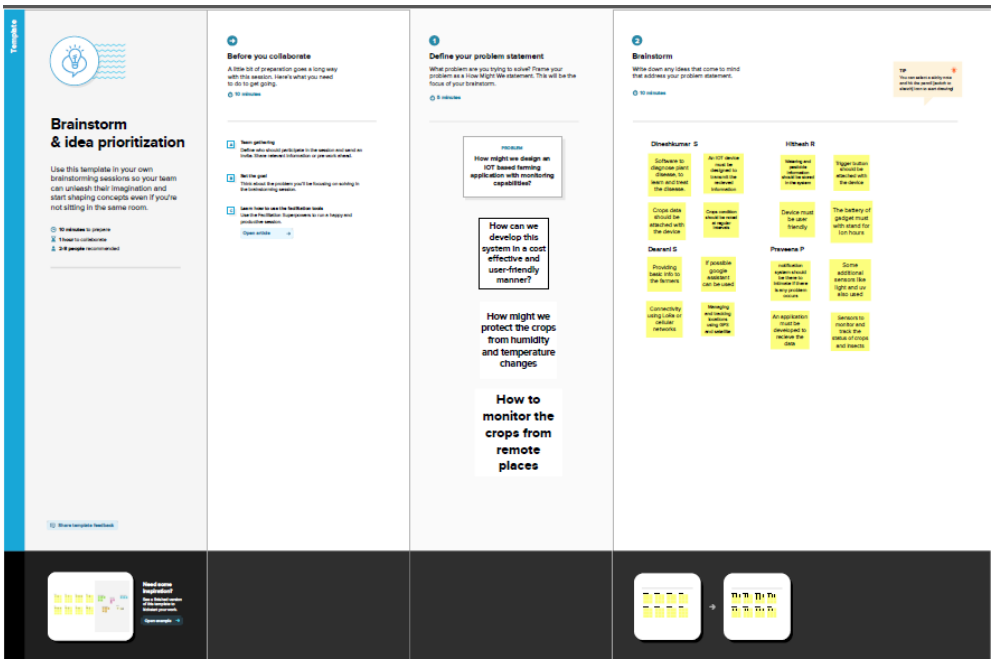


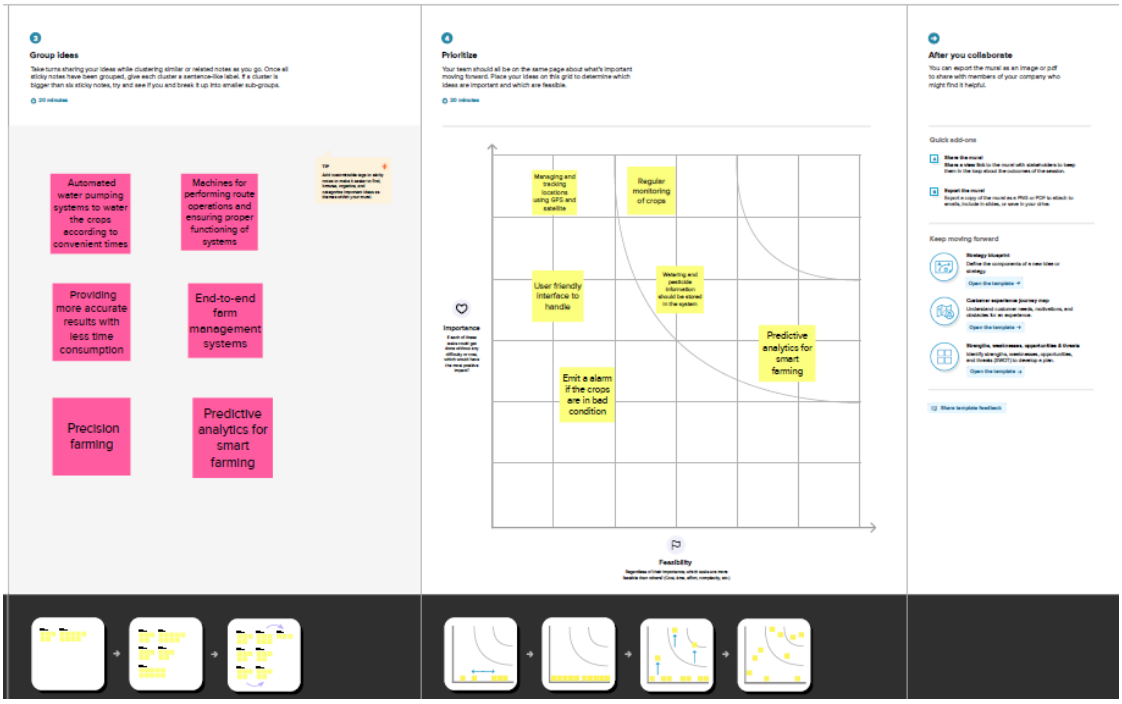
3.IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS:



3.2 IDEATION AND BRAINSTORMING:

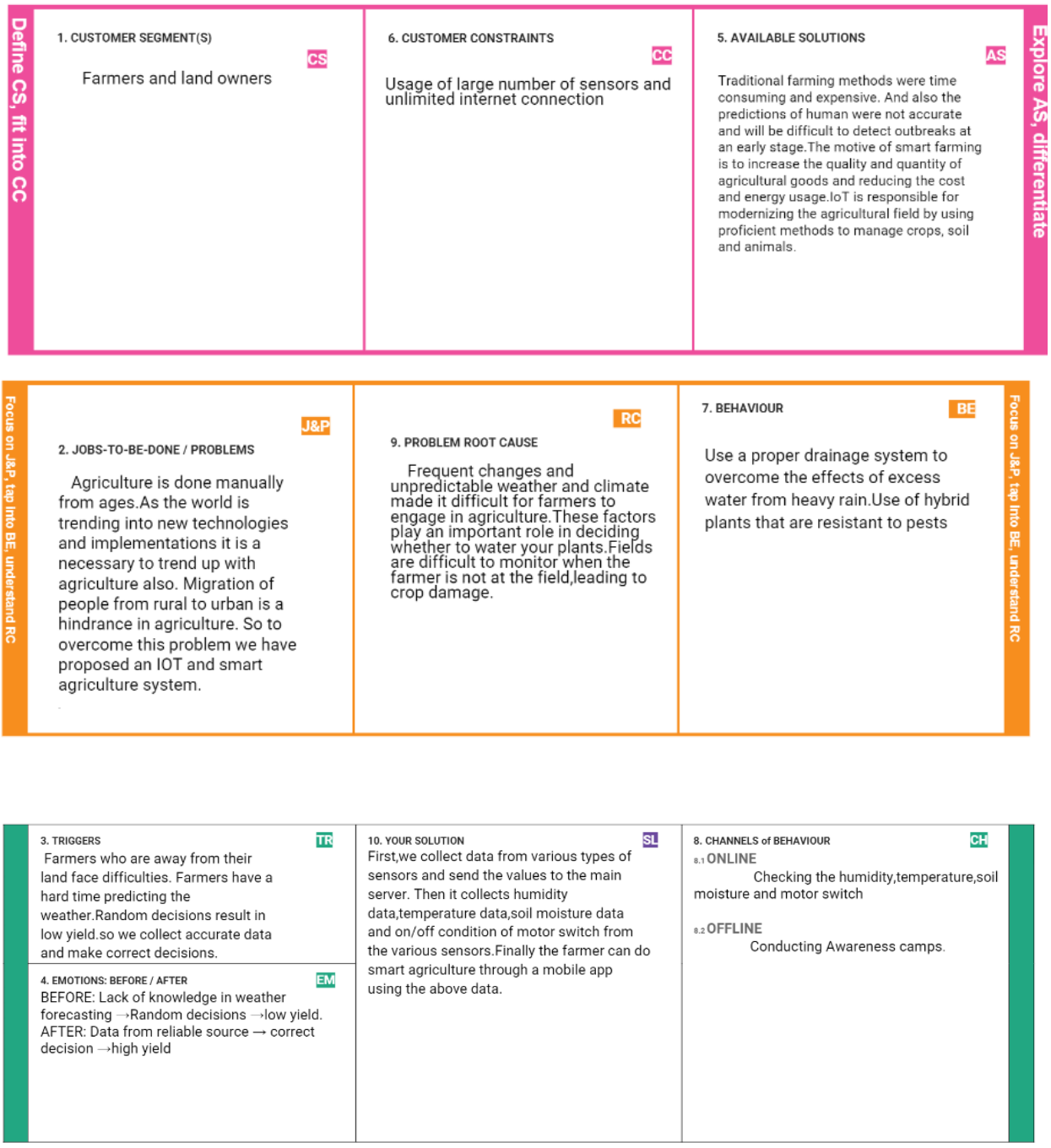




3.3 PROPOSED SOLUTION

In olden days,Traditional farming methods were used where the soil and livestock were managed manually. These methods were time consuming and expensive. And also sometimes the predictions of human were not accurate also difficult to detect outbreaks at an early stage.The motive of smart farming is to increase the quality and quantity of agricultural goods at the same time keeping in mind the cost and energy usage.IoT is responsible for modernizing the agricultural field by using proficient methods and instruments to manage crops, soil and animals. This in turn has led to decrease in the waste generation and a phenomenal increase in productivity. This is smart agriculture using IoT.

3.4 PROBLEM SOLUTION FIT



4.REQUIREMENT ANALYSIS

4.1 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 Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Sensor Function for framing System	Measure the Temperature and Humidity Measure the Soil Monitoring Check the crop diseases
FR-4	Manage Modules	Manage Roles of User Manage User permission
FR-5	Check details	Temperature details Humidity details
FR-6	Data Management	Manage the data of weather conditions Manage the data of crop conditions Manage the data of live stock conditions

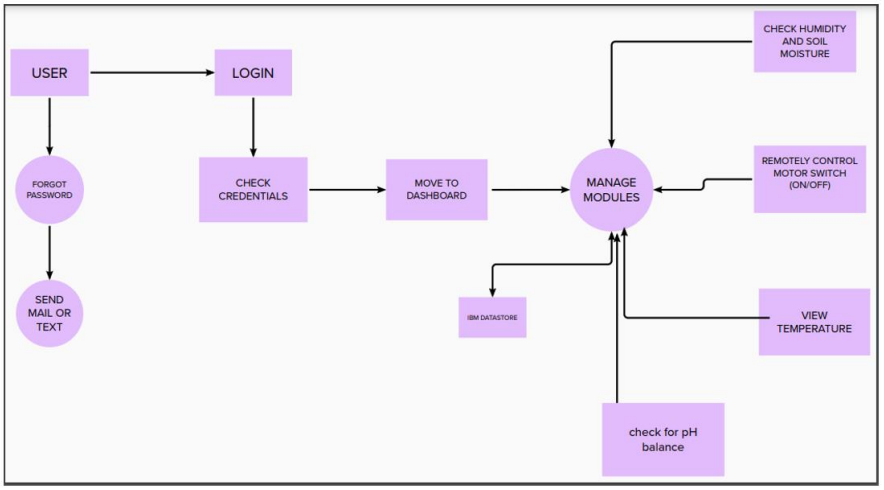
4.2 NON FUNCTIONAL REQIREMENTS:

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

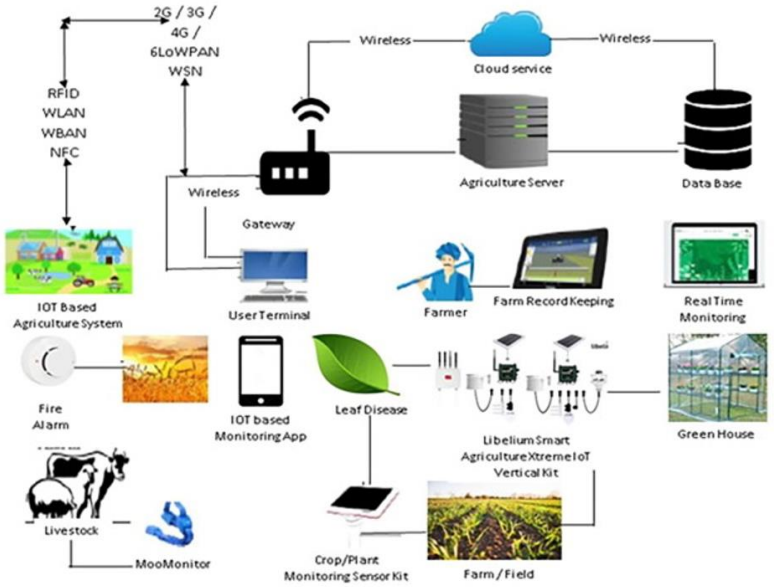
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	User friendly guidelines for users to avail the features. Most simplistic user interface for ease of use.
NFR-2	**Security**	All the details about the user are protected from unauthorized access. Detection and identification of any misfunctions of sensors.
NFR-3	**Reliability**	Implementing Mesh IoT Networks Building a Multi-layered defence for IoT Networks.
NFR-4	**Performance**	The use of modern technology solutions helps to achieve the maximum performances thus resulting in better quality and quantity yields.
NFR-5	**Availability**	This app is available for all platforms
NFR-6	**Scalability**	Scalability refers to the ability to increase available resources and system capability without the need to go through a major system redesign or implementation.

5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAM:



5.2SOLUTION AND TECHNICAL ARCHITECTURE:



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 Gmail		Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email & password		High	Sprint-1
Customer (Web user)	Dashboard	USN-5	As a User can view the dashboard, and this dashboard include the check roles of access and then move to the manage modules.	I can view the dashboard in this smart farming application system.	High	Sprint 2
		USN-6	User can remotely access the motor switch	In the smart farming app	High	Sprint 3
Administrator			As a user once view the manage modules this describes the Manage system Admins and Manage Roles of User and etc.			Sprint 2

6.PROJECT PLANNING & SCHEDULING

6.1Sprint Planning & Estimation:

The purpose of Sprint planning is to define what can be delivered in the sprint and how the work can be achieved. It kicks off the session by setting the agenda and focus.If done correctly,it also creates an environment where the team is motivated,challenged and can be successful.

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority
Sprint-1	Simulation creation	USN-1	Connects sensors and Arduino with python code	2	High
Sprint-2	Software	USN-2	Creating device in the IBM Watson IoT platform,workflow for IoT scenarios using node- red.	2	High
Sprint-3	MIT app inventor	USN-3	Develop an application for the smart farmer project using MIT app inventor.	2	High
Sprint-3	Dashboard	USN-3	Design the modules and test the app.	2	High
Sprint-4	Web UI	USN-4	To make the user to interact with the software.	2	High

6.2Sprint Delivery Schedule:

This consist of sprints with respective to their duration,sprint start and end date and the releasing data.

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022		05 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022		12 Oct 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022		15 Oct 2022

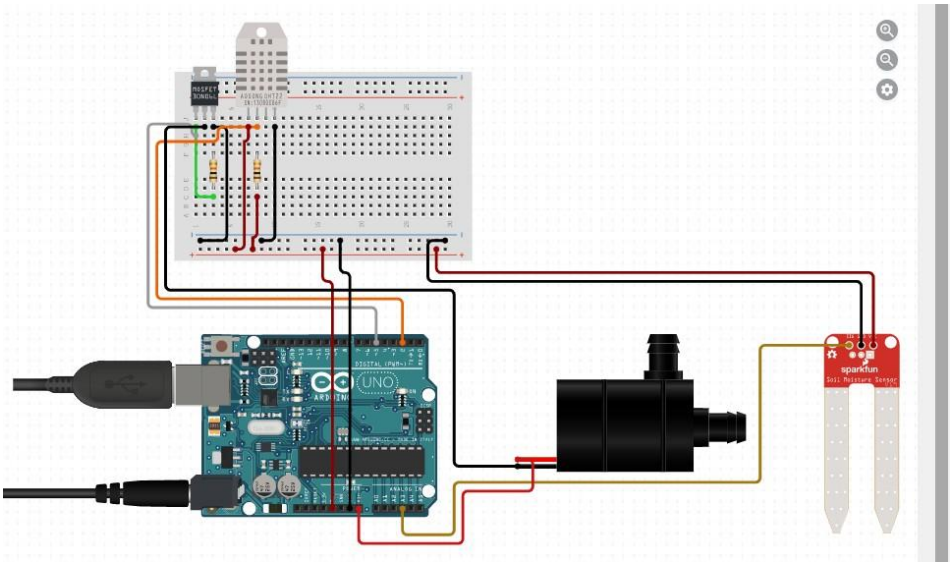
7.CODING AND SOLUTIONING

Connecting Sensors with Arduino using C++ code:

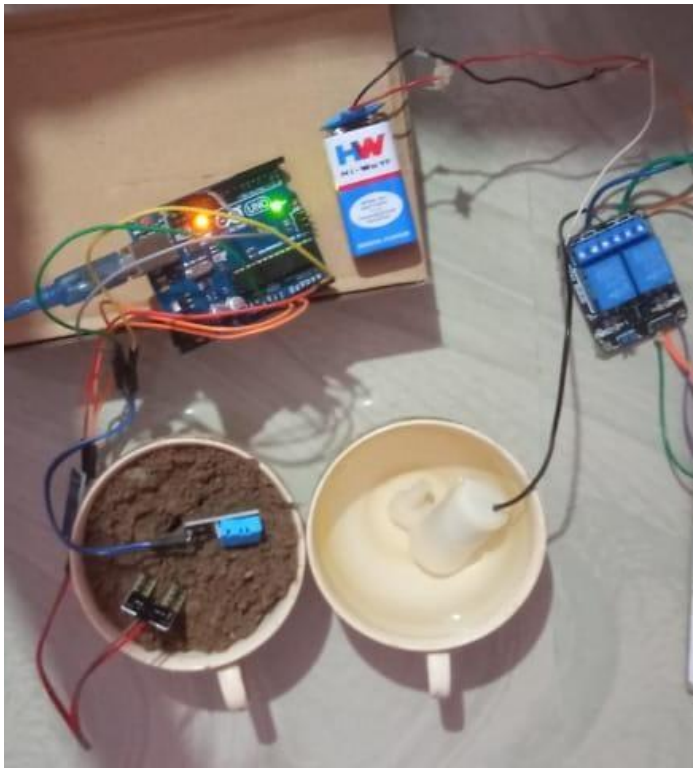
```
#include "Arduino.h"
#include "dht.h"
#include "SoilMoisture.h"
#define dht_apin A0
const int sensor_pin = A1; //soil moistureint pin_out = 9;
dht DHT; int c=0;
void setup()
{
pinMode(2, INPUT); //Pin 2 as INPUT pinMode(3,
OUTPUT); //PIN 3 as OUTPUTpinMode(9,
OUTPUT);//output for pump
}
void loop()
{
  if (digitalRead(2) == HIGH)
  { digitalWrite(3, HIGH);           // turn the LED/Buzz ON
  delay(10000); // wait for 100 msecond digitalWrite(3, LOW);
                                      // turn the LED/Buzz OFF
  delay(100);
  }
   Serial.begin(9600);
      delay(1000);
    DHT.read11(dht_apin); //tempraturefloat
  h=DHT.humidity;
  float t=DHT.temperature;
   delay(5000); Serial.begin(9600);
```

```
 float moisture_percentage;int
sensor_analog;
sensor_analog = analogRead(sensor_pin);
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);
  }
```

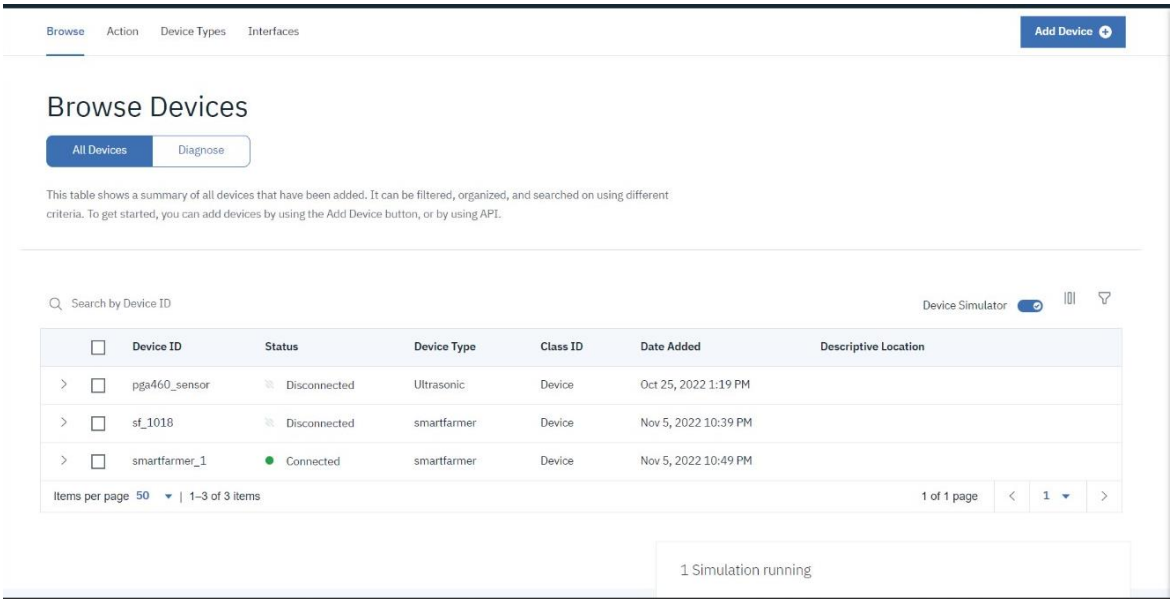
Circuit Diagram:

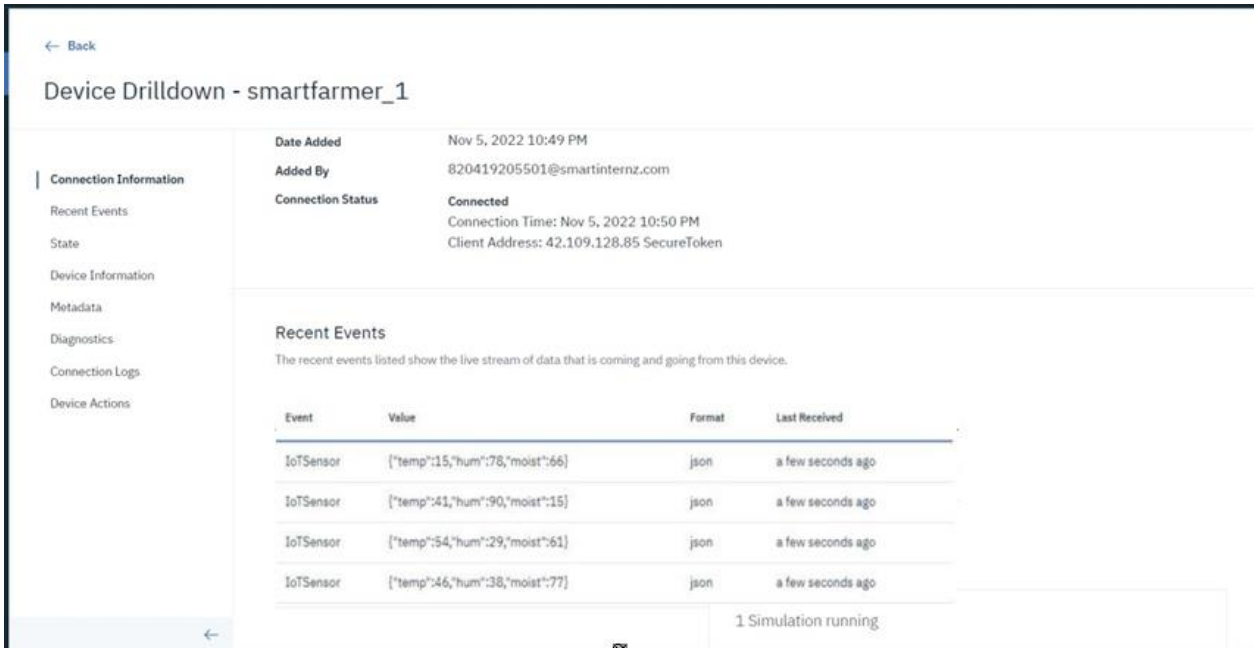


Sensor Connection:



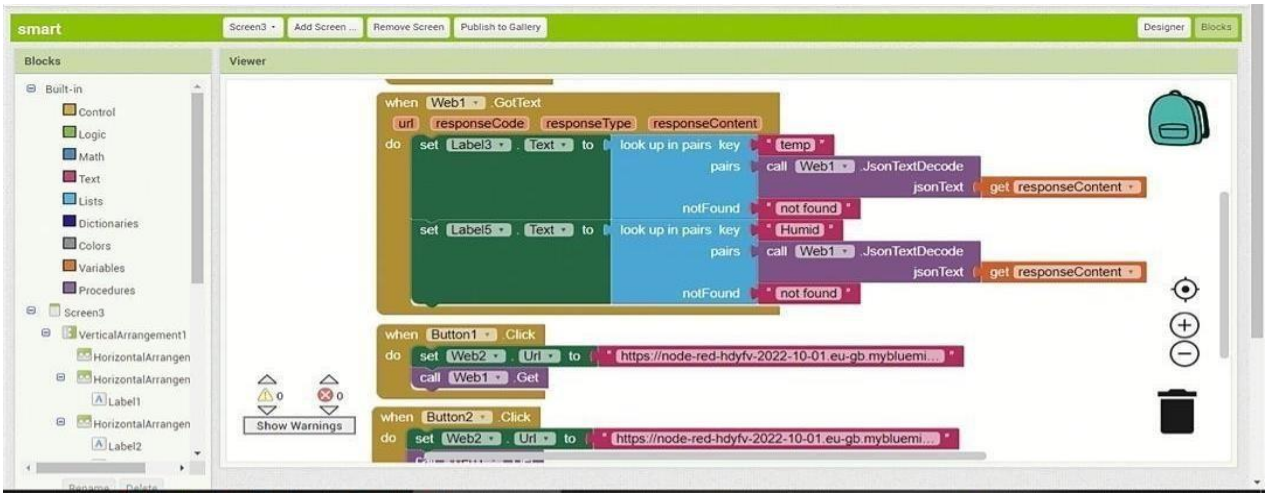
Device Details:



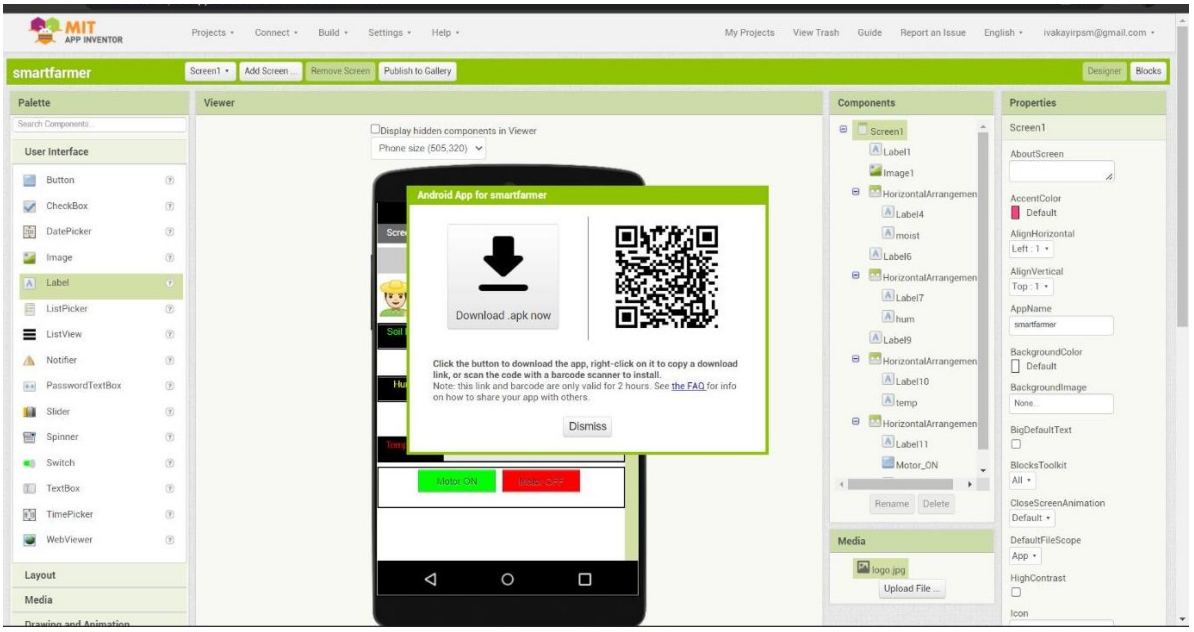


Creating Mobile app using MIT app

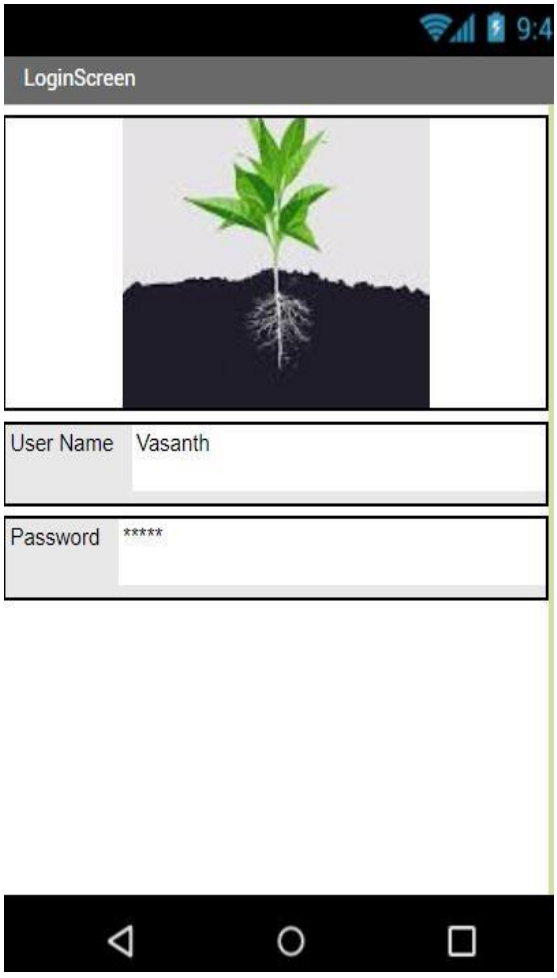
Inventor:

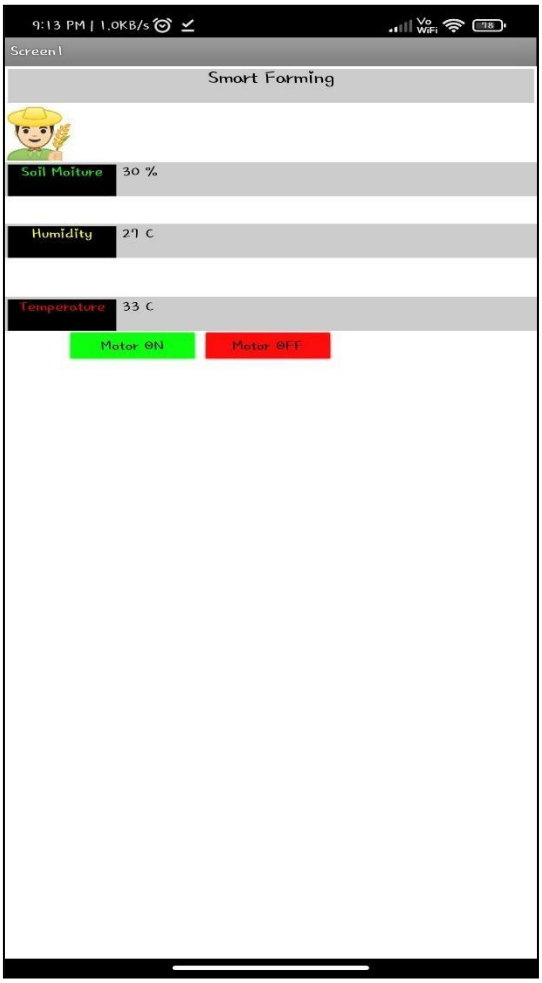


QR Code for APK download:



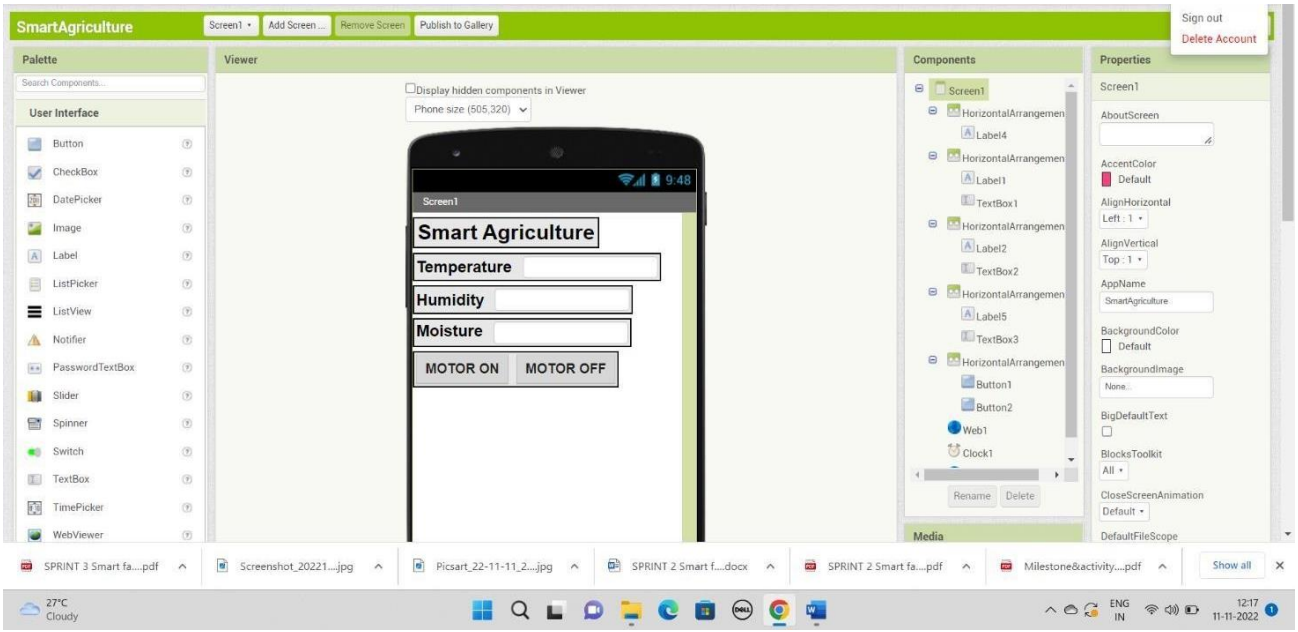
Output Screen in Mobile :

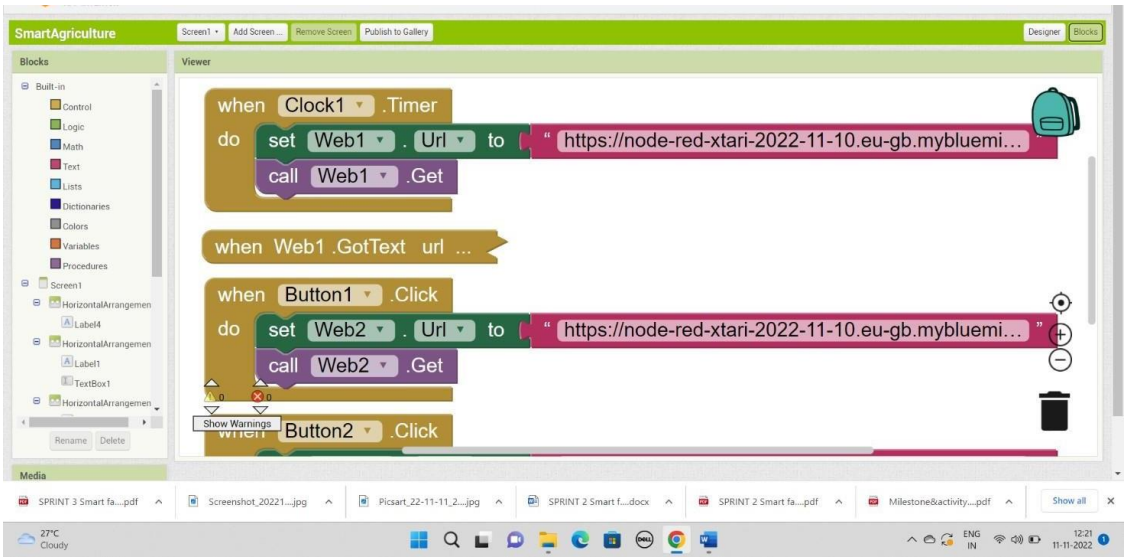




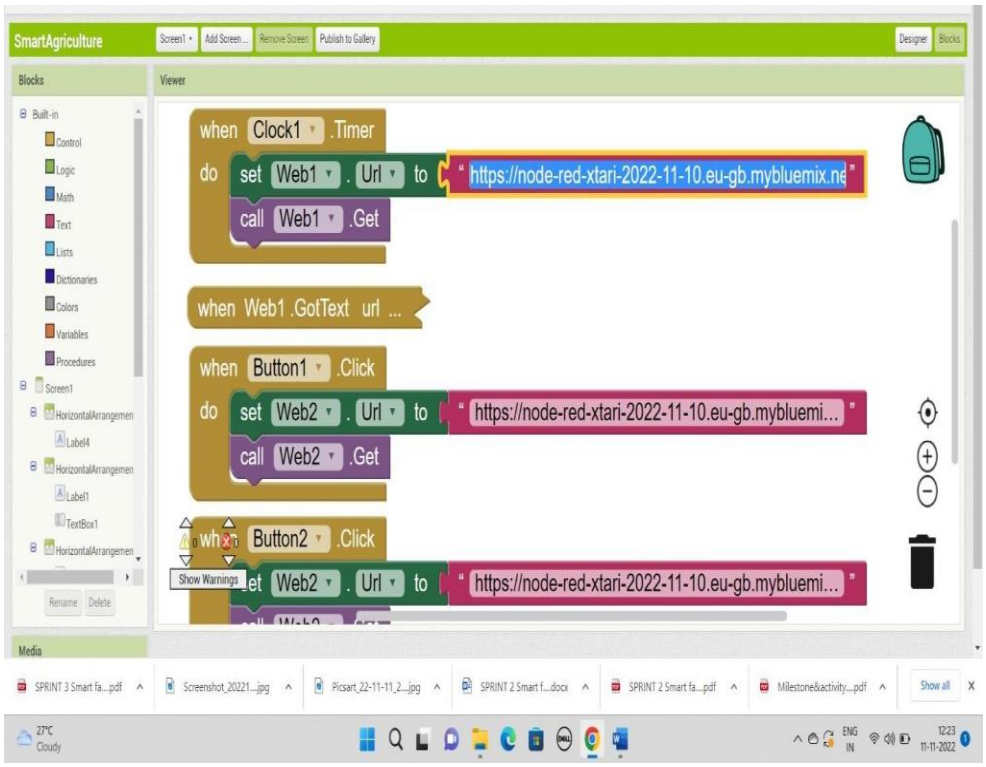
Creating a MIT Account

Creating Blocks to Build the Mobile Application

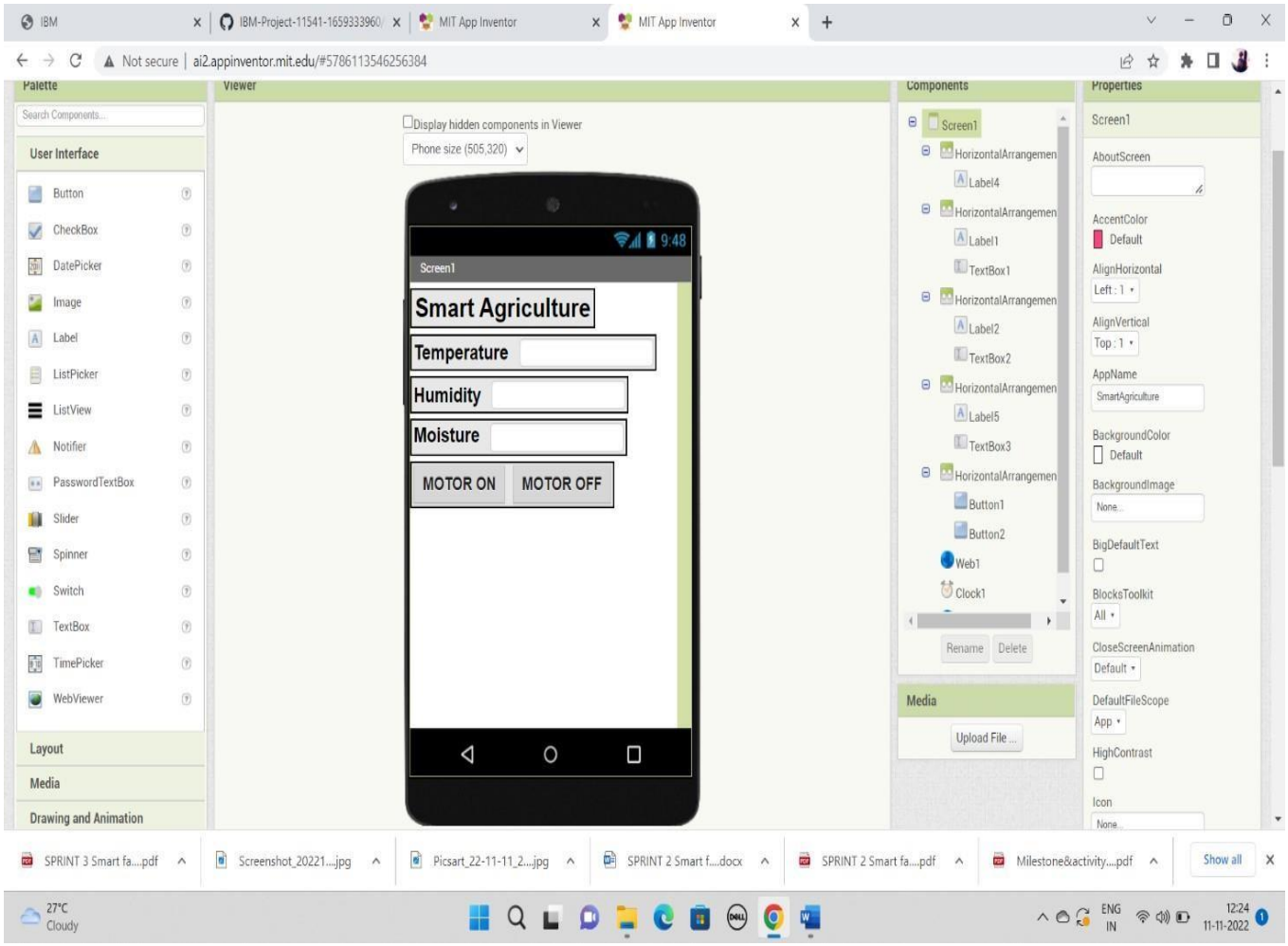




Configuring the Blocks with the Node Red Link:

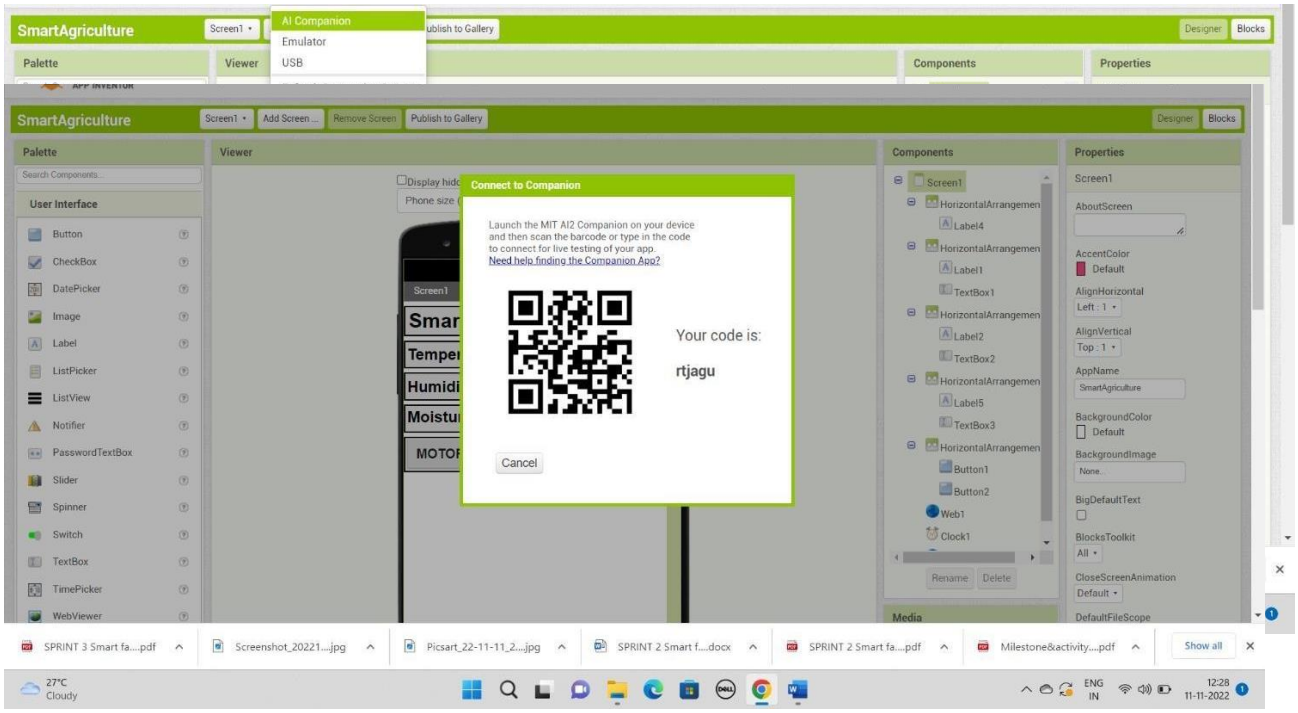


Creating the Mobile Interface:

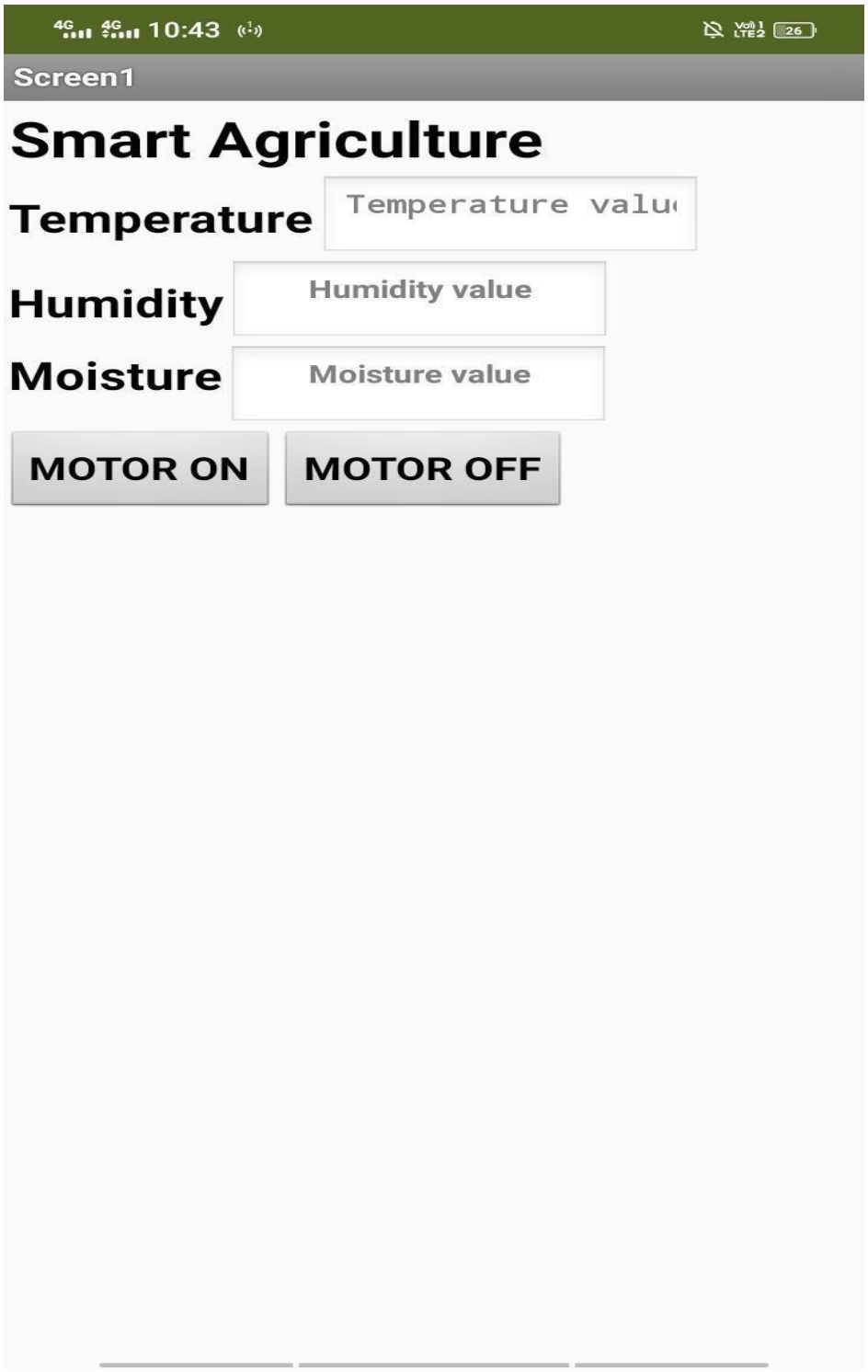


Connecting it to the AI Companion

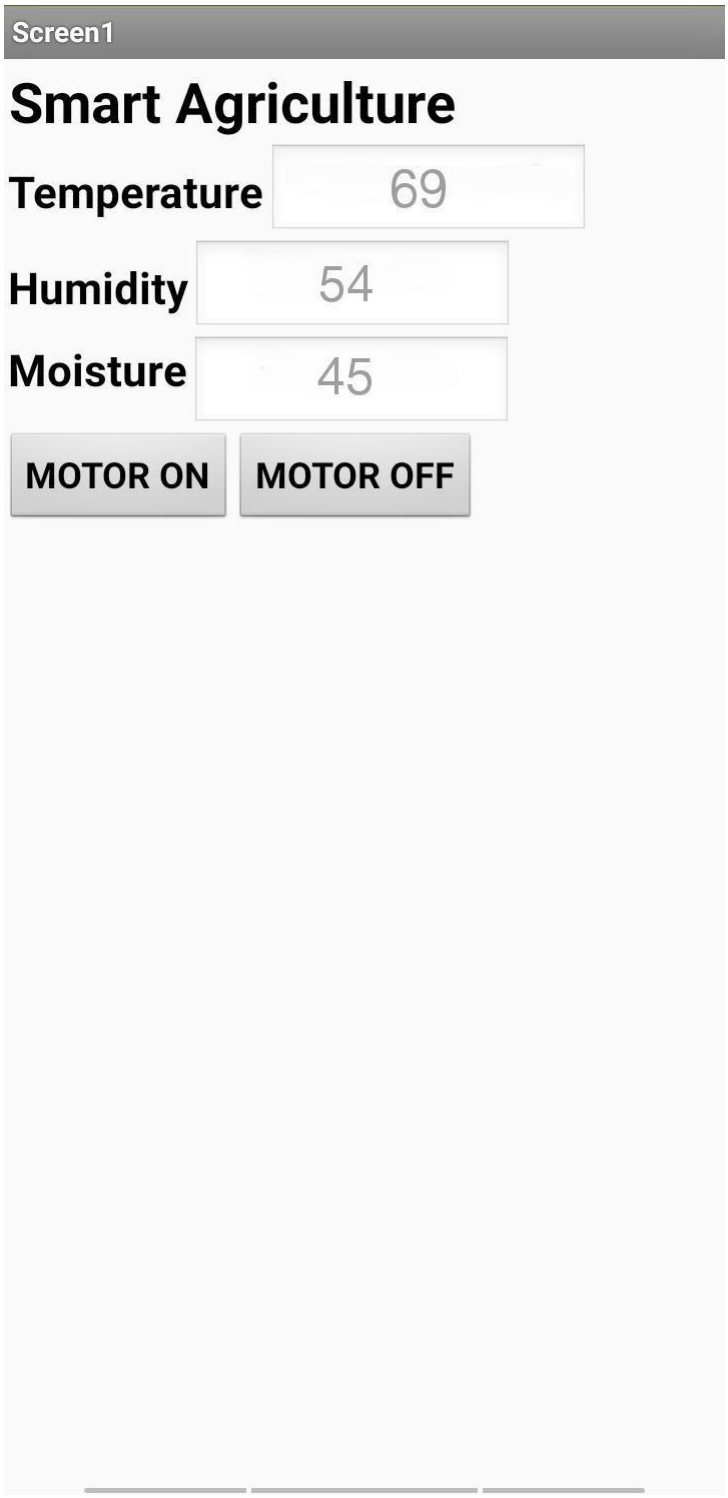
QR Code to Connect with the Mobile



Mobile Connected Interface



Receiving Data:



Motor ON and Motor OFF Command and Output:

8.TESTING

8.1 TEST CASES:

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9.RESULTS

9.1 PERFORMANCE METRICS:

The system's performance is determined by its accuracy. It should detect leakage as soon as possible. It should be sensitive towards leakage and should be reliable.

10.ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- Increased work efficiency. One of the greatest things about Smart Farming is its potential to save valuable time. ...
- Improved fuel efficiency. Smart Farming allows farmers to be much more precise. ...

- Reduced consumables. ...
- Increased yields.

DISADVANTAGES

The main disadvantage is the time it can take to process the information. Farmers are so busy with harvesting and caring for their crops that they may not have time to process data. There are also issues with the water supply, as well as issues with the cost of the technology, which can be quite expensive.

11.CONCLUSION

In IoT-based smart farming, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.) and automating the irrigation system. The farmers can monitor the field conditions from anywhere.

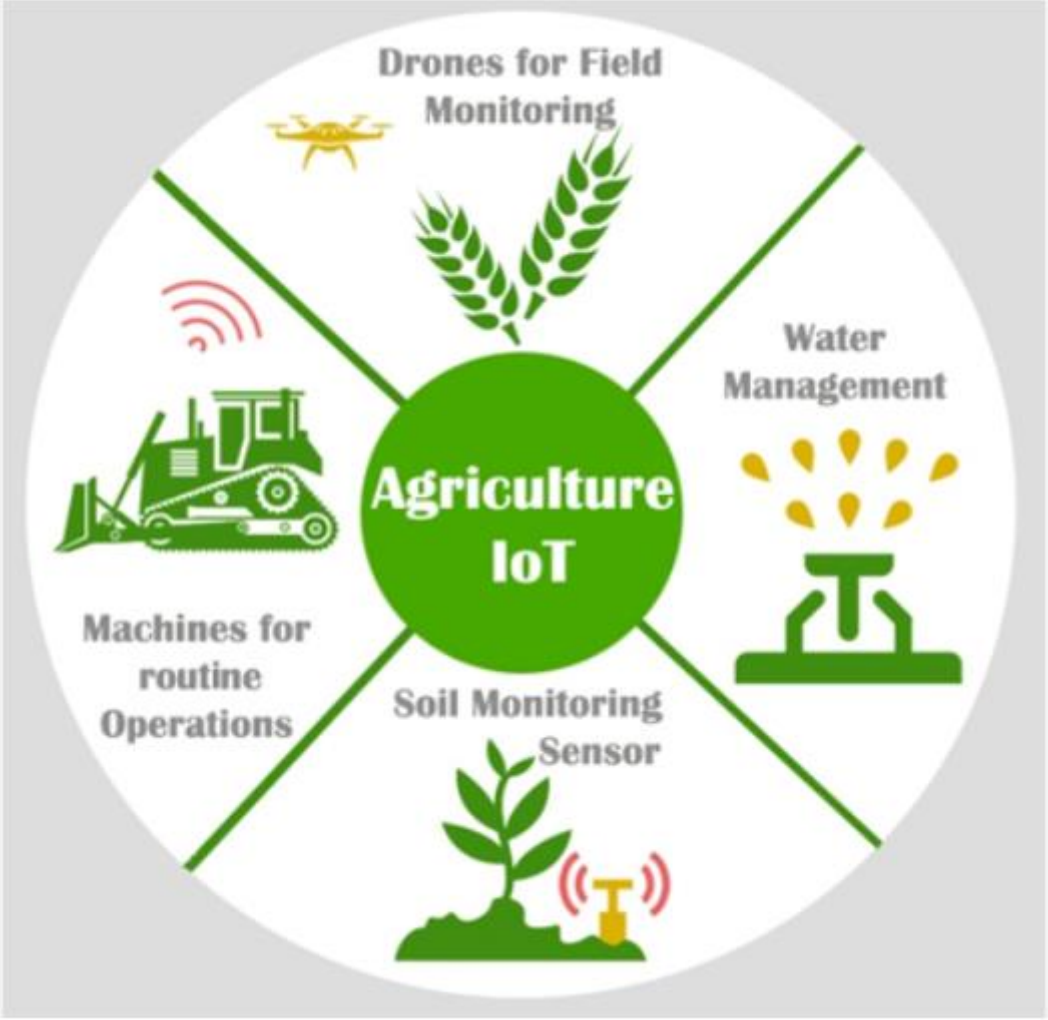
12.FUTURE SCOPE

Through collecting data from sensors using IoT devices, you will learn about the real-time state of your crops. The future of IoT in agriculture allows predictive analytics to help you make better harvesting decisions. Pattern forecasting can be used by farmers to predict weather patterns and crop harvesting.

13.APPENDIX

"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 required by production.The Internet of Things (IoT) has provided ways to improve nearly every industry imaginable. In

agriculture, IoT has not only provided solutions to often time-consuming and tedious tasks but is totally changing the way we think about agriculture. What exactly is a smart farm, though? Here is a rundown of what smart farming is and how it's changing agriculture.



Github Link: https://github.com/IBM-EPBL/IBM-Project-47963-1660803584

Project Demo Link: https://clipchamp.com/watch/Y4rvLRN3tfb