Smart Farmer – IoT Enabled Smart Farming Application

Submitted by

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1.Introduction

1.1.Project Overview

IoT-based farming systems help farmers to monitor various parameters of their fields, such as soil moisture, temperature, and humidity, using several sensors. A farmer can monitor all sensor parameters through his web or mobile application without being near

his field. Crop irrigation is one of the most important tasks for a farmer. By monitoring sensor parameters and controlling motor pumps from a mobile application, irrigation or crop movement decisions can bemade easily.

1.2.Purpose

Better production management leads to a better cost control and less waste. For example, the ability to eliminate abnormal animal health conditions helps eliminate the risk of yield loss. In addition, automation increases efficiently. Smart Farming forms the ecological base of faming. Minimizing the site-specific application of inputs such as fertilizers and pesticides in precision farming systems reduces leaching issues and digester gas emissions.

2.Literature Survey

2.1.Existing Problem

IoT’s Smart Farming improves entire farming systems by monitoring fields in real time. With the help of sensors and internet connectivity, the Internet of Things in culture has not only saved the celebrity era, but has also encouraged the abuse of resources such as water and electricity. Climate plays a very important role in agriculture. Mis-knowledge of climate also significantly reduces the quantity and quality of crop production. Precision agriculture/precision farming is one of his best known applications of IoT in agriculture. It enables smart farming applications such as livestock monitoring, field observation, and inventory monitoring, making farming practices more precise and controllable. To make greenhouses smart, IoT has enabled weather stations to automatically adjust climateconditions according to a specificset of instructions. IoT implementation in the greenhouse eliminated human intervention, making the whole process more cost-effective and more accurate.

2.2.References

i. Internet of Things in agriculture, recent advances and future challenges Antonis Tzounisa, Nikolaos Katsoulasa, Thomas Bartzanas, Constantinos Kittasa a Department of Agriculture Crop Production & Rural Environment, University of Thessaly, Volos, Greece b Institute for Research & Technology – Thessaly, Centre for Research and Technology – Hellas, Volos, Greece Received 18 March 2017, Revised 2 September 2017, Accepted 21 September 2017, Available online 24 November 2017, Version of Record 24 November 2017.

ii. Divya J., Divya M.,Janani V. [2] Agriculture is essential to India's economy and people's survival.The purpose of this project is to create an embedded-based soil monitoring and irrigation system that will reduce manual field monitoring and provide information via a mobile app. The method is intended to help farmers increase their agricultural output. A pH sensor, a temperature sensor, and a humidity sensor are among the tools used to examine the soil. Based on the findings, farmers may plant the bestcrop for the land.

iii. Kittikhun Meethongjan, Suwit Kongsong. The smart agriculture system played with an automation system and monitoring system based on wireless sensor networks. It can collect data from different sensors deployed at various nodes and sends it through

the wireless protocol. In smart agriculture, Arduino mainboard of IOT system consists of temperature sensor, moisture sensor, water level sensor, DC motor and GPRS module.

2.3.Problem Statement Solution

To provide efficient decision support system using wireless sensor network which handle different activities of farm and gives useful information related to farm. Information related to Soil moisture, Temperature and Humidity content. Due to the weather condition, water level increasing Farmers get lot of distractions which is not good for Agriculture. Water level is managed by farmers in both Automatic/Manual using that mobile application. It will make more comfortable to farmers. Performing agriculture is very much time consuming. Traditional agriculture and related sectors are unable to meet the demands of modern agriculture, which requires high yield, quality and efficient production. Therefore, it is very important to look to modernize existing methods and use information technology and data over a period of time to predict the best possible productivity and country-suitable crops. The introduction of high-speed internet, mobile devices, and access to reliable and low-cost satellites is just some of the key technologies characterizing the precision farming trend in agriculture. Precision agriculture is one of his best-known applications of IoT in the agricultural sector, with many organizations around the world using the technology. Products

and services used include VRI Optimization, Soil Moisture Probes and Virtual Optimizer PRO. Optimize variable rate irrigation (VRI) to maximize profitability, improve yields and increase water efficiency in irrigated fields with variable terrain and soils. IoT is making great strides in areas such as manufacturing, healthcare, and automotive. When it comes to food production, transportation and storage, it offers a range of options to improve his per capita food availability in India. Sensors that provide information on soil nutrient status, pest infestation, moisture conditions, etc. can be used to improve crop yields over time.

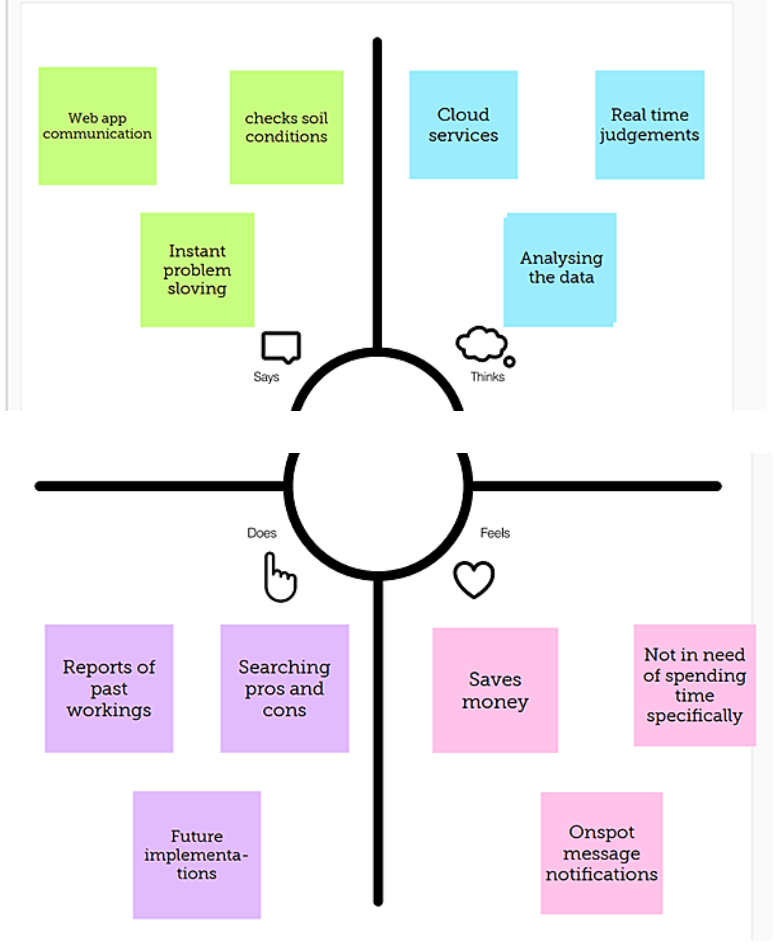
3.Ideation & Proposed Solution

3.1.Prepare Empathy Map

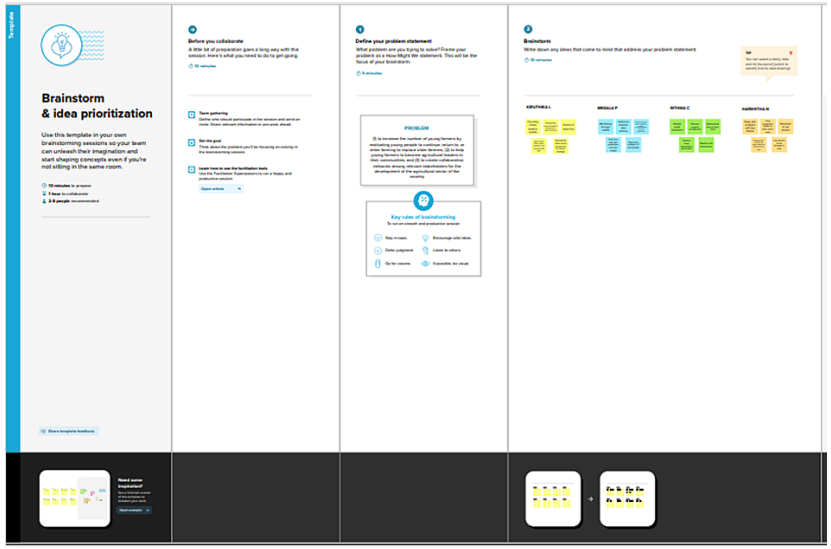
Empathy Map

Dive into the mind of the user for focused product development

Build empathy and keep your focus on the user by putting yourself in their shoes.



3.2 Ideation


Template
Brainstorm
& idea prioritization
Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.
Before you collaborate
Define your problem statement
PROBLEM
Key rules of brainstorming
Brainstorm
Write down any ideas that come to mind that address your problem statement.

Group ideas

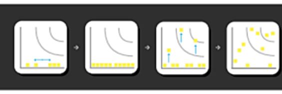
Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes



After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

Share the mural
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

Export the mural
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.
Open the template

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template

Share template feedback

3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To provide efficient decision support system using wireless sensor network which handle different activities of farm and gives useful information related to farm. Information related to Soil moisture, Temperature and Humidity content. Due to the weather condition, water level increasing Farmers get lot of distractions which is not good for Agriculture. Water level is managed by farmers in both Automatic/Manual using that mobile application. It will make more comfortable to farmers. Performing agriculture is very much time consuming.

2.	Idea / Solution description	In Internet of Things based smart agriculture, a system is formed to monitor the farmland with the help of sensors, which senses components like temperature, light, humidity, soil moisture, etc. Then, automate the irrigation system and allow farmers to monitor their field conditions from anywhere through IoT Analytics Platform. To make the agricultural process even smarter and accurate, precision agriculture is used. This makes agricultural practice more controlled and precise in terms of raising livestock and farming. The output of the solution will be in the form of an application which gives us the above mentioned features like displaying the temperature, humidity, soil moisture which enables the farmers to know about the exact condition of thesoil.

3.	Social Impact / Customer Satisfaction	Smart Farming has enabled farmers to reduce waste and enhance productivity with the help of sensors (humidity, temperature, soil moisture) and automation of irrigation systems. Further with the help of these sensors, farmers can monitor the field conditions from anywhere. Internet of Things based smart Farming is highly efficient when compared with the conventional approach. Thus this application helps the farmers to save time, reduce the work.
4.	Business Model (Revenue Model)	By using this application farmers can overcome the over usage and under usage of water, fertilizers, etc. With the help of the sensors used they get an exact notification about the humidity level, moisture content level and temperature level in the soil. This helps them to save the time and cost for labours.

5.	Scalability of the Solution	Here we use the application that gives the exact conditions of the soil and also shows the historical conditions. Once when the threshold value is low the sensors starts working and send the notification to the farmer. It is also used to detect seasonal variations as climate plays a major role in agriculture. This application works best for farmers who do farming as a full time job.

3.4 Proposed Solution Fit

Project Title: Smartfarmer - IoT Enabled Smart Farming Application **Project Design Phase-I Solution Fit** **Team ID: PNT2022TMD01763**

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) — CS

The customers of this product are the farmers who cultivate crops. Our aim is to assist, aid and help them to monitor the field parameters remotely and to keep track of the parameters. This product saves the agriculture from extinction.

6. CUSTOMER CONSTRAINTS

Deployment of huge number of sensors is difficult. It requires an unlimited or continuous internet connection to be successful.

5. AVAILABLE SOLUTIONS — AS

The irrigation process is automated using IoT. weather data and field parameters were obtained and processed to automate the process of irrigation. The drawbacks are high cost of installation, efficient only for short distance, difficulty in storing the data.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS — J&P

The objective of this product is to obtain the different field parameters using sensor and process it using a central processing system. Cloud is used to store and transmit the data by using IoT. Weather APIs are employed to assist the farmer in making decision. The farmer could take decision through a mobile application

9. PROBLEM ROOT CAUSE — RC

The frequent change or unpredictable weather and climate, made it difficult for the farmers to do agriculture. These factors play a major role in making decision whether to water the plant or not. The monitoring of the field is hard when the farmer is out of station, thus leading to crop damage.

7. BEHAVIOUR — BE

Using proper drain system to overcome the effects of excess water due to heavy rain. Using hybrid varieties of crop that are resistant to pests.

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS — TR

Farmers facing issues in providing proper irrigation. No proper supply of water leads to reduced production which affects the profit level of the farmer. Farmer's struggle to predict the weather.

4. EMOTIONS: BEFORE / AFTER — EM

BEFORE: Lack of knowledge in weather forecasting

→Random decisions →low yield.

AFTER: Data from reliable source

→ correct decision →high yield

10. YOUR SOLUTION — SL

Our product collects the data from different types of sensors and it sends the value to the main server. It also collects the weather data from API. The ultimate decision whether to water the crop or not is taken by the farmer using a mobile application.

8. CHANNELS of BEHAVIOR — CH

ONLINE: Providing online assistance to the farmer, in providing knowledge regarding the pH and moisture level of the soil. Online assistance to be provided to the user in using the product

OFFLINE: Awareness camps to be organized to teach the importance and advantages of automation and IoT in the development of agriculture.

Extract online &offline CH of BE

4.Requirement Analysis

4.1Functional Requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail Registration by creating a new user name and password
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User login	Login using the credentials we have used during registration
FR-4	User permission	**Smart Farming with IoT** relies increasingly on smart technology for the management of agricultural enterprises. And it does so in order to increase the quality and quantity of the products.

FR-5	Using the intelligent system	IoT and AI solutions can get integrated into autonomous tractors to help collect real-time data about soil health, including water levels, temperature, and weather.

4.2.Non-Functional Requirements

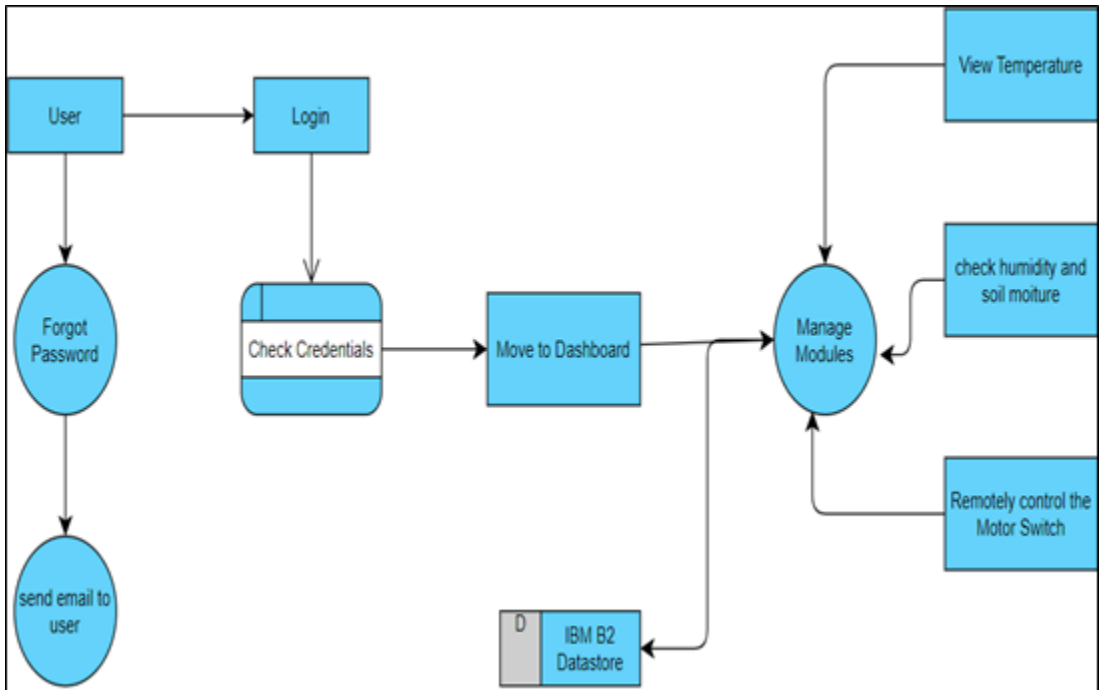
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It is very user friendly, any people with less knowledge also can easily understand.Remote Management. With farms being located in far-off areas and distant lands, farmers enable this for better solution.

NFR-2	**Security**	Smart farming, which involves the application of sensors and automated irrigation practices, can help monitor 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 actively helps farmers to better understand the important factors such as water level,weather,humidity and soil mositure.
NFR-4	**Performance**	The performance of smart farming is high and it is very efficient as it is very easy to understand and has a high security and scalability.
NFR-5	**Availability**	This smart farming is enabled at any system like laptop , mobile phone , desktop, Gis and user friendly.

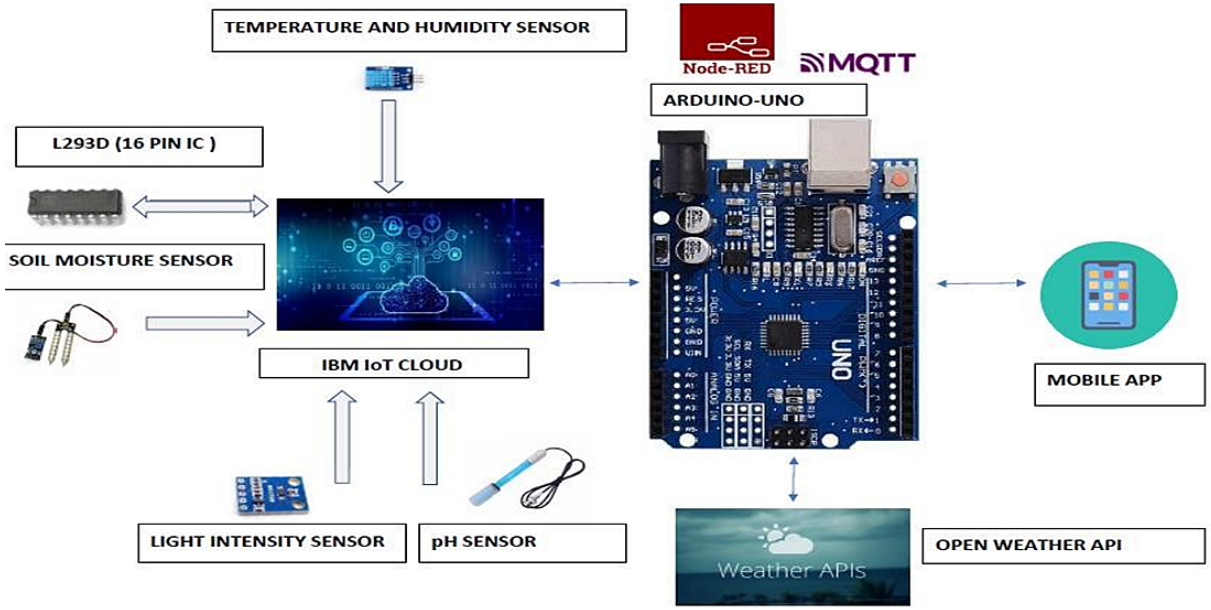
NFR-6	**Scalability**	smart farming refers to the adaptability of a system to increase the capacity,the number of technology devices such as sensors and actuators, while enabling timely analysis.

5.Project Design

5.1.Data Flow Diagram



5.2.Solution Architecture



- The different soil parameters (temperature, humidity, Soil Moisture) are sensed using different sensors, and the obtained value is stored in the IBM cloud.
- Arduino UNO is used as a processing unit that processes the data obtained from sensors and weather data from weather API.
- Node-red is used as a programming tool to wire the hardware, software, and APIs. The MQTT protocol is followed for communication.
- All the collected data are provided to the user through a mobile application that was developed using the MIT app inventor. The user could make a decision through an app, whether to water the crop or not depending upon the sensor values. By using the app they can remotely operate the

motor switch.

5.3.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	I can access the dashboard by using	High	Sprint-1

			panel	navigation panel		
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-1
		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-1
	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-1
	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-1
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-1
		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-1
		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-1

		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-1
		USN-5	As a user I want customer care to troubleshoot technical problems	I can get the problem solved within a day	High	Sprint-1
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-1
		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-1
		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-1

6.Project Planning & Scheduling

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User StoryNumber	User Story/Task	Story Points	Priority	Team Member

Sprint-1	Registration (FarmerMobile User)	UNS-1	As a user, I canregisterfor the application by entering my email, password, and confirming my password.	2	High	Kiruthika L (Leader)
Sprint-1	Login	UNS-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Megala P (Member2)
Sprint-2	User Interface	UNS-3	As a user, I can registerfor the application throughFacebook	3	Low	Rithika C (Member 3)

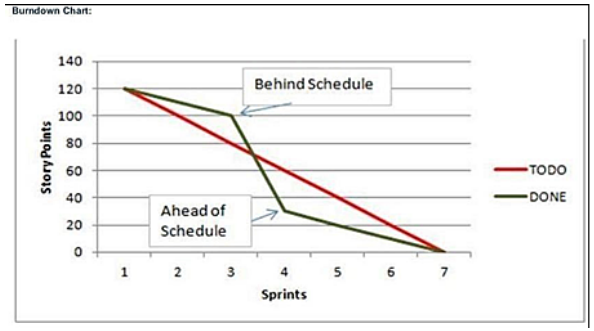
Sprint-1	Data Visualization	UNS-4	As a user, I can registerfor the application throughGMAIL	2	Medium	Harshitha N (Member 4)
Sprint-3	Registration (Farmer-Web User)	USN - 1	As a user, I can log intothe application by entering email and password	3	High	Kiruthika L(Leader)
Sprint - 2	Login	USN - 2	As a registered user, I need to easily login loginto my registered account via the web page in minimumtime	3	High	Megala P (Member 2)
Sprint - 4	Web UI	USN - 3	As a user, I need to have a friendly user interface to easily viewand access the resources	3	Medium	Rithika C (Member3)
Sprint - 1	Registration (Chemical Manufacturer - Web user)	USN - 1	As a new user, I want tofirst register using my organization email and create a password for the account.	2	High	Harshitha N(Member 4)

Sprint - 4	Login	USN - 2	As a registered user, Ineed to easily log in using the registered account via the web page.	3	High	Kiruthika L (Leader)
Sprint - 3	Web UI	USN - 3	As a user, I need to have a userfriendly interface to easily viewand access the resources.	3	Medium	Megala P (Member 2)
Sprint - 1	Registration (Chemical Manufacturer - Mobile User)	USN - 1	As a user, I want to firstregister using my emailand create a password for theaccount.	1	High	Rithika C (Member 3)
Sprint - 1	Login	USN - 2	As a registered user, I need to easily log in tothe application.	2	Low	Harshitha N (Member 4)

6.2 Sprint DeliverySchedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story PointsCompleted (as on Planned End Date)	Sprint Release Date(Actual)
Sprint-1	12	6Days	24Oct 2022	29Oct 2022	20	29Oct 2022
Sprint-2	6	6Days	31Oct 2022	05Nov 2022	20	30OCT 2022
Sprint-3	6	6Days	07Nov 2022	12Nov 2022	20	6NOV 2022
Sprint-4	6	6Days	14Nov 2022	19Nov 2022	20	1. NOV 2022

6.3.JIRA Report



7.Coding & Solutioning

7.1.Feature - 1

Receiving commands from IBM cloud using C++ program

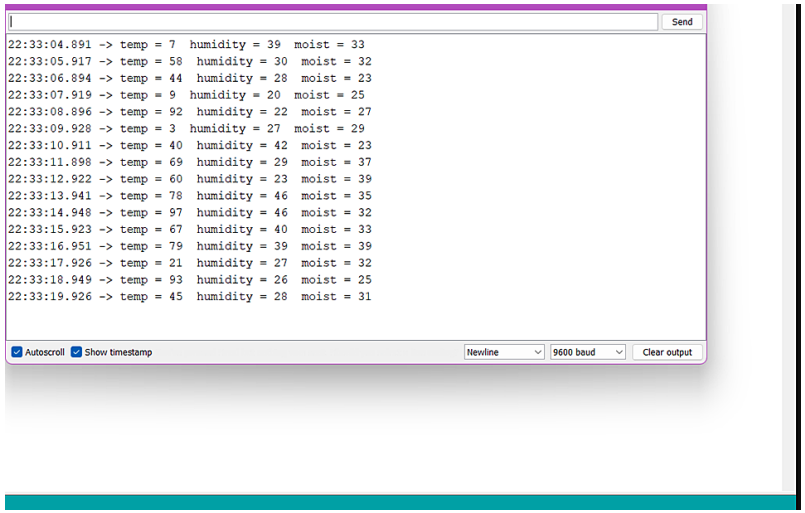
```
#include "Arduino.h" #include "dht.h"
#include "SoilMoisture.h" #define dht_apin
A0
#define organization = "mmbh4c" #define deviceType =
"smartfarmer" #define deviceId = "smartfarmer_1" #define
authMethod = "use-token-auth" #define authToken =
"123456789"
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";

char publishTopic[] = "iot-2/evt/abcd_1/fmt/json";char topic[] = "iot-
2/cmd/home/fmt/String";
char authMethod[] = "use-token-auth";char token[]=TOKEN; char clientId[] = "d:"
ORG ":" DEVICE_TYPE ":"DEVICE_ID;
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 OUTPUT pinMode(9,
OUTPUT);//output for pump
}

void loop()

{

if (digitalRead(2) == HIGH)

{
digitalWrite(3, HIGH);       // turn the LED/Buzz ONdelay(10000); digitalWrite(3,

LOW);       // turn the LED/Buzz OFFdelay(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);
  }


  }
```

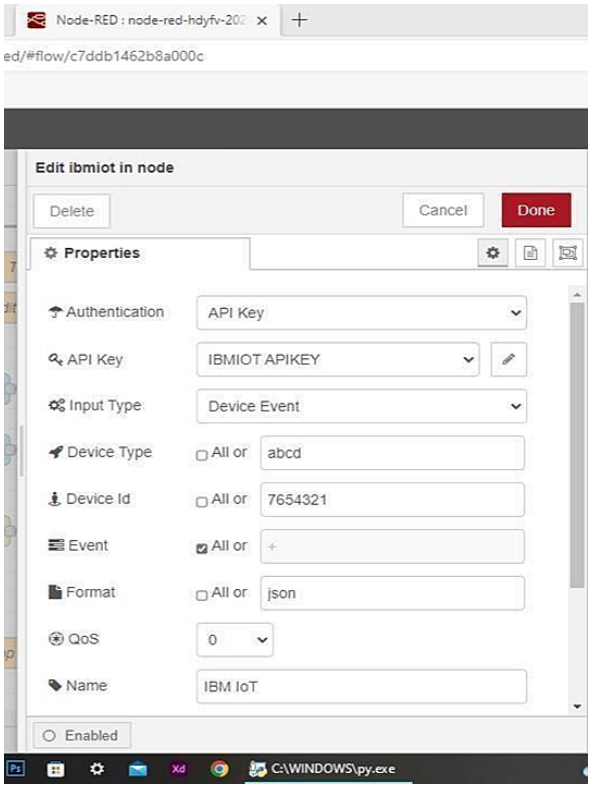
Output



7.2.Feature – 2

Configuration of Node-Red to send commands to IBM cloud

Ibmiot out node I used to send data from Node-Red to IBM Watson device. So, after adding it to the flow we need to configure it with credentials of our Watsondevice.



Here we add two buttons inUI 1 -> for motor on

2 -> for motor off

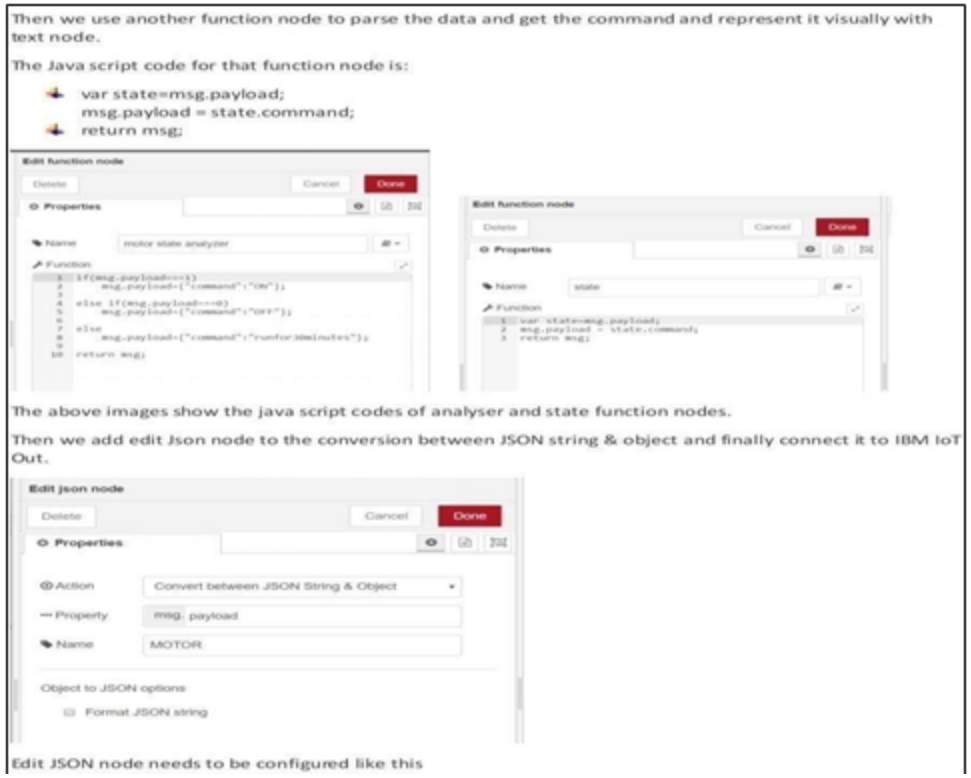
We used a function node to analyses the data received and assign command toeach number.

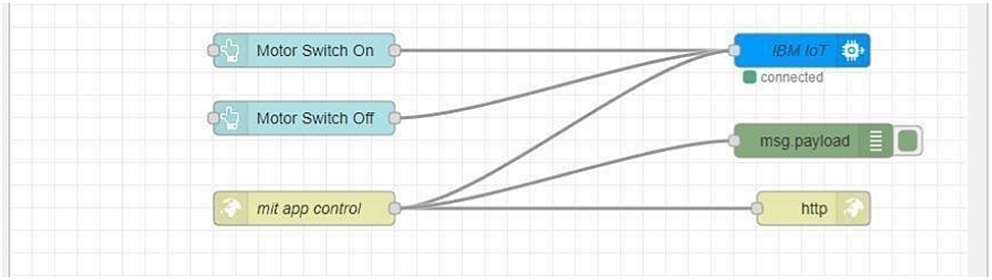
The Java script code for the analyses is:

if(msg.payload===1) msg.payload={"command”:

“ON"}; else if(msg.payload===0)

msg.payload={"command”: “OFF"};





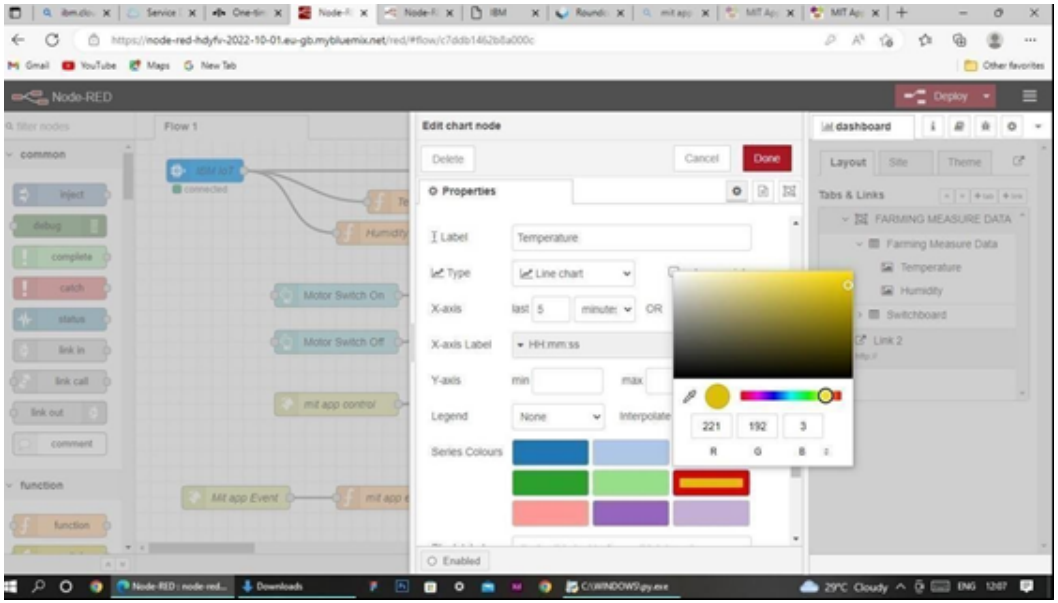
This is the program flow for sending commands to IBM cloud.

Adjusting User Interface

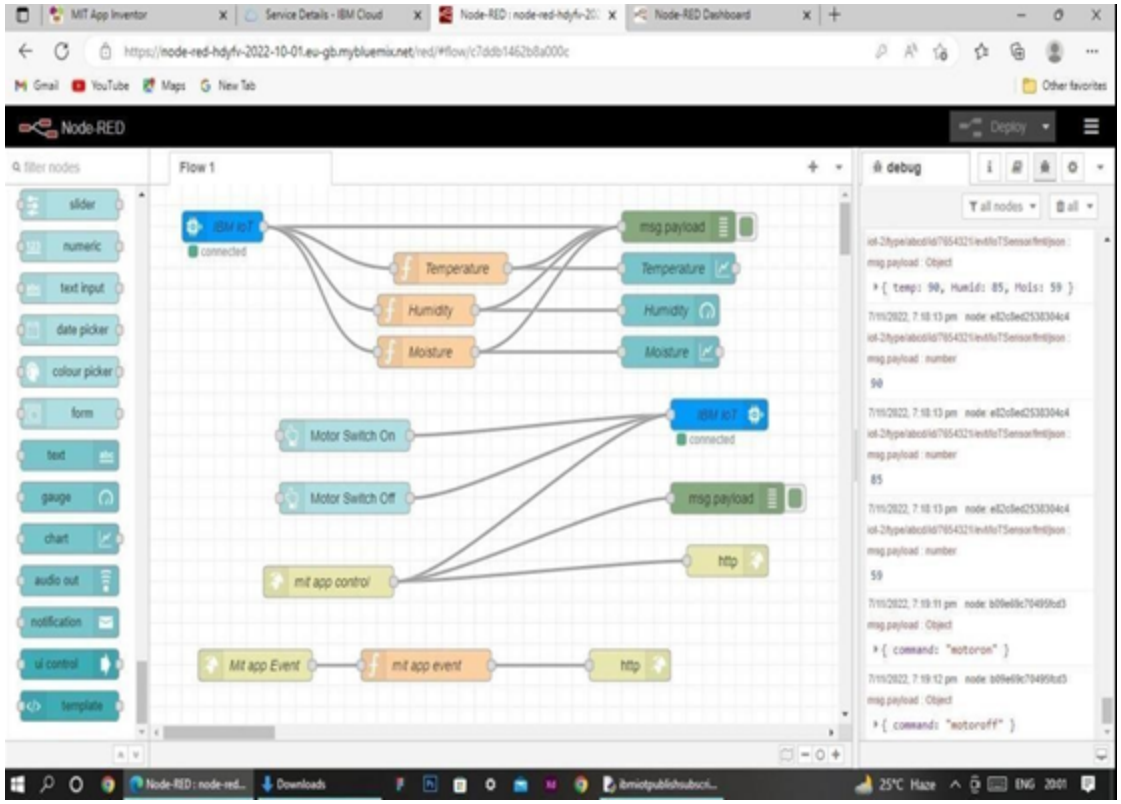
In order to display the parsed JSON data a Node-Red dashboard is created

Here we are using Gauges, text and button nodes to display in the UI and helps to monitor the parameters and control the farm equipment.

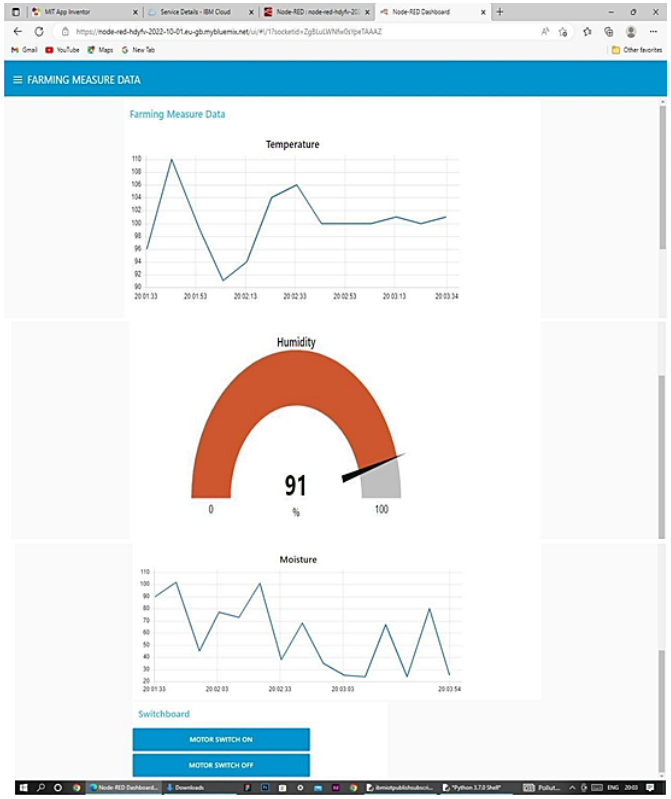
Below images are the Gauge, text and button node configurations.



Complete Program Flow



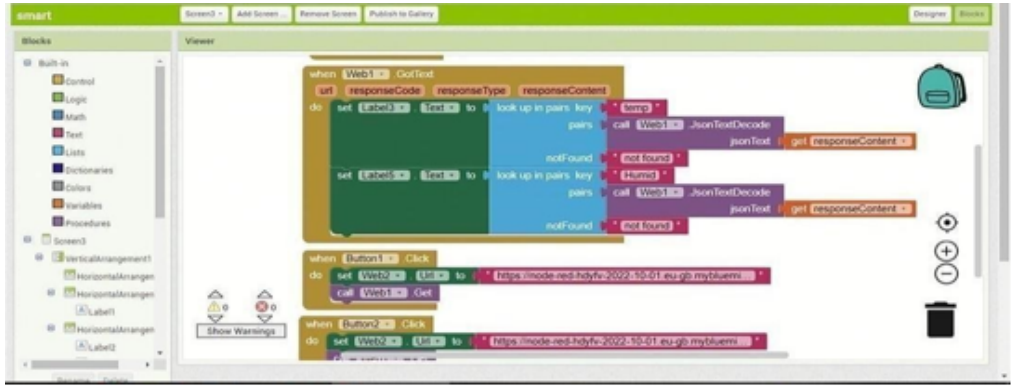
Web APP UI Home Tab

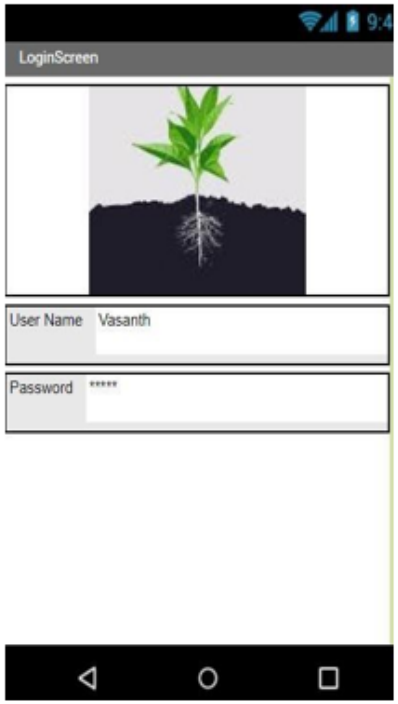


Mobile App UI

SMART FARMER APPLICATION

Blocks

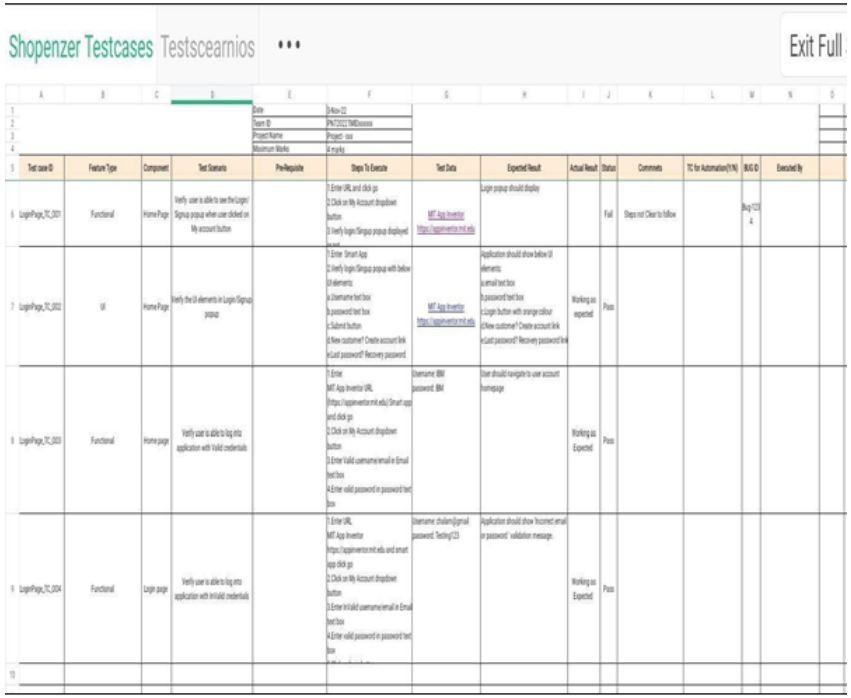

smart
Blocks
Viewer
Show Warnings


LoginScreen
User Name
Vasanth
Password
*****


Smart Farming
Soil Moisture
Humidity
Temperature

8.Testing

8.1.Test Cases



8.2.User Acceptance Testing

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

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. 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.

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

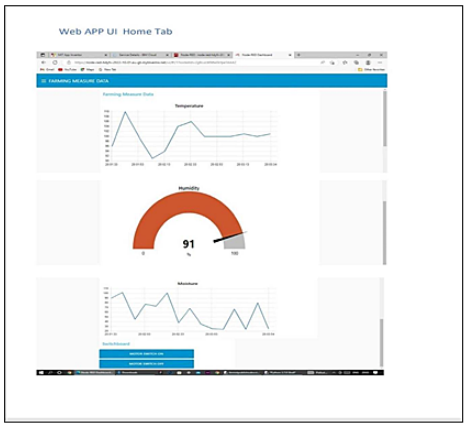
Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	8	3	2	2	16
Duplicate	1	0	2	0	3
External	2	3	0	1	6
Fixed	9	2	3	17	31
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	1	4	1	1	7
Totals	21	12	9	22	66

3. Test Case Analysis

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

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	5	0	0	5
Client Application	30	0	0	30
Security	2	0	0	2
Outsource Shipping	2	0	0	2
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	1	0	0	1

9.Result


Web APP UI Home Tab
FARMING MEASURE DATA
Farming Measure Data
Temperature
Humidity
91
%
0
100
Moisture
Switchboard


Screen1
Smart Farming
Soil Moisture
50 %
Humidity
Temperature
33 C
Pump ON
Pump OFF

10.Advantages & Disadvantages

Advantages:

- Farms can be monitored and controlled remotely.
- Increase in convenience to farmers.
- Less labor cost.
- Better standards of living.

Disadvantages:

- Lack of internet/connectivity issues.
- Added cost of internet and internet gateway infrastructure.
- Farmers wanted to adapt the use of WebApp.

11.Conclusion

An IoT-based SMART FARMING SYSTEM for live monitoring of temperature,humidity and soil moisture is proposed using Arduino and cloud computing. The system has high efficiency and accuracy in acquiring live temperature and soil moisture data. The IoT-based smart farming system proposed in this report constantly assists farmers by providing accurate live feeds of ambient temperature and soil moisture for over 99 curated results, thus enabling farmers to increase their agricultural yields and help manage food production efficiently.

12.Future Scope

By collecting data from Sensor with IoT devices, we can learn about the “real state” of Crops. In future, IoT system in agriculture enables predictive analytics and helps you make better harvest decisions. It is important to use the latest information and communication technology to manage the family in order to improve the quantity and quality of products while optimizing the human labor force. In between

Technologies available for today's glory: Soil, water, light, humidity and temperature control. Small Agricultural Products are designed to support field monitoring through the automation of automation systems using Sensors. As a result, Fame and associated volumes can easily monitor field conditions from anywhere.

13.Appendix

Links:

IBM cloud reference: https://cloud.ibm.com

Github link : https://github.com/IBM-EPBL/IBM-Project-17437-1659670304

IOT Watson simulator : https://157uf3.internetofthings.ibmcloud.com/dashboard/devices/browse

Node-Red:https://node-red-hdyfv-2022-10-01.eu-gb.mybluemix.net/red/%23flow/c7ddb1462b8a000c