SMART FARMER IOT ENABLED SMART FARMING APPLICATION

A PROJECT REPORT

Submitted by

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TEAM ID: PNT2022TMID49939

For the project

HX8001 PROFESSIONAL READYINESS FOR INNOVATION EMPLOYABLITY AND ENTREPRENEURSHIP

In the department of

ELECTRONICS AND COMMUNICATION ENGINEEING

EINSTEIN COLLEGE OF ENGINEEING, TIUNELVELI-627 012
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NOVEMBER:2022

BONAFIED CERTIFICATE

Certified this Report "**SMART FARMER IOT ENABLED SMART FARMING APPLICATION"**, for the project, is the bonafied work of **"P.MAYIL ANNAMALAI (Team Member) (950619106011), S.MUTHARASAN (Team Member) (950619106013), M.SELVIN (Team Lead) (950619106303), S.VIJAYA KUMAR (Team Member) (950619106305)"** who carried out the project work under my supervision. Certified further that to the best of my knowledge the work reported here in does not form part of any other thesis or any other candidate.

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A PROJECT REPORT ON

SMART FARMER IOT ENABLED SMART FARMING APPLICATION

Domain	**:**	Internet Of Things
Team ID	**:**	PNT2022TMID49939
College Name	**:**	Einstein College Of Engineering

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SMART FARMER IOT BASED ENABLED SMART FARMING APPLICATION

1. **INTRODUCTION**

   1.1 Project Overview

   1.2 Purpose

2. **LITERATURE SURVEY**

   2.1 Existing problem

   2.2 References

   2.3 Problem Statement Definition

3. **IDEATION & PROPOSED SOLUTION**

   3.1 Empathy Map Canvas

   3.2 Ideation & Brainstorming

   3.3 Proposed Solution

   3.4 Problem Solution fit

4. **REQUIREMENT ANALYSIS**

   4.1 Functional requirement

   4.2 Non-Functional requirements

5. **PROJECT DESIGN**

   5.1 Data Flow Diagrams

   5.2 Solution & Technical Architecture

   5.3 User Stories

6. **PROJECT PLANNING & SCHEDULING**

   6.1 Sprint Planning & Estimation

   6.2 Sprint Delivery Schedule

   6.3 Reports from JIRA

7. **CODING & SOLUTIONING (Explain the features added in the project along with code)**

   7.1 Feature 1

   7.2 Feature 2

   7.3 Database Schema (if Applicable)

8. TESTING

8.1 Test Cases

8.2 User Acceptance Testing

9. RESULTS

9.1 Performance Metrics

10. ADVANTAGES & DISADVANTAGES

11. CONCLUSION

12. FUTURE SCOPE

13. APPENDIX

Source Code

GitHub & Project Demo Link

1 INTRODUCTION

1.1 Project Overview:

With the rapid growth of population and the increasing demand for food worldwide, improving productivity in farming procedures is essential. Smart farming is a concept that emphasizes the use of modern technologies such as the Internet of Things (IoT) and artificial intelligence (AI) to enhance productivity in farming practices. In a smart farming scenario, large amounts of data are collected from diverse sources such as wireless sensor networks, network-connected weather stations, monitoring cameras, and smartphones. These data are valuable resources to be used in data-driven services and decision support systems (DSS) in farming applications. However, one of the major challenges with these large amounts of agriculture data is their immense diversity in terms of format and meaning. Moreover, the different services and technologies in a smart farming ecosystem have limited capability to work together due to the lack of standardized practices for data and system integration. These issues create a significant challenge in cooperative service provision, data and technology integration, and data-sharing practices. To address these issues, in this paper, we propose the platform approach, a design approach intended to guide building effective, reliable, and robust smart farming systems. The proposed platform approach considers six requirements for seamless integration, processing, and use of farm data. These requirements in a smart farming platform include interoperability, reliability, scalability, real-time data processing, end-to-end security and privacy, and standardized regulations and policies. A smart farming platform that considers these requirements leads to increased productivity, profitability, and performance of connected smart farms. In this paper, we aim at introducing the platform approach concept for smart farming and reviewing the requirements for this approach.

1.2 Purpose:

- IoT based Smart Farming **improves the entire Agriculture system by monitoring the field in real-time**.
- Smart farming **reduces the ecological footprint of farming.**
- Also reduced the extravagant use of resources such as Water and Electricity.
- 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 LITERATURE SURVEY

2.1 Existing problem:

Then food crops with the neip of the environment. Using the conventional techniques for agriculture, the labour work required for the farm is more to build a good crop yield. For an excellent crop yield, we need to protect the crop against pests. This pest control is done through traditional methods where farmers used to spray pesticides to kill the problems from the field by using sprays. There is a loss in the crop yield. As we don't know about the weather reports daily downstream and canal watering system. A proposed innovative agriculture system is brought out to convert loss-making traditional farming into high crop fielding and profit-making.

2.2 References:

Zuraida Muhammad, Muhammad Azri Asyraf Mohd Hafez, Nor Adni MatLeh, Zakiah Mohd Yusoff , Shabinar Abd Hamid [1] The term "Internet of Things" refers to the connection of objects, equipment, vehicles, and other electronic devices to a network for the purpose of data exchange (IoT). The Internet of Things (IoT) is increasingly being utilised to connect objects and collect data. As a result, the Internet of Things' use in agriculture is crucial. The idea behind the project is to create a smart agriculture system that is connected to the internet of things. The technology is combined with an irrigation system to deal with Malaysia's variable weather. This system's microcontroller is a Raspberry Pi 4 Model B. The temperature and humidity in the surrounding region, as well as the moisture level of the soil, are monitored using the DHT22 and soil moisture sensor. The data will be available on both a smartphone and a computer. As a result, Internet of Things (IoT) and Raspberry Pi-based Smart Agriculture Systems have a significant impact on how farmers work. It will have a good impact on agricultural productivity as well. In Malaysia, employing IoT-based irrigation systems saves roughly 24.44 percent per year when compared to traditional irrigation systems. This would save money on labour expenditures while also preventing water waste in daily needs.

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 best crop for the land. The sensor data is sent to the field manager through Wi-Fi, and the crop advice is created with the help of the mobile app. When the soil temperature is high, an automatic watering system is used. The crop image is gathered and forwarded to the field manager for pesticide advice.

H.G.C.R. Laksiri, H.A.C. Dharmagunawardhana, J.V. Wijayakulasooriya [3] Development of an effective loT-based smart irrigation system is also a crucial demand for farmers in the field of agriculture. This research develops a low-cost, weather-based smart watering system. To begin, an effective drip irrigation system must be devised that can automatically regulate water flow to plants based on soil moisture levels. Then, to make this water-saving irrigation system even more efficient, an IoT-based communication feature is added, allowing a remote user to monitor soil moisture conditions and manually adjust water flow. The system also includes temperature, humidity, and rain drop sensors, which have been updated to allow remote monitoring of these parameters through the internet. In real time, these field weather variables are stored in a remote database. Finally, based on the present weather conditions, a weather prediction algorithm is employed to manage water distribution. Farmers would be able to irrigate their crops more efficiently with the proposed smart irrigation system.

Anushree Math, Layak Ali, Pruthviraj U[4] India is a country where agriculture plays a vital role. As a result, it's critical to water the plants wisely in order to maximise yield per unit space and so achieve good output. Irrigation is the process of providing a certain amount of water to plants at a specific time. The purpose of this project is to water the plants on the National Institute of Technology Karnataka campus with a smart drip irrigation system. To do this, the open source platform is used as the system's fundamental controller. Various sensors have been employed to supply the current parameters of components that impact plant healthiness on a continual basis. By controlling a solenoid valve, water is provided to the plants at regular intervals depending on the information acquired from the RTC module. The webpage may be used to monitor and manage the complete irrigation system. This website contains a function that allows you to manually or automatically control plant watering. The health of the plants is monitored using a Raspberry Pi camera that gives live streaming to the webpage. The controller receives water flow data from the water flow sensor through a wireless network. The controller analyses this data to see if there are any leaks in the pipe. Forecasting the weather is also done to restrict the quantity of water given, making it more predictable and efficient.

Dweepayan Mishra, Arzeena Khan, Rajeev Tiwari, Shuchi Upadhaye [5] Agriculture is a substantial source of revenue for Indians and has a huge impact on the Indian economy. Crop development is essential for enhanced yield and higher-quality delivery. As a result, crop beds with ideal conditions and appropriate moisture can have a big influence on output. Traditional irrigation systems, such as stream flows from one end to the other, are usually used. As a result of this delivery, the moisture levels in the fields can alter. A designed watering system can help to enhance the management of the water system. This research proposes a terrain-specific programmable water system that will save human work while simultaneously improving water efficiency and agricultural productivity. The setup is made up of an Arduino kit, a moisture sensor, and a Wi-Fi module. Data is acquired by connecting our experimental system to a cloud framework. After then, cloud services analyse the data and take the necessary actions.

R. Nageswara Rao, B.Sridhar [6] Agrarian countries like India rely heavily on agriculture for their development. Agriculture has always been a roadblock to the country's development. Smart agriculture, which comprises modernising present agricultural systems, is the only answer to this challenge. As a result, the suggested strategy attempts to use automation and Internet of Things technologies to make agriculture smarter. Crop growth monitoring and selection, irrigation decision assistance, and other uses are possible thanks to the Internet of Things (IoT). To modernise and boost crop yield, a Raspberry Pi-based autonomous irrigation IOT system has been proposed. This project's main purpose is to produce crops using the least amount of water possible. Most farmers waste a lot of time in the fields in order to focus on water available to plants at the appropriate time. Water management should be improved, and the system circuit's complexity should be minimised. Based on the data collected from the sensors, the suggested system determines the amount of water required. Two sensors detect the humidity and temperature of the soil, as well as the humidity, temperature, and length of sunshine each day, and send the data to the base station. Based on these characteristics, the recommended systems must calculate the irrigation water quantity. The key benefit of the system is the integration of Precision Agriculture (PA) and cloud computing, which will reduce water fertiliser consumption while increasing crop yields and assisting in the evaluation of field weather conditions.

Shweta B. Saraf, Dhanashri H. Gawali [7] The Internet of Things (IoT) is the internet-based connectivity of a huge number of devices (IoT). A unique identity links each item, allowing data to be sent without human involvement It makes it possible to develop strategies for improved natural resource management. Smart gadgets with sensors, according to the IoT concept, enable interaction with the physical and logical worlds. The proposed system in this study is built on the Internet of Things and uses real-time input data. Over a wireless sensor network, a smart farm irrigation system uses an Android phone to remotely monitor and regulate drips. Between sensor nodes and base stations, Zigbee is utilised to communicate. A web-based java graphical user interface is used to process and present the server's real-time observed data. Field irrigation system wireless monitoring eliminates human interaction and enables for remote monitoring and control using an Android phone.

Cloud computing is a potential choice due to the large volume of data created by the wireless sensor network. This research presents and examines a cloud-based wireless communication system for monitoring and controlling a collection of sensors and actuators in order to determine the water needs of plants.

Shrihari M[8] The concept of automating agricultural production has been around since the early 1990s, and one of the primary challenges that both scientists and farmers confront is irrigation. Irrigation is a dynamic system that is heavily reliant on outside influences. This article describes a method that uses a custom-built mathematical model to handle data from wireless sensors on Google Cloud, resulting in a smart system. An IoT-enabled design that can scale up to big farms. According to Holistic Agricultural Studies, around 35 have been damaged by animals and people. This intelligent system uses Tensor flow and deep learning neural networks to recognise animals depending on their threat level, as well as human intruders who are not authorised on the farm, and to alert the farmer immediately. An android application is included with the device, which allows for remote access and surveillance through live video streaming.

G. Sushanth, and S. Sujatha [9] Smart agriculture is a novel concept since IoT sensors can offer information about agricultural regions and then act on it based on user input. The purpose of this study is to develop a smart agricultural system that utilises cutting-edge technologies such as Arduino, Internet of Things, and wireless sensor networks. Through automation, the research tries to take use of emerging technologies such as the Internet of Things (IoT) and smart agriculture. The capacity to monitor environmental factors is a critical component in increasing crop efficiency. The purpose of this study is to develop a system that can monitor temperature, humidity, wetness, and even the movement of animals that might damage crops in agricultural areas using sensors, and then send an SMS notification as well as a notification on the app developed for the same to the farmer's smartphone via Wi-Fi/3G/4G if there is a discrepancy. The system uses a duplex communication link based on a cellular Internet interface, which allows data inspection and irrigation schedule to be changed using an android app. Because of its energy independence and inexpensive cost, the gadget has the potential to be useful in water-scarce, geographically isolated areas.

Vaishali S, Suraj S, Vignesh G, Dhivya S and Udhayakumar S [10] From the beginning of time, agriculture has been the most important practise in human society. Traditional irrigation methods, such overhead sprinklers and flood irrigation, are inefficient. They waste a lot of water and may even make people sick by causing fungus growth in the soil due to too much moisture. Due to the scarcity of water, an automated irrigation system is essential for water conservation and, as a result, agricultural profitability. Irrigation consumes around 85% of the world's total accessible water resources. This need is projected to increase in the coming years as the population grows. To meet this need, we must employ creative methods that lower the quantity of water utilised in irrigation. Sensors in the automated system monitor the availability of water to the crops, and watering is done as needed through controlled irrigation. Because of its practically limitless storage and processing capabilities, as well as its fast flexibility, cloud computing is an intriguing solution to the massive amount of data generated. The objective is to focus on factors like as temperature and soil moisture. This is a mobile integrated and smart irrigation system based on an Internet of Things-enabled application-controlled monitoring system. The main purpose of this project is to regulate the water supply and monitor the plants using a Smartphone.

Hamza BENYEZZA,Mounir BOUHEDDA,Khaoula DJELLOUT,Amina SAIDI [11] Water management currently global problem to all of us to tackle them in near future we need to plan it smartly. As we are living in modern world filled with lots of useful sensors from which we can designed systems with water saving capabilities. The work in this paper is focusing on increasing effective use of water using field assist to farmer. Basically it works with soil moisture sensor which gives finding of moisture level in soil and reconnects with Thing Speaks cloud via Wi-Fi module ESP8266 to observation of soil conditions. Proposed system also set with an algorithm such that on soil moisture pattern data it can predict decision on irrigation of crops. system also warns farmer about empty water source if it occurs . benefits of using this system also includes weather prediction through website. The device has the potential to be beneficial in water-scarce, geographically isolated places due to its energy independence and low cost. The fact that the technology is simple to use for farmers adds to its utility. It also saves water by preventing waste.

Shiny Rajendrakumar, Prof. V K Parvati, Prof. Rajashekarappa [12] Agricultural Irrigation is very important for the production of crops. Many methods have developed to save water in different ways. In traditional irrigation systems we require an operator or farmer to put water on crops but he does not come to know which crop require how much amount of water to get proper amount of yields. Irrigation means planting the crops by water. There are so many traditional irrigation methods, but all these methods consume large amount of water. Automated irrigation is the method which saves the water from up to 97% as compared to traditional methods. By using these modern methods like ICT productivity can be improved without unnecessary wastage of water. Here we are concentrating on loT.

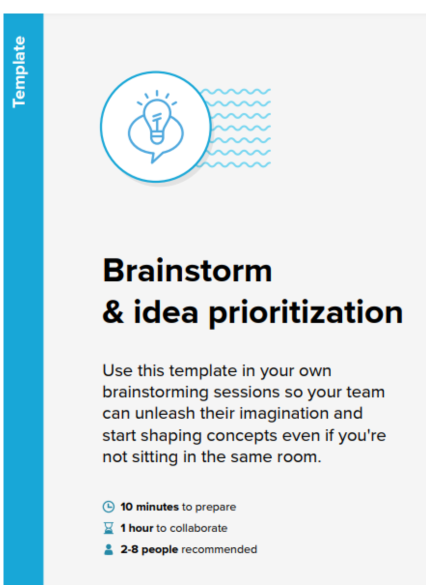
2.3 Problem Statement Definition:

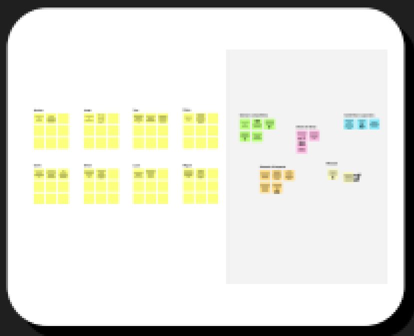
To provide efficient decision web using wireless sensor network which handle different activities of farm and provides useful information associated with farm. Information associated with Soil moisture, Temperature and Humidity content. Due to the atmospheric condition, water level increasing Farmers 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

3.1Empathy Map Canvas:

3.2 Ideation & Brainstorming:





Need some inspiration?

See a finished version of this template to kickstart your work.

Open example →

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A **Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B **Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.

C **Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1

Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM

How might we [your problem statement]?

Key rules of brainstorming

To run an smooth and productive session

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

Selvin

- Detect the water level
- Increase the temperature, At a time run the motor
- Temperature is increase but the moisture content is high
- If the sensor doesn't work properly, then the motor will off automatically within a certain period
- the sytem will also detect the speed of the wind and alert the farmer

Mayil annamalai

- Adopt and learn new technologies
- Distribute connectivity to the cloud
- Invest in farm productivty
- "Satisfy consumer" changing taste and expectations
- Poor internet connectivity

Mutharasan

- the system will also detect the pipe damage and report to the user
- the system will also detect the motor damage and report to the user
- the system will also detect the phase is single or three phase
- If there is no water in the well then the system will detect and alert the farmer
- It will also detect the movement of animals and inform to the user by buzzer

Vijaya kumar

- good living conditions and hygiene for livestock
- Possibility of good quality food products
- its not Risks to human health
- it is more efficient than normal farming
- monitoring quality of soil in real time

3

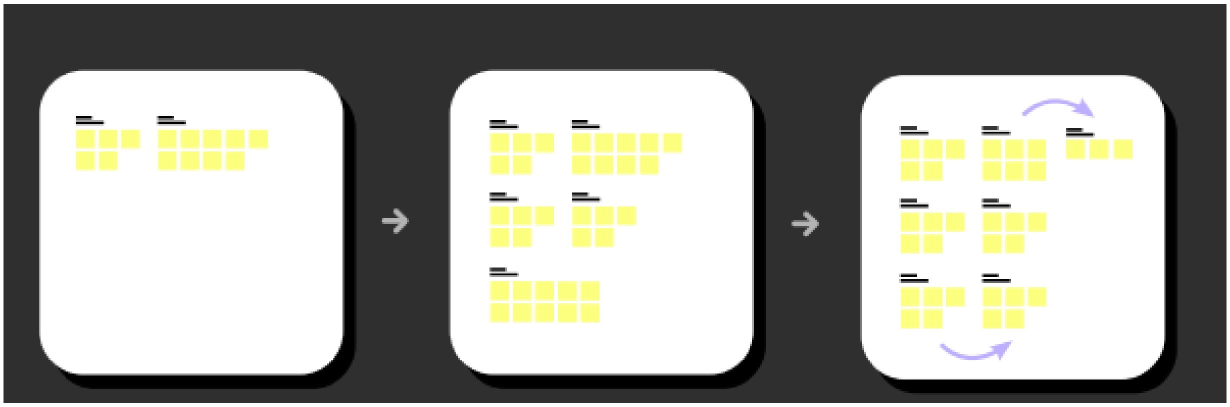
Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, 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

TIP

Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

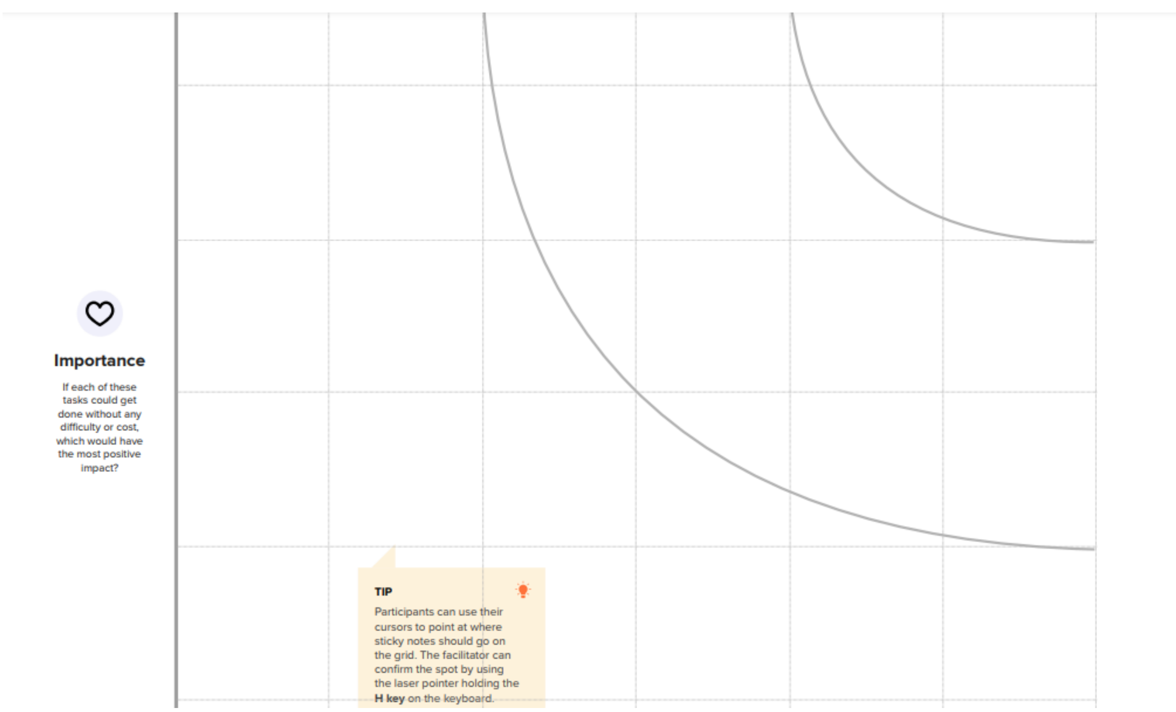


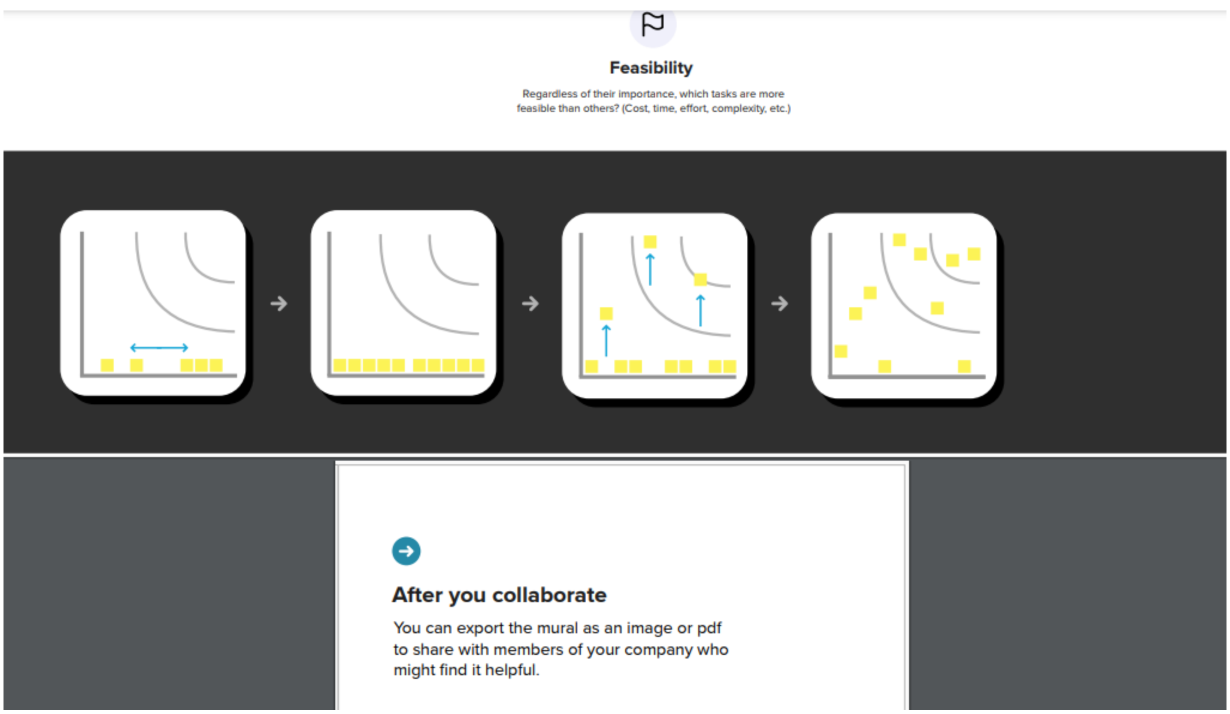
4

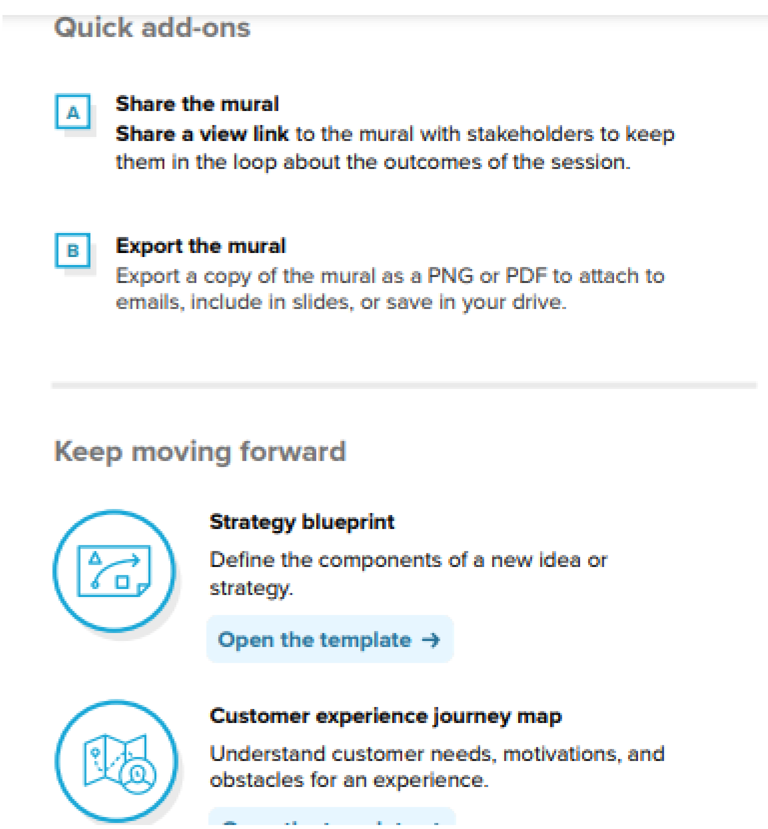
Prioritize

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







3.3 Proposed Solution:

S.No	Parameter	Description
1	Problem statement(problem to be solved)	In case of animal movement, the system may destroy.
2	Idea / Solution description	The system will produce high noise if it detect any movement of the animal.
3	Novelty / Uniqueness	The sensing and processing time is lower than the existing method.
4	Social Impact / Customer Satisfaction	It helps the farmer to perform multi tasking.
5	Business Model (Revenue Model)	This project is profitable because of its efficiency and its importance.
6	Scalability of the Solution	More no of users can be handled.

3.4 Problem Solution fit:

Customer Segment:

Farmers are our main customer.

Customer Constraints:

System hardware need to be handled with care.

Only limited users are added to handle the system

Only the person who authorized to system able to access it.

Available Solution:

They project proposes an IoT Based low-cost system to quality of sand in real time, analyse

Jobs-To-Be-Done/Problems:

Some times the sensor may get damaged due to animal movement .

Triggers:

The Customers get triggered when they read a more efficient solution in the news

Emotions: Before/After

Any farmers will be affected if there is no system to monitor quality of sand.

Problem Root Cause:

He to the sudden change in the climet, the standard of the soil variestime to time.

Your Solution:

Toper implementation helps to avoid missing of data

Behaviour:

There project resemble with the existing system that both the systems will collect the sand quality parameters and monitors.

Channel of Behaviour:

Mainly our customers are the farmers.

4.REQUIREMENT ANALYSIS

4.1 Functional requirement:

FR-NO	Functional Requirements(Epic)	Sub Requirement(story/Sub-Task)
FR-1	User Registration	Registration through Form Registration through G-mail Registration through Linked IN
FR-2	User conformation	Confirmation via Email Confirmation via OTP
FR-3	Login	Login through Email Login through Gmail
FR-4	Dashboard	Access the Dashboard

4.2 Non Functional requirement:

NFR-NO	Non-Functional Requirements	Description
NFR-1	Usability	It also helps you to give the right information to user to the user as per their needs.
NFR-2	Security	Security farmer system are a required administrative safeguard under the mobile

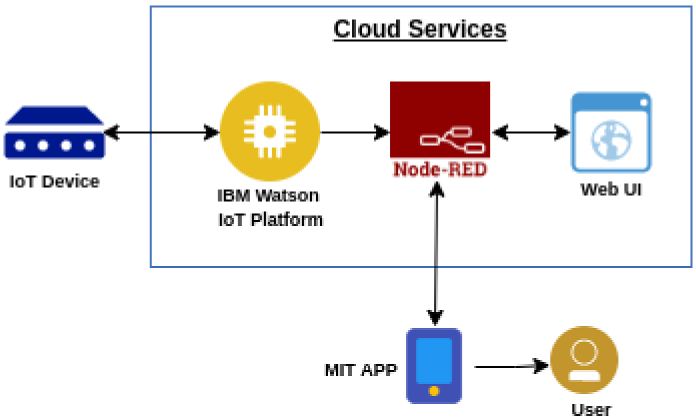
		application security rule.
NFR-3	Reliability	Each office should establish a simple, reliable tracking and farmer system to facilitate communication.
NFR-4	Performance	Farmer systems are effective at improving cancellation, rescheduling of appointments.
NFR-5	Availability	In this farmer system scheduling tool which provides a reliable, very simple to use and fast solution to schedule meetings.
NFR-6	Scalability	Possibility of increasing or decreasing the system power according to the needs of the moments and customer availability.

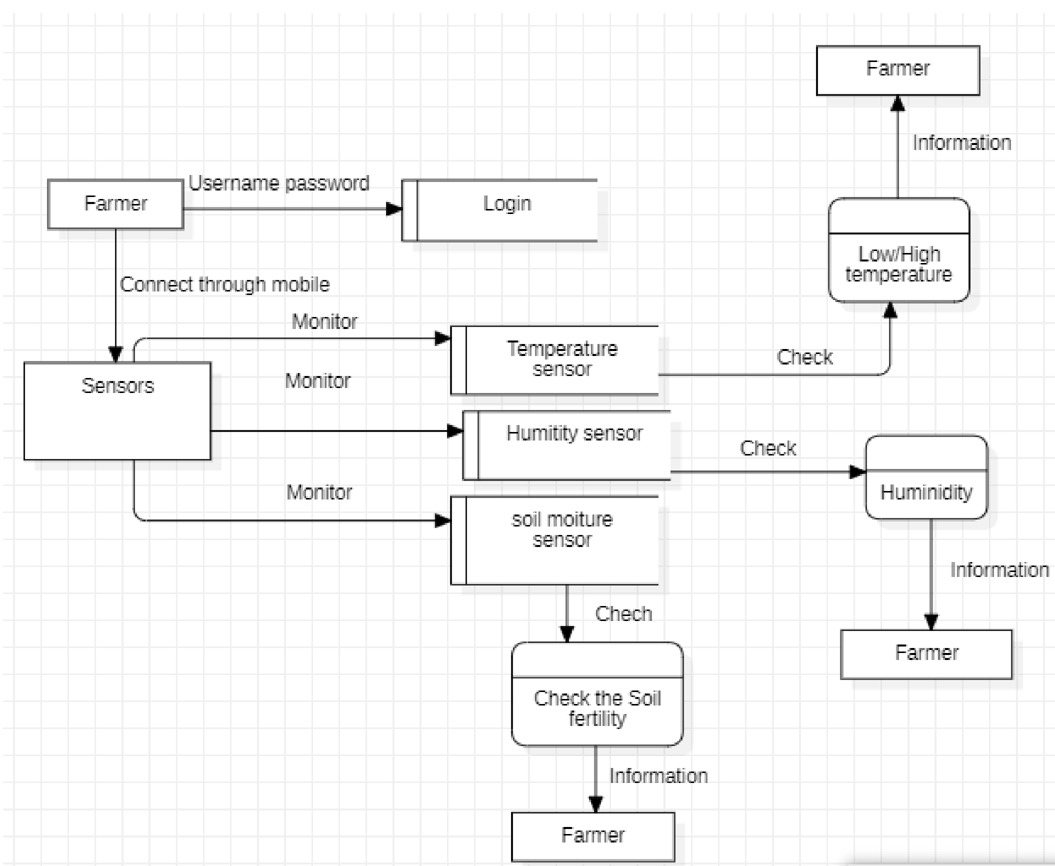
5 PROJECT DESIGN

5.1 Data Flow Diagrams:

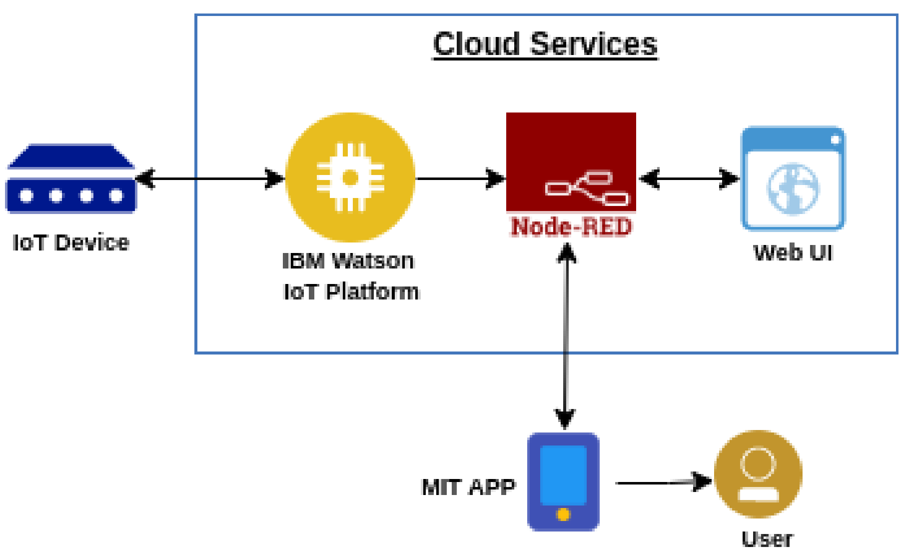
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Flow:





5.2 Solution & Technical Architecture:



5.3 User Stories:

- 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.

6 PROJECT PLANNING & SCHEDULING

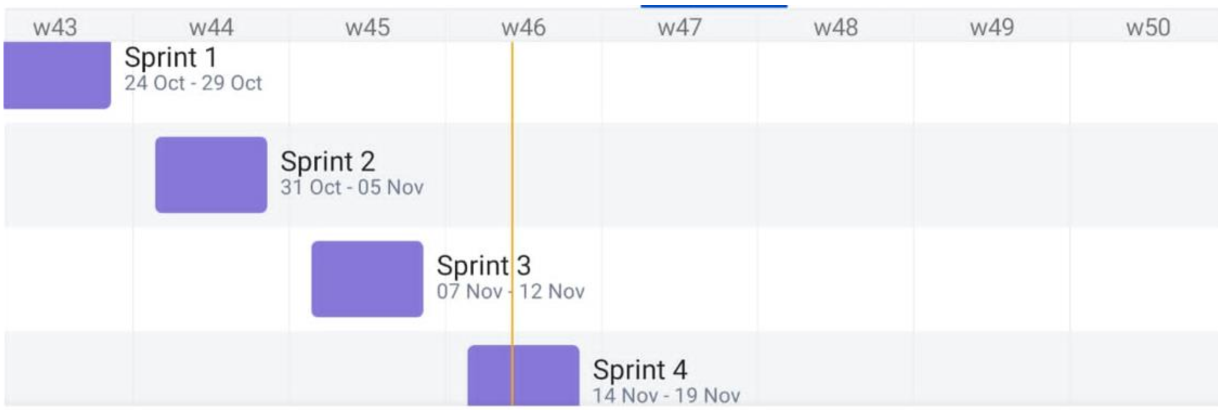
6.1 Sprint Planning & Estimation:

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 email, password, and confirming my password.	2	High	M.Selvin
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	S.Mutharasan
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	P.Mayil Annamalai
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	S.Vijaya Kumar
Sprint-1	Login	USN-5	As a user, I can log into the application by Entering email & password	1	High	M.Selvin

6.2 Sprint Delivery Shedule:

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	20	06 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	14 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 Reports from JIRA



7 CODING & SOLUTIONING (Explain the features added in the project along with code)

7.1 Feature 1:

```
Import
time
    import sys
    import ibmiotf.application # to install pip install ibmiotf
    import ibmiotf.device
    #Provide your IBM Watson Device Credentials
    organization = "hrodmj" #replace the ORG ID
    deviceType = "NODEMCU1"#replace the Device type wi
    deviceId = "12345"#replace Device ID
    authMethod = "token"
    authToken = "abhi1234" #Replace the authtoken
    def myCommandCallback(cmd): # function for Callback
        print("Command received: %s" % cmd.data)
        if cmd.data['command']=='motoron':
            print("Motor On IS RECEIVED")

        elif cmd.data['command']=='motoroff':
            print("Motor Off IS RECEIVED")
```

```
        if cmd.command == "setInterval":

                if 'interval' not in cmd.data:
                        print("Error - command is missing required information: 'interval'")
                else:
                        interval = cmd.data['interval']
        elif cmd.command == "print":
                if 'message' not in cmd.data:
                        print("Error - command is missing required information: 'message'")
                else:
                        output=cmd.data['message']
                        print(output)
try:
        deviceOptions = {"org": organization, "type": deviceType, "id": deviceId,
"auth-method": authMethod, "auth-token": authToken}
        deviceCli = ibmiotf.device.Client(deviceOptions)

except Exception as e:
        print("Caught exception connecting device: %s" % str(e))
        sys.exit()
# Connect and send a datapoint "hello" with value "world" into the cloud as an event
of type "greeting" 10 times
deviceCli.connect()
while True:

        deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

7.2 Feature 2:

```
#include <ESP8266WiFi.h>
 #include <ESP8266HTTPClient.h>
 #include <Adafruit_ADS1015.h>
 WiFiClient client;
 String thingSpeakAddress= "http://api.thingspeak.com/update?";
 String writeAPIKey;
 String tsfield1Name;
 String request_string;
 HTTPClient http;
 Adafruit_ADS1115 ads;
 void setup()
 {
 Serial.begin(115200);
 delay(3000);
 WiFi.disconnect();
 Serial.println("START");
 WiFi.begin("DESKTOP","asdfghjkl");
 // Wifi ("ID","Password") while ((!(WiFi.status() == WL_CONNECTED)))
{
 delay(300);
 Serial.println("...");
 }
 Serial.println("I AM CONNECTED");
 Serial.println("Hello!");
 Serial.println("Getting single-ended readings from AIN0..3");
 Serial.println("ADC Range: +/- 6.144V (1 bit = 3mV/ADS1015,
0.1875mV/ADS1115)");
 ads.begin();
 }
void loop()
 {
 int16_t adc0, adc1, adc2, adc3; Serial.println(" ");
 adc0 = ads.readADC_SingleEnded(0);
 adc0 = adc0 / 25; adc1 = ads.readADC_SingleEnded(1);
```

```
adc1 = adc1 / 25; adc2 = ads.readADC_SingleEnded(2);
adc2 = adc2 / 25; adc3 = ads.readADC_SingleEnded(3);
adc3 = adc3 / 25;
Serial.print("SOIL MOISTURE in persent 1% : ");
Serial.println(adc0);
Serial.print("SOIL MOISTURE in persent 2% : ");
Serial.println(adc1);
Serial.print("SOIL MOISTURE in persent 3% : ");
Serial.println(adc2);
Serial.print("SOIL MOISTURE in persent 4% : ");
Serial.println(adc3);
Serial.println(" ");
If (client.connect("api.thingspeak.com",80))
{
request_string = thingSpeakAddress;
request_string += "key=";
request_string += "2YGO2FHN3XI3GFE7";
request_string += "&";
request_string += "field1";
request_string += "=";
request_string += adc0;
http.begin(request_string);
http.GET();
http.end();
}
delay(10);
if(client.connect("api.thingspeak.com",80))
{
request_string = thingSpeakAddress;
request_string += "key=";
request_string += "2YGO2FHN3XI3GFE7";
request_string += "&";
request_string += "field2";
request_string += "=";
```

```
 request_string += adc1;
 http.begin(request_string);
 http.GET();
 http.end();
}
 delay(10);
 if (client.connect("api.thingspeak.com",80))
 {
 request_string = thingSpeakAddress;
 request_string += "key=";
 request_string += "2YGO2FHN3XI3GFE7";
 request_string += "&";
 request_string += "field3";
 request_string += "=";
 request_string += adc2;
 http.begin(request_string);
 http.GET(); http.end();
 }
 delay(10);
 if (client.connect("api.thingspeak.com",80))
 {
 request_string = thingSpeakAddress;
 request_string += "key=";
 request_string += "2YGO2FHN3XI3GFE7";
 request_string += "&";
 request_string += "field4";
 request_string += "=";
 request_string += adc3;
 http.begin(request_string);
 http.GET();
 http.end();
 }
 delay(10);
 }
```

8. TESTING

8.1 Test Cases:

Date	4 Nov 2022
Team ID	PNT2022TMID49915
Project Name	Smart farmer-iot based enabled smart farming application
Maximum marks	4 Marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets
LoginPage_TC_OO1	UI	Home Page	Verify user is able to see the Login		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup displayed or not	https://127.0.0.1 4000/	Login/Signup popup should display	Working as expected	Pass	
LoginPage_TC_OO2	UI	Home Page	Verify the UI elements in Login/Signup popup		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link e.Last password? Recovery password link	https://shopenzer.com/	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Last password? Recovery password link	Working as expected	Pass	
LoginPage_TC_OO3	UI	Home page	Verify user is able to log into application with Valid credentials		1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: chalam@gmail.com password: Testing123	User should navigate to user account homepage	Working as expected	Pass	
LoginPage_TC_OO4	Functional	Web page	Verify user is able to viwe the soil moisture,temperature and weather		1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter InValid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	a.soil moisture=6.5 b.temperature=57.6 c c.weather=7.7	User should show that the			
LoginPage_TC_OO4	Functional	Web page	Verify user is able to viwe the soil moisture,temperature and weather		1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter Invalid password in password text box 5.Click on login button	a.soil moisture=10.5 b.temperature=77.6 c c.weather=9.7	Application should show that the temperature is out of range. The soil moisture is not good.	not working	fail	
LoginPage_TC_OO5	Functional	web page	Verify user can able to viwe the temperature and weather and soil moisture.		1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter InValid username/email in Email text box 4.Enter Invalid password in password text box 5.Click on login button	a.soil moisture=7.3 b.temperature=65.6 c c.weather=8.2	Application should show that the weather is out of range. The soil moisture is not good.	working as expected	pass	

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 smart farmer- iot based enabled smart farming application project at the time of the release to User Acceptance Testing (UAT).

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	9	5	3	2	19
Duplicate	2	0	2	0	4
External	3	4	0	2	9
Fixed	10	3	2	18	33
Not Reproduced	0	0	2	0	2
Skipped	0	1	1	2	4
Won't Fix	0	6	2	2	10
Totals	24	19	12	26	81

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	7	0	0	7
Client Application	49	0	0	49
Security	2	0	0	2
Outsource Shipping	3	0	0	3

Exception Reporting	8	0	0	8
Final Report Output	4	0	0	4
Version Control	2	0	0	2

8. RESULTS

8.3 Performance


Personal Hotspot : 1 connections, Used 431 MB
Screen1
Smart Agriculture Using IoT
From IBM IoT_sensor
Temperature
15
Humidity
76
Object Temp
24
From Open_Weather
Temperature
30
Humidity
56
Pressure
1007
Region
Salem
Weather
overcast clouds
Alert
humidity is high
Motor ON
Motor OFF

9. ADVANTAGES & DISADVANTAGES

Advantages:

1. Intelligent data collection

Sensors installed on IoT devices are able to collect a large volume of useful information for farmers. As we mentioned below, some examples are climatic conditions, soil quality and plantation progress.

Such data can be used to monitor the status of the farm, as well as the performance of workers and the efficiency of the appliances.

2. Waste reduction

With greater production control, IoT in agriculture facilitates cost-efficient management. From smart devices, producers can more accurately identify any anomaly in the crop, for example.

Consequently, it is easier to effectively prevent any infestation that will harm yields.

In addition, one can also save in the process of irrigation and fertilization.

After all, there are sensors installed in the agricultural machinery, which can generate a lot of information about the soil.

Another advantage is the possibility of programming the sensors to notify about the ideal harvest time. In this way, waste is avoided in the crop.

3. Process automation

From smart devices, it is also possible to automate several stages of the production process, such as irrigation, fertilization or pest control.

By getting rid of these manual interventions, you get higher accuracy, better product quality and save resources. Thus, agriculture ensures higher standards of quality in the harvest.

4. Animal monitoring

With IoT, farmers can monitor the health of farm animals closely, even if they are physically distant.

Thus, one can reduce the search time of cows and sheep in the pasture, for example, if they are part of the herd.

It is also possible to monitor the pregnancy of these animals and identify which of them are sick. If so, the sensor sends a notification to the producer to contact a veterinarian.

5. Competitive advantage

One more benefit is increased harvest —as we mentioned in the above topics— that yields a competitive advantage in business. To exemplify, we can mention preventive maintenance.

Once sensors are installed on a tractor, for example, the collected data can quickly notify whenever any technical failure arises.

Disadvantage:

In the case of equipment like robots and computer-based intelligence for running the devices, it is highly unlikely that a normal farmer will be able to possess this knowledge or even develop them.

Farmers are not used to these high-end technologies. They do not understand computer language or the artificial intelligence.

For the smart agriculture, Internet of Things is essential which will require artificial intelligence and computer-based intelligence. This cannot be balanced here.

To overcome this challenge, the devices will have to be changed in a dramatic fashion so as to make it understandable for farmers.

As said earlier, if the devices are to be altered according to the level of the farmers, it will involve a lot of money to transform these types of equipment.

This, on the other hand, means that the process will cost huge money.

Since the farming industry does not see higher profits, huge investments in this space are unlikely.

Even after the altering of machines, there are chances where the farmers might tend to operate the machines wrongly causing it to damage or send it to repair.

Since these pieces of equipment are already costly, repairing it or replacing it will again cost a lot of money.

10. CONCLUSION

Agriculture production systems and food systems must undergo significant transformations to meet the interlinked challenges of achieving sustainability, ensuring food security and addressing climate change. Increasing resource efficiency is essential to increase and safeguard food security in the long term and making a significant contribution climate change mitigation. With the increased risks from the impacts of climate change, efficiency and resilience have to be considered together at every scale and from environmental, economic and social perspectives. Climate-smart agriculture is a dynamic approach that guides the needed changes towards addressing the challenges of climate change. It is not a new agricultural system, nor a set of practices. It articulates globally applicable principles for managing agriculture for food security under changing climatic conditions, which can serve as the basis for policy support and recommendations by multilateral organizations. Climate-smart agriculture provides a framework for putting in place comprehensive policies, adequate institutions and proper governance to implement sustainable, climate-sensitive development strategies. The framework can also be used for channelling new financing to address the investment needs for research organizations and enable farmers to overcome the barriers, including up-front costs and temporarily foregone income, to the adoption of climate-smart agriculture practices.

11. FUTURE SCOPE

In India, the major problem is farmers are poor, farming mainly subsistence and small size landholding. In India, more than 57.8% of farmers' land holdings size is less than 1ha. However, in major agricultural states like Punjab, Haryana, Uttar Pradesh, and Gujarat, more than a quarter of the population has an operating holding size of more than 4 hectares (Shanwad et. al. 2004). Although these are individual landholdings, the field sizes are considerable when considering contiguous fields with the same crop. According to aerial data, more than half of contiguous field sizes in Punjab's Patiala district are bigger than 15 hectares. For the sake of implementing smart farming, these contiguous fields can be regarded as one field. Smart farming has the potential to be used for important food-grain crops such as rice and wheat, particularly in Punjab and Haryana. In India, however, several horticultural crops with high profits have a significant potential for smart farming.

There is a scope for implementation of smart farming for major food-grain crops such as rice,

wheat, especially in the states of Punjab and Haryana. However, many horticultural crops in

India, which are high profit making crops, have wide scope for smart farming.

12. APPENDIX

- **SOURCE CODE**
- **GITHUB & PROJECT REPORT LINK**

Source Code:

```
#include <ESP8266WiFi.h>
#include <ESP8266HTTPClient.h>
String thingSpeakAddress= "http://api.thingspeak.com/update?";
String writeAPIKey;
String tsfield1Name;
String request_string,request_string1;
HTTPClient http;
#include <DHT.h>
#include <ESP8266WiFi.h>
String apiKey = "77921LPMGM2OAGQE";
char *ssid = "DESKTOP";
char *pass = "asdfghjkl";
char* server = "api.thingspeak.com";
#define DHTPIN 0
dht(DHTPIN, DHT11);
WiFiClient client;
void setup()
{
dht.begin();
Serial.begin(115200);
delay(3000);
WiFi.disconnect();
Serial.println("START");
WiFi.begin("DESKTOP","asdfghjkl");
while ((!(WiFi.status() == WL_CONNECTED)))
{
delay(300);
```

```
 Serial.println("...");
 }
 Serial.println("I AM CONNECTED");
}
 void loop()
 {
 if (client.connect("api.thingspeak.com",80))
 {
 request_string = thingSpeakAddress;
 request_string += "key=";
 request_string += "77921LPMGM2OAGQE";
 request_string += "&";
 request_string += "field3";
 request_string += "=";
 request_string += analogRead(A0);
 http.begin(request_string);
 http.GET();
 http.end();
 }
 delay(10);
 float h = dht.readHumidity();
 float t = dht.readTemperature();
 if (isnan(h) || isnan(t))
{
 Serial.println("Failed to read from DHT sensor!");
 return;
 }
 if (client.connect(server,80))
 {
 String postStr = apiKey;
 postStr +="&field1=";
 postStr += String(t);
 postStr +="&field2=";
 postStr += String(h);
```

```
 postStr += "\r\n\r\n";
 client.print("POST /update HTTP/1.1\n");
 client.print("Host: api.thingspeak.com\n");
 client.print("Connection: close\n");
 client.print("X-THINGSPEAKAPIKEY: "+apiKey+"\n");
 client.print("Content-Type:    application/x-www-form-urlencoded\n");    client.print("Content-
Length: ");
 client.print(postStr.length());
 client.print("\n\n");
 client.print(postStr);
 Serial.print("Temperature: ");
 Serial.print(t);
 Serial.print(" degrees Celcius, Humidity: ");
 Serial.print(h);
 Serial.print(" Soil Sensor ");
 Serial.print(A0);
 Serial.println("%. Send to Thingspeak.");
 }
 client.stop();
 Serial.println("Waiting...");
 delay(10);
 }
```

GitHub & Project Demo Link:

https://www.uploadlite.com/d/PFEvbQoF5SUQZD