

**SMARTFARMER - IOT ENABLED SMART FARMING  
APPLICATION  
NALAIYA THIRAN PROJECT BASED LEARNING**

Submitted by

**Team ID: PNT2022TMID040704**

**RAMYA T  
ROHINTH M P  
NAVEEN M  
ROHIT KUMAR P**

**in partial fulfillment for the award of the  
degree of  
BACHELOR OF ENGINEERING  
IN  
ELECTRONICS AND COMMUNICATION ENGINEERING**



**KONGU ENGINEERING COLLEGE**

**(Autonomous)**

**PERUNDURAI, ERODE-638 060**

**NOV 2022**

## **INDEX**

### **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

### **5. PROJECT DESIGN**

5.1 Data Flow Diagrams

5.2 Solution & Technical Architecture

## **6. PROJECT PLANNING & SCHEDULING**

6.1 Sprint Planning, Schedule & Estimation

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

7.1 Feature

## **8. RESULTS**

8.1 Performance Metrics

## **9. ADVANTAGES & DISADVANTAGES**

## **10. CONCLUSION**

## **11. FUTURE SCOPE**

## **APPENDIX**

### **Source Code**

## **1. Introduction**

### **1.1.Overview:**

In this project I have developed a mobile application using which a farmer can monitor the temperature, humidity, pressure and soil moisture parameters along with weather forecasting details. Based on these details he can water the crops by controlling the motors through the app .

### **1.2.Purpose:**

Agriculture plays a crucial role in the life of an economy. It is the backbone of our economic system, so improving the quality and way of production is crucial. Here comes the Smart Agriculture system. Smart agriculture helps in automated farming, collection of data from the field and then analyses it so that the farmer can make accurate decision in order to grow high quality crop.

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.

## **2.Literature Survey**

### **2.1.Existing problem**

Agriculture is extremely dependent on the climate. Temperature increases and carbon dioxide can boost some crop yields depending on the location; but other conditions must also exist, such as humidity, pressure, and water availability. Although slight warming and more carbon dioxide in the atmosphere could benefit some plants to grow faster, severe warming, floods, and drought would reduce yields. Farmers need to spend a lot of time to maintain these. Heat is not the only extreme weather. Extreme cold can benefit farmers by freezing the soil deep beneath the ground. In parts of the upper Midwest, frost depths exceed 40 inches. A deep frost depth can aid farmers in diverse ways. The cold helps nitrogen that is applied in the fall from vaporizing during the winter. The cycle of freezing and thawing of water helps soften the soil after the thaw. Extreme cold and frozen soils also reduce the survival rate of some insects.

Severe weather other than heat and cold can cause loss and devastation to a farm. Most farmers can't avoid the results of extreme weather. Diverse extreme weather can affect farms in different ways. Because of this, it's important that farmers have a proper system and need a mobile application to monitor the weather changes and to control the motor.

1. Almalki, F.A., Soufiene, B.O., Alsamhi, S.H. and Sakli, H., (2021) , has

presented a paper on "A low-cost platform for environmental smart farming monitoring system based on IoT and UAVs". This paper shows a low-cost platform for comprehensive environmental parameter monitoring using flying IoT. The proposal is based on experimental work to fulfill the requirements of automated and real-time monitoring of the environmental parameters using both under- and aboveground sensors.

2. Bauer, J. and Aschenbruck, N., (2018), has proposed a paper on, "Design and implementation of an agricultural monitoring system for smart farming". In this proposed paper, a holistic IoT-based agricultural monitoring system is presented. The main component of this system is an in-situ WSN that is tailored for the collection of sensor information that is of special interest for Smart Farming. The focus of the sensor network is on the continuous assessment of the LAI that is relevant for a precise monitoring of crop growth processes. Using an MQTT-based IoT infrastructure and PLMN connectivity, this sensor network is connected to a central server. The server is responsible for data persistence, analytics, and also for visualization that can be used as decision support for farmers.
3. Bacco, M., Berton, A., Ferro, E., Gennaro, C., Gotta, A., Matteoli, S., Paonessa, F., Ruggeri, M., Virone, G. and Zanella, A., (2018) has presented a paper titled on, "Smart farming: Opportunities, challenges and technology enablers". This paper presented an overview of IoT technologies in several smart farming scenarios. Different agricultural domains have been analysed in this work, highlighting the most relevant communication requirements, and providing a mapping between the presented use cases and the enabling

technologies. We considered UGVs and UAVs, surveying different uses and their requirements. We are convinced that deep learning architectures and CNN techniques can be key enablers for their joint use, thus opening to a better understanding and management of the farmland.

4. Bacco, M., Barsocchi, P., Ferro, E., Gotta, A. and Ruggeri, M., (2019) has presented a paper on, “The digitisation of agriculture: a survey of research activities on smart farming”. A key component in this paper is the use of hardware and software technologies, like the deploying of sensor nodes, control systems, robotics, satellites for imagery and positioning, data storage and analysis, advisory systems, and terrestrial and aerial drones.
5. Idoje, G., Dagiuklas, T. and Iqbal, M., (2021) , has proposed a paper on , “Survey for smart farming technologies: Challenges and issues” . The application of smart farming to crop and animal production and post-harvesting is discussed. The impact of climate change on agriculture is also considered. This paper contributes to knowledge by iterating the challenges of smart technology to agriculture while highlighting the issues identified from existing framework of smart agriculture. The authors identify many gaps in existing research affecting the application of IoT in smart farming, and suggest further research to improve the current food production globally, to provide better food management and sustainability measures across the globe.
6. Maduranga, M.W.P. and Abeysekera, R., (2020) , has presented a paper entitled on “ Machine learning applications in IoT based agriculture and

smart farming: A review. This paper proposed that , High-performance computing capability in ML opens up new opportunities for data-intensive science as the amount of data collected increases; ML algorithms could be applied to further enhance application intelligence and functionality. In this article we review existing approaches have been made to the smart agriculture and farming based on IoT and ML separately.

7. Mahajan, H.B., Badarla, A. and Junnarkar, A.A., (2021), has proposed a paper on, “CL- IoT: cross-layer Internet of Things protocol for intelligent manufacturing of smart farming”. This paper proposed that , The existing protocols use energy and distance in general for clustering and data transmissions which did not solve the problems of long-distance communications in farming applications. So a cross-layer-based clustering and routing algorithms have designed to reduce network communication delay, latency, and energy consumption.
8. Ramli, M.R., Daely, P.T., Kim, D.S. and Lee, J.M., (2020), has presented a paper on, “IoT-based adaptive network mechanism for reliable smart farm system”. This paper presents an adaptive network mechanism for a smart farm system by using LoRaWAN and IEEE 802.11ac protocols. The system has the ability to adjust a protocol based on the network condition.



## **2.2. Problem Statement Definition**

Incorporation of technology into farming to reduce work and labour, increase productivity and to improve the soil and plant the next crop. Many experienced and young farmers face issues in incorporating the technologies in agriculture. The major issues faced are labour cost, coping with climate change, soil erosion and biodiversity losses. This may lead to loss of agricultural land and the decrease in the varieties of crops and livestock produced. These issues mainly occur due to increasing pressure from climatic changes, soil erosion which mostly starts from the first day of farming. It is important to fix these issues as it is required for the growth of better-quality food products. It is important to maximise the crop yield and to maintain soil richness.

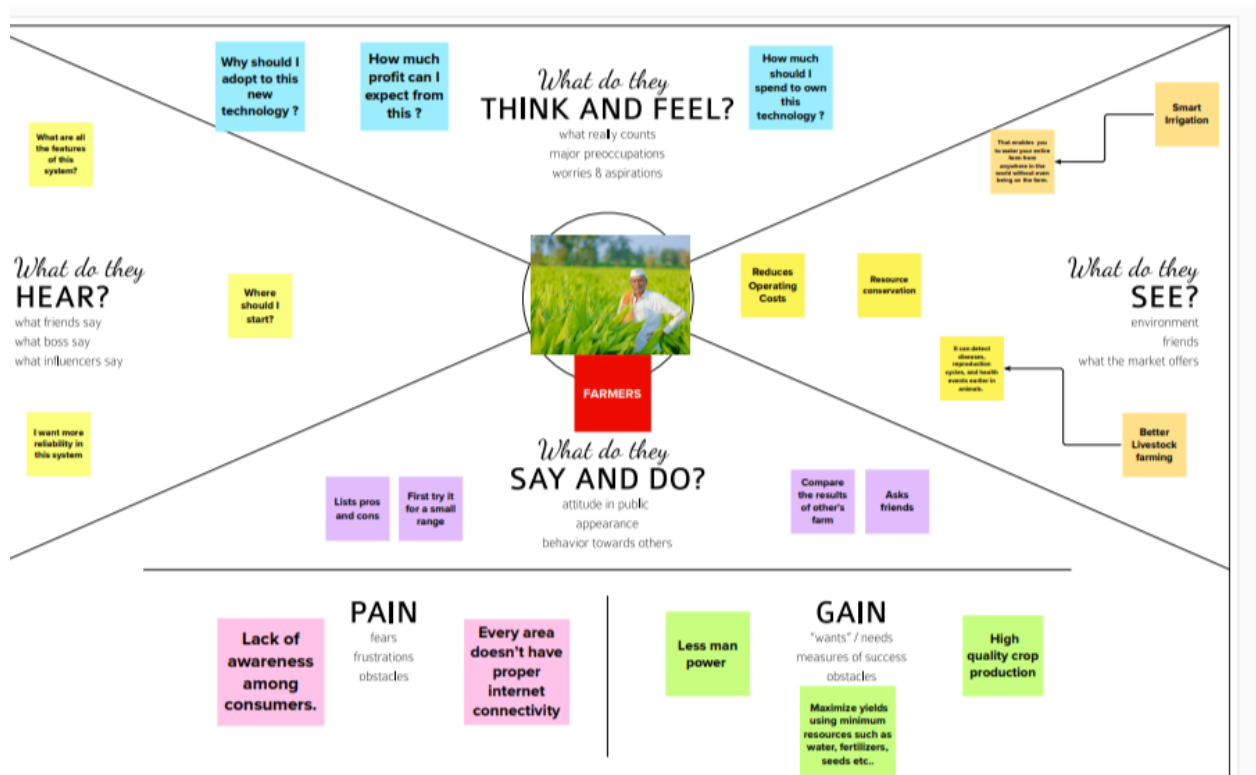
The soil moisture sensor measures wetness content in the soil. The Arduino UNO microcontroller used to receive input from various sensors and it can be controlled automatically. When the soil moisture sensor goes low the water pump will be on and it exceeds defined levels of the water motor will turn off automatically. We can constantly monitor the growth of a crop using ultrasonic sensors. PIR sensor detects the motion or unusual movement in the agricultural land. This device is very helpful to the farmer to monitor and control environmental parameters in their field. The farmers did not go to their field, they can remotely monitor and control using the cloud.



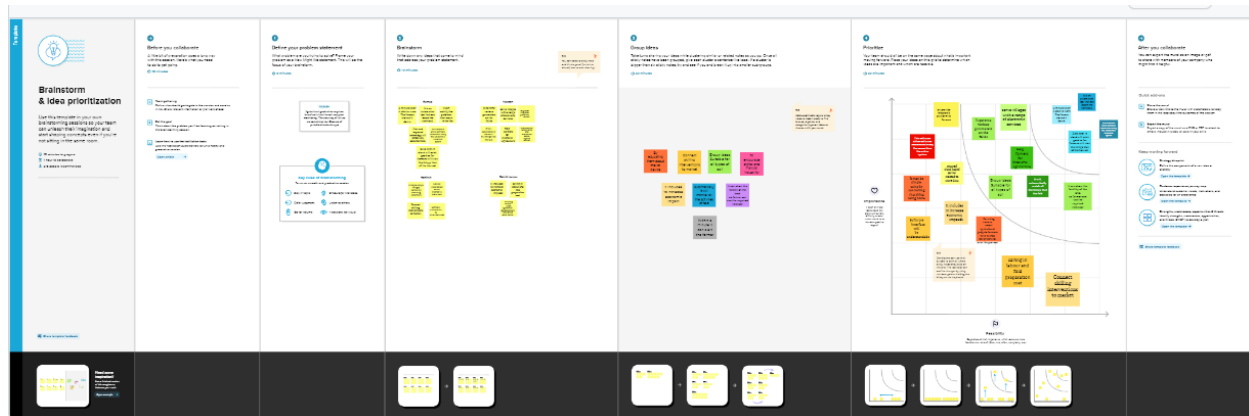
### 3.IDEATION & PROPOSED SOLUTION

#### 3.1.EMPATHY MAP CANVAS

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to help teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



## 3.2 Ideation and Brainstorming



Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions. 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.

Introduction on Internet of Things (IoT), application of IoT in agricultural field to improve the yield and quality by reducing the cost is provided. The sensors which are used in the architecture are discussed briefly and the process of transmission of data from the agriculture field to the central system is explained. The proposed system advantages are included. In addition, open research issues, challenges, and the future of IoT in the agricultural field are highlighted. The concept is basically developed on an idea, where there are numerous things or objects - such as Arduino, sensors, GSM models, LCD display, etc., that are connected with the

Internet. Each of the objects has a different address and is able to interact with other items. The things or objects cooperate with each other to reach a common goal.

We are going to construct a smart agricultural monitoring system which can collect crucial agricultural data and send it to an IoT platform called Thingspeak in real time where the data can be logged and analysed. The logged data on Thingspeak is in graphical format, a botanist or a reasonably knowledgeable farmer can analyse the data (from anywhere in the world) to make sensible changes in the supplied resources (to crops) to obtain high quality yield.

### 3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	It is hard for the farmers to check the environmental condition of their crops every time?
2.	Idea / Solution description	Using modern IoT techniques get the data like temperature and humidity of the soil whenever we want with the help sensors.
3.	Novelty / Uniqueness	Use of mobile application for displaying data gives good user experience and also the app provides smart suggestions.
4.	Social Impact / Customer Satisfaction	User friendly app and easy to install the embedded setup up. It makes the decision making easy for the farmers.
5.	Business Model (Revenue Model)	Apart from the data we can give smart suggestion when they subscribe.
6.	Scalability of the Solution	As industries develop. It is very important for Agricultural industry to compete equally so this product will be successful in the future

### 3.4 Problem solution fit

<b>1.Customer segments:-</b>  Types of Customers who are going to this project are <ul style="list-style-type: none"> <li>• Large Scale Farmers</li> <li>• Remote Farmers</li> </ul>	<b>6.Customer constrains:-</b>  The customer needs a solution which will solve the problems in farming when he is in a remote location and that solution should fulfil the following needs. <ul style="list-style-type: none"> <li>• Cost efficient</li> <li>• Low power consumption</li> <li>• Time efficient</li> </ul>	<b>5. Available solutions :-</b>  We can give solutions to this problem by using the Smart Farming Application which collects the Moisture level data from the field and operate in the basis of that moisture level.
<b>2. Jobs to be done :-</b>  The Customers want to automate the irrigation process, reduce cost of manual workers and minimize the power consumption	<b>9. Problem route cause:-</b>  The route cause for Smart farming Applica	<b>7. Behavior:-</b>  The customer needs to make a revolutionary change in farming by means of modern technologies.
<b>3. Triggers:-</b>  Farmers are facing many problems while farming in traditional manner. This triggers the Smart Farming Applications.	<b>10. Solution:-</b>  Our solution for this project is to give environment sustainable Product for the farming in modern era with reduced cost and with best efficiency	<b>8.Channels of behaviour:-</b>  The channels of behavior recombines the ration of the following <ul style="list-style-type: none"> <li>• Online</li> <li>• Offline</li> </ul>
<b>4. Emotions:-</b> Farmers feel very relaxed and feel stressless while working in field.		

## 4.Requirement Analysis

### 4.1 Functional Requirements

FR No.	Functional Requirement (Epic)	SubRequirement (Story / Sub-Task)
FR-1	<b>Arduino Board</b>	To interface temperature, humidity, soil moisture sensors.
FR-2	<b>ESP 8266</b> Following are the functional requirements of the proposed solution.	It facilitates any microcontroller to access Wi-Fi network.
FR-3	<b>IBM cloud</b>	To store the sensors information
FR-4	<b>MIT App inventor</b>	To develop an app to display the temperature, humidity and soil moisture level.
FR-5	<b>Open weather API</b>	Used to get the information and access the resources.

### Non-functional Requirements:

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

FR No.	Non-Functional	Description
--------	----------------	-------------

	Requirement	
NFR-1	<b>Usability</b>	The temperature, humidity and soil moisture sensors are connected to arduino and by using the IBM cloud to store the information of the sensors. With the help of mobile application, farmer will easily know the results about their field. The mobile application will send the notification message to his mobile phone.
NFR-2	<b>Security</b>	To prevent from the intruder, password is specified.
NFR-3	<b>Reliability</b>	The mobile application is more reliable to the farmer because it is developed with API.
NFR-4	<b>Performance</b>	

		Because of using the sensors, it provides an accurate results.
NFR-5	<b>Availability</b>	Automatic adjustment of farming equipment made possible by linking information like crops/weather and equipment to auto-adjust temperature, humidity, etc.

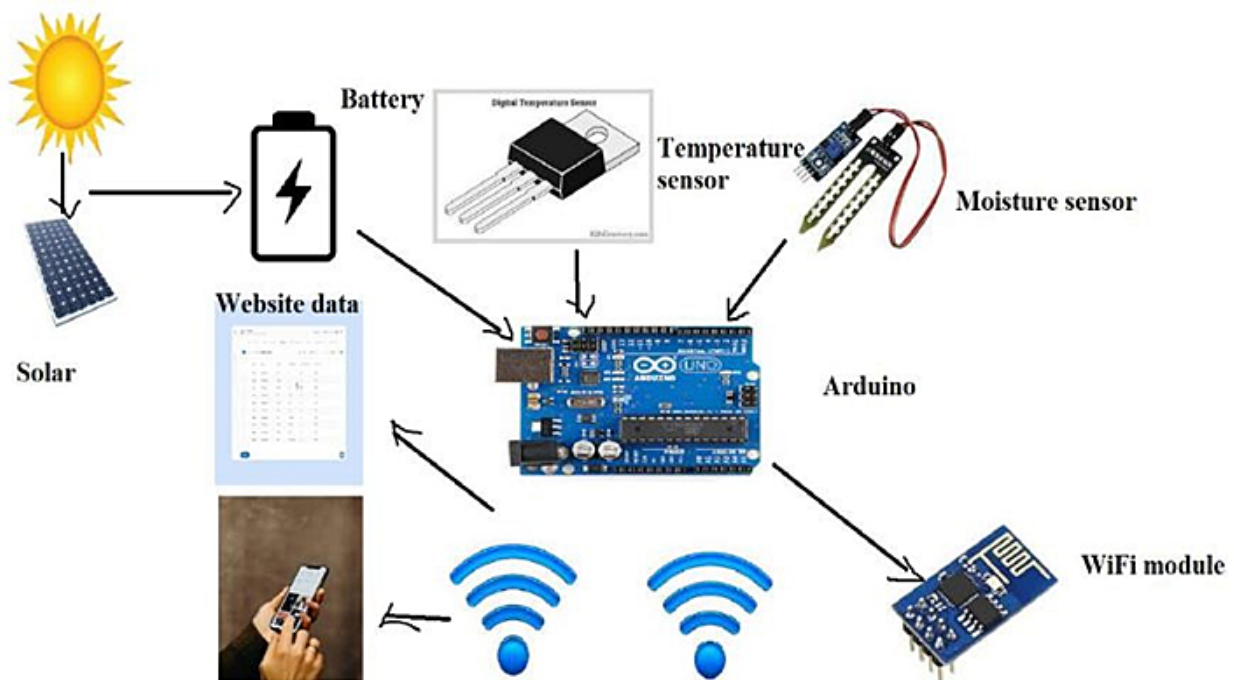


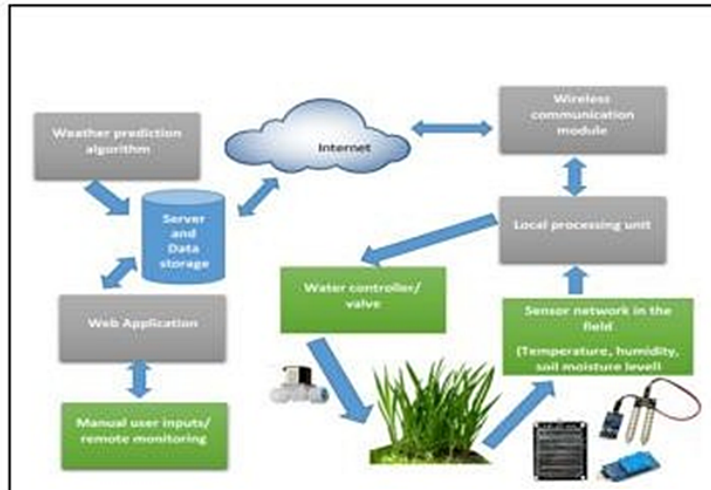
NFR-6	<b>Scalability</b>	Without getting any inputs from the farmer, the results will be updated.
-------	--------------------	--

## 5.PRODUCT 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.





## 5.2.USER STORIES

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story/ Task	Acceptance criteria	Priority	Release
Customer	Registration (Farmer)	USN-1	As a user,I can register for the application by entering my email, password, and	I can access my database	High	Sprint-1

			confirming my password			
Customer	I/O interface for Sensors.	USN-2	I can connect the various sensors like temperature, moisture sensor with Arduino board	I can monitor temperature, moisture etc..	High	Sprint-2
Customer	IoT Device setup	USN-3	Integrating all the devices and sensors		High	Sprint-3
Customer	Customized UI in mobile app	USN-4	To make the user to interact with the software	User can access the app for the services.	High	Sprint-4

### **5.3. Solution & Technical Architecture:**

- The different soil parameters temperature, soil moistures and then humidity are sensed using different sensors and obtained value is stored in the IBM cloud.
- Arduino UNO is used as a processing Unit that process the data obtained from the sensors and whether data from the weather API.
- NODE-RED is used as a programming tool to write the hardware, software, and APIs. The MQTT protocol is followed for the 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 decide 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.

## 6.PROJECT PLANNING & SCHEDULING

### 6.1.Sprint Planning, Estimation & Schedule

<b>Sprint</b>	<b>Functional Requirement(Epic)</b>	<b>User Story Number</b>	<b>User Story/Task</b>	<b>Story Points</b>	<b>Priority</b>	<b>Team Member</b>
<b>Sprint-1</b>	Registration(Farmer)	USN-1	As a user, I can register for the application by entering my username, password.	4	High	Ramya T
<b>Sprint-1</b>	IBM IoT cloud Service	USN-2	Publish and subscribe to IBM IoT cloud	4	High	Rohinth M.P

<b>Sprint-2</b>	I/O interface for Sensors.	USN-3	As a user, I can connect the various sensors like temperature, moisture sensor with Arduino board.	8	High	Naveen M
<b>Sprint-3</b>	Interface for connecting to IBM IoT cloud.	USN-4	Temperature and soil moisture sensor sends the data to the cloud via IBM Watson service.	3	High	Rohith Kumar P
<b>Sprint-3</b>	Create Node Red Simulator	USN - 5	Create Node-Red Service and create a web application	3	Medium	Ramya T
<b>Sprint - 4</b>	App Development	USN - 6	Add a user interface in a mobile app to monitor temperature, humidity and control the motor.	6	High	Rohin M P

### Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint StartDate	Sprint EndDate (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date(Actual)
Sprint-1	8	6 Days	24 Oct 2022	29 Oct 2022	8	29 Oct 2022
Sprint-2	8	6 Days	31 Oct 2022	05 Nov 2022	8	05 NOV 2022
Sprint-3	6	6 Days	07 Nov 2022	12 Nov 2022	6	12 NOV 2022
Sprint-4	6	6 Days	14 Nov 2022	19 Nov 2022	6	19 NOV 2022

### VELOCITY:

Average Velocity for sprint 1= Sprint Duration /velocity =6/8 = 0.75

Average Velocity for sprint 2= Sprint Duration /velocity =6/8 = 0.75

Average Velocity for sprint 3= Sprint Duration /velocity =6/6 = 1

Average Velocity for sprint 4= Sprint Duration/velocity =6/6 = 1



## 6.2.Milestone and Activity List:

<b>Title</b>	<b>Description</b>	<b>Date</b>
Literature Survey & Information Gathering	Conducting a literature review on the chosen project and acquiring data by consulting technical papers, research publications, etc.	09 SEPTEMBER 2022
Prepare Empathy Map	Get an Empathy Map Canvas ready to record the user's gains and pains. Make a list of the problems.	09 SEPTEMBER 2022
Brainstorming ideas	By planning the brainstorming session, make a list of the ideas and rank the top three according to importance and viability.	19 SEPTEMBER 2022
Proposed Solution	Create a proposal for a solution that details its innovation, viability as a business idea, social impact, scalability, and other factors.	19 SEPTEMBER 2022
Problem Solution Fit	Prepare problem - solution Fit document.	19 SEPTEMBER 2022
Solution Architecture	Prepare solution Architecture document.	19 SEPTEMBER 2022

Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application	03 OCTOBER 2022
Data Flow Diagrams	Draw the data flow Diagrams and submit for review.	03 OCTOBER 2022
Technology Architecture	Architecture diagram.	03 OCTOBER 2022

Sprint Delivery	Prepare the Sprint delivery on Number of Sprint planning meetings organized, Minutes of meeting recorded.	03 NOVEMBER 2022
Milestone & Activity List	Prepare the milestones & Activity list of the project.	03 NOVEMBER 2022
Project Development Delivery of Sprint- 1,2,3&4	Develop & submit the developed code by testing it.	IN PROGRESS...

## 7.CODING & SOLUTIONING

### 7.1 FEATURE

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random

#Provide your IBM
WatsonDevice Credentials
organization = "3nw9vo"
deviceType =
"farming"
deviceId =
"application"
authMethod =
"token"
authToken =
"87654321"

# Initialize GPIO
def myCommandCallback(cmd):
    print("Command received: %s" %
    cmd.data['command'])
    status=cmd.data['command']
    if status=="
    motoron":
        print
        ("Motor is
```

```

        on")
elif status ==
    "motoroff":
    print
    ("Motor is
    off")
else :
    print ("please send propercommand")

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
cloudas an event of type"greeting" 10 times
deviceCli.connect()

while True:
    #Get Sensor Data from DHT11

    temp=random.randi
    nt(90,110)
    Humid=random.ran
    dint(60,100)

```

```

data = { 'temp' : temp,
'Humid': Humid }#print
data
def myOnPublishCallback():
    print ("Published Temperature = %s C"% temp, "Humidity = %s
%%%" Humid, "toIBMWatson")

    success = deviceCli.publishEvent("IoTSensor",
"json", data, qos=0,
on_publish=myOnPublishCallback)
    if not success:
        print("Not
connected to IoTTF")
        time.sleep(10)

    deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application
from the cloudddeviceCli.disconnect()

```

```
Python 3.7.0 Shell
File Edit Shell Debug Options Window Help
Python 3.7.0 (tags/v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: C:\Users\Lenovo\Downloads\ibms1.py =====
2022-11-18 16:18:01.759 ibmiotf.device.Client INFO Connected successfully: d:3mw9vo:farming:application
Published Temperature = 109 C Humidity = 84 % to IBM Watson
Published Temperature = 97 C Humidity = 75 % to IBM Watson
Published Temperature = 98 C Humidity = 64 % to IBM Watson
Published Temperature = 103 C Humidity = 68 % to IBM Watson
Published Temperature = 97 C Humidity = 61 % to IBM Watson
Published Temperature = 105 C Humidity = 89 % to IBM Watson
Published Temperature = 106 C Humidity = 73 % to IBM Watson
|
```

The screenshot shows the IBM Watson IoT Platform interface. At the top, there's a navigation bar with 'Browse', 'Action', 'Device Types', and 'Interfaces'. A sidebar on the left contains icons for various functions. The main content area displays a device card for 'application', which is 'Connected' and of type 'farming'. Below the card, the 'Recent Events' tab is active, showing a table of live data events.

Event	Value	Format	Last Received
IoTSensor	{"temp":94,"Humid":95}	json	a few seconds ago
IoTSensor	{"temp":106,"Humid":73}	json	a few seconds ago
IoTSensor	{"temp":105,"Humid":89}	json	a few seconds ago
IoTSensor	{"temp":97,"Humid":61}	json	a few seconds ago

## **8.RESULT**

### **8.1.PERFORMANCE METRICS**

Hence a helpful and useful system is built for farmers to assist them in farming and also prevent them from natural calamities. It also saves farmers time to maintain all these things as this is working on cloud he can turn on/off motor from anywhere so basically it helps farmers and make them relived thus helping our economy to grow.



## **9.ADVANTAGES & DISADVANTAGES**

### **Advantage:**

- monitoring weather parameters such as temperature, pressure, humidity, soilmoisture remotely controlling motorseasily through buttons
- alert farmers in caseof any calamities
- threshold values are set any anomalies will be reportedto the farmer
- user friendly and efficient
- low cost

### **Disadvantage:**

- sensors may sometimemalfunction
- maybe inaccurate sometimes
- farmer needs internetconnectivity
- farmer must have a phone and have basic knowledgeto operate it

### **Applications:**

- Monitoring of ClimateConditions -Probably the most popularsmart

agriculture gadgets are weather stations, combining various smart farming sensors. Located across the field, they collect various data from the environment and send it to the cloud. The provided measurements can be used to map the climate conditions, choose the appropriate crops, and take the required measures to improve their capacity (i.e. precision farming).

- Greenhouse Automation-In addition to sourcing environmental data, weather stations can automatically adjust the conditions to match the given parameters. Specifically, greenhouse automation systems use a similar principle.
- Crop Management - One more type of IoT product in agriculture and another element of precision farming is crop management devices. Just like weather stations, they should be placed in the field to collect data specific to crop farming; from temperature and precipitation to leaf water potential and overall crop health, these can all be used to readily collect data and information for improved farming practices.
- Cattle Monitoring and Management-Just like crop monitoring, there are IoT agriculture sensors that can be attached to the animal on a farm to monitor their health and log performance. This works similarly to IoT devices for pet care.
- End-to-End Farm Management Systems-A more complex approach to IoT products in agriculture can be represented by the so-called farm productivity management systems. They usually include a number of agriculture IoT devices and sensors, installed on the premises as well as a powerful dashboard with analytical capabilities and in-built accounting/reporting

features.

## **10.CONCLUSION**

Smart Farming and IoT-driven agriculture are paving the way for what can be called a Third Green Revolution. The Third Green Revolution is taking over agriculture. That revolution draws upon the combined application of data-driven analytics technologies, such as precision farming equipment, IoT, “big data” analytics, Unmanned Aerial Vehicles (UAVs or drones), robotics, etc.

In the future this smart farming revolution depicts, pesticide and fertilizer use will drop while overall efficiency will rise. IoT technologies will enable better food traceability, which in turn will lead to increased food safety. It will also be beneficial for the environment, for example, more efficient use of water, or optimization of treatments and inputs. Therefore, smart farming has a real potential to deliver a more productive and sustainable form of agricultural production, based on a more precise and resource-efficient approach. New farms

will finally realize the eternal dream of mankind.

**GitHub link**

<https://github.com/IBM-EPBL/IBM-Project-21962-1659799125>

**Video Link**

<https://player.vimeo.com/video/772825065>

