**PROJECT REPORT**

**IOT BASED SMART CROP PROTECTION SYSTEM FOR AGRICULTURE**

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**1 INTRODUCTION:**

**1.1 Project Overview**

This is a Smart Agriculture System project based on Internet Of Things (IoT), that can measure soil moisture and temperature conditions for agriculture using Watson IoT services. IoT is network that connects physical objects or things embedded with electronics, software and sensors through network connectivity that collects and transfers data using cloud for communication. Data is transferred through internet without human to human or human to computer interaction.

In this project we have not used any hardware. Instead of real soil and temperature conditions, sensors IBM IoT Simulator is used which can transmit soil moisture temperature as required.

➢ **Project requirements**: Node-RED, IBM Cloud, IBM Watson IoT, Node.js, IBM Device, IBM IoT Simulator, Python 3.7, Open

Weather API platform.

➢ **Project Deliverables**: Application for IoT based Smart Agriculture System

**1.2 PURPOSE**

IoT based farming improves the entire agriculture system by

monitoring the field in real-time. With the help of IoT in agriculture not only saves the time but also reduces the extravagant use of resources such as water and electricity.

Sometimes due to over or less supply of water in the agricultural field crops may not grow proper. Using IoT supply of water and growth of plants can be satisfied to a greater extent. The flow of water can be controlled from the application.

**1.2.1 SCOPE OF WORK**

➢ Create a device in IBM Cloud Account.

➢ Install Node-RED and configure the nodes that we want to use in the project. ➢ Create the open weather map account and get the API key and the weather conditions using API key in the Node-RED.

➢ Create a web application for user interaction for observation and control actions.

**2 LITERATURE SURVEY:**

**2.1 EXISTING PROBLEM**

● In agriculture water is needed for the crops for their growth. If the Soil gets dry it is necessary to supply water. But sometime if the farmer doesn't visit the field, it is not possible to know the condition of soil.

● Sometimes over supply of water or less supply of water affects the growth of crops.

● Sometimes if the weather/temperature changes suddenly it is necessary to take certain actions.

● Specific crops grow better in specific conditions, they may get damaged due to bad weather.

**2.2 PROPOSED SOLUTION**

● Soil Moisture can be checked by using the sensors that can sense the soil condition and send the moisture content in the soil over the cloud services to the web application.

● The supply of water can be controlled from anywhere by controlling the motor state (ON/OFF), using web application.

● Surrounding temperature can also be sensed by the sensors and displayed on the application.

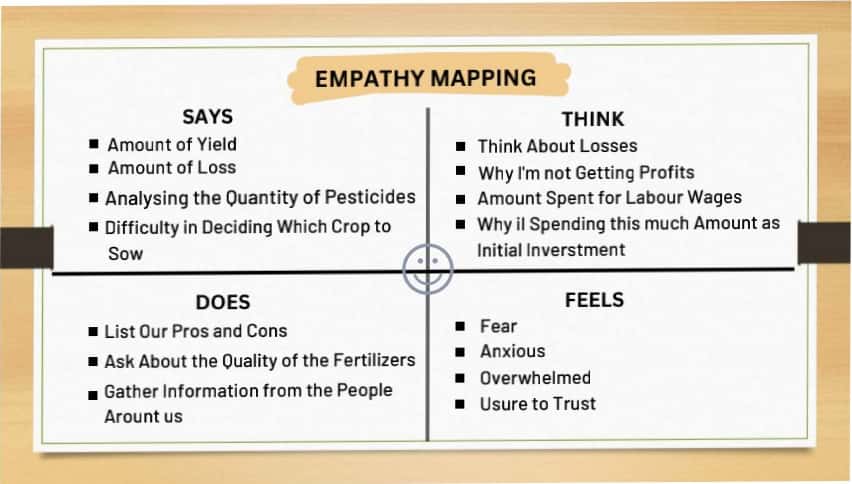
● Real time weather conditions can also be known by using different weather APIs from different websites and displayed on our application.

**2.3Reference**

* <https://www.youtube.com/embed/cicTw4SEdxk>
* <https://ieeexplore.ieee.org/document/9031025>

**3. IDEATION & PROPOSED SOLUTION**

**3.1 Empathy Map Canvas**



**3.2 Ideation**

**What do they think and feel?**

As its name may imply, smart farming is the use of technology in animal agriculture, and it’s something that’s been around since the Industrial Revolution. The biggest difference between then and now, though? “Motorized devices are being replaced with IOT”.

**What do they hear?**

Smart farming is about using the new technologies which have arisen at the dawn

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of the Fourth Industrial Revolution in th areas of agriculture and cattle production to increase production quantity and quality, by making maximum use of resources and minimizing the environmental impact.

**What do they see?**

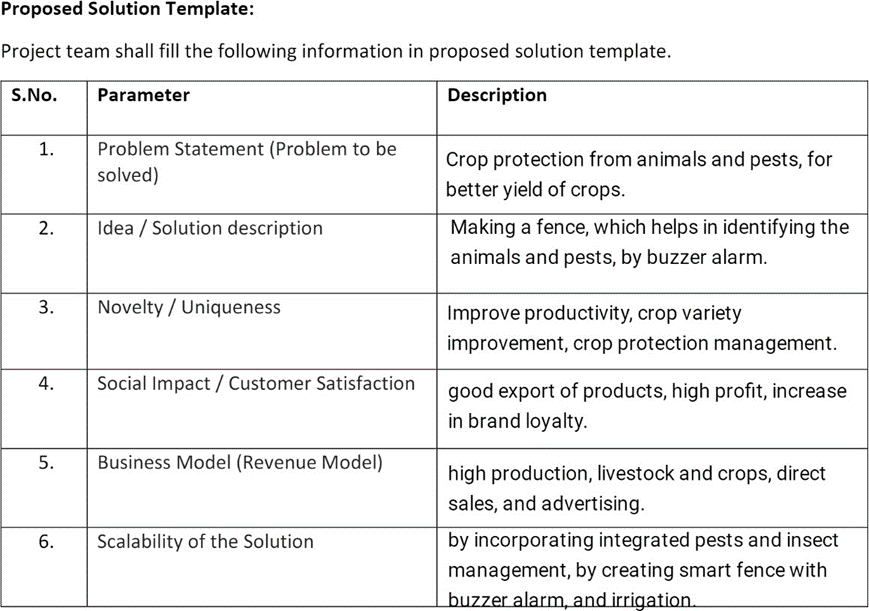
Smart farming is a management concept focused on providing the agricultural industry with the infrastructure to leverage advanced technology – including big data, the cloud and the internet of things (IoT) – for tracking, monitoring, automating and analyzing operations.

**What do they say and do?**

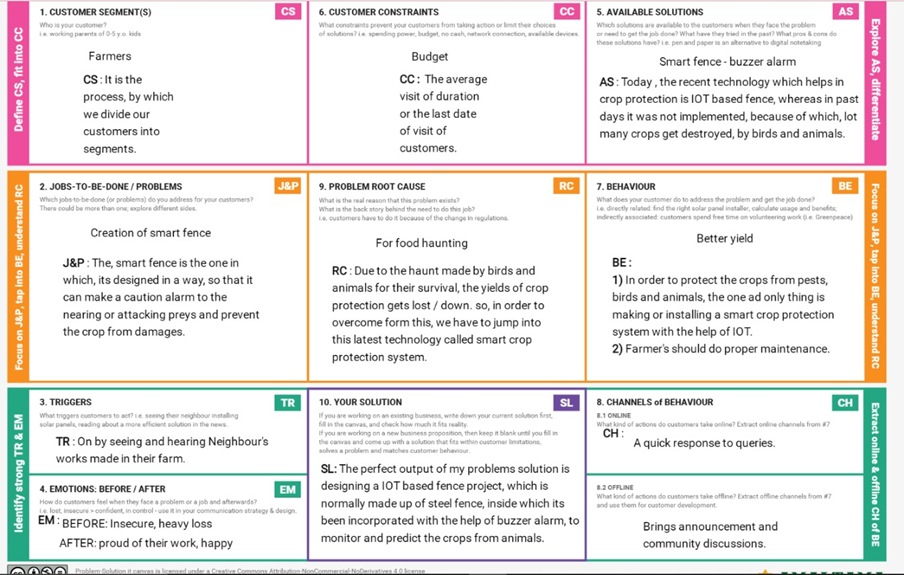
●The aim of this technology is to make the most of all the data collected by various tools, by converting them into real sources of information in order to then define ways of simplifying agricultural work. It also allows for accurate and predictive analysis of all situations that may affect the farms, such as weather conditions (temperature, humidity, etc.) and sanitary or economic situations, for example. This makes it easier to organize the supply of energy, water, livestock feed and fertilizer.

●In its most advanced form, smart farming facilitates the exchange of information between different farms, creating a real network of connected farms accessible from a smartphone or a computer.

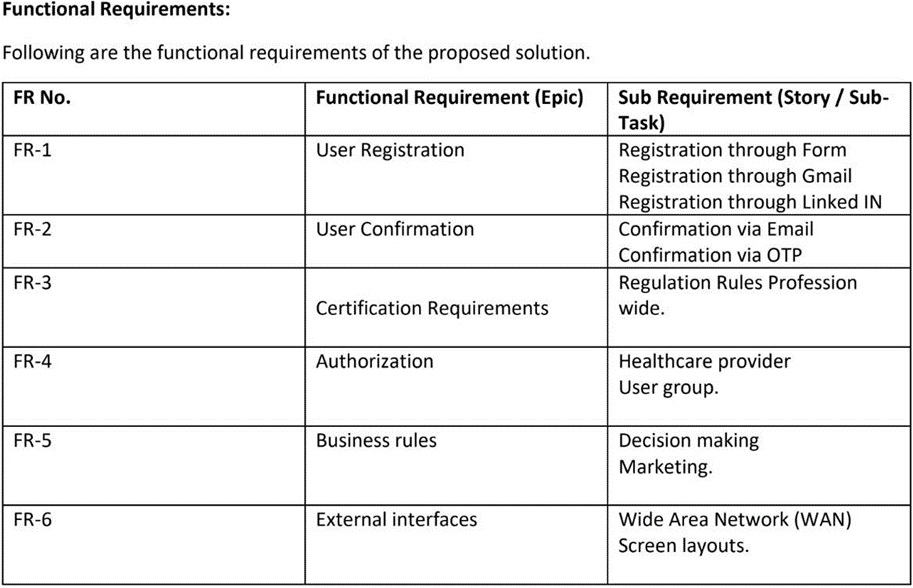
**3.3 Proposed Solution**



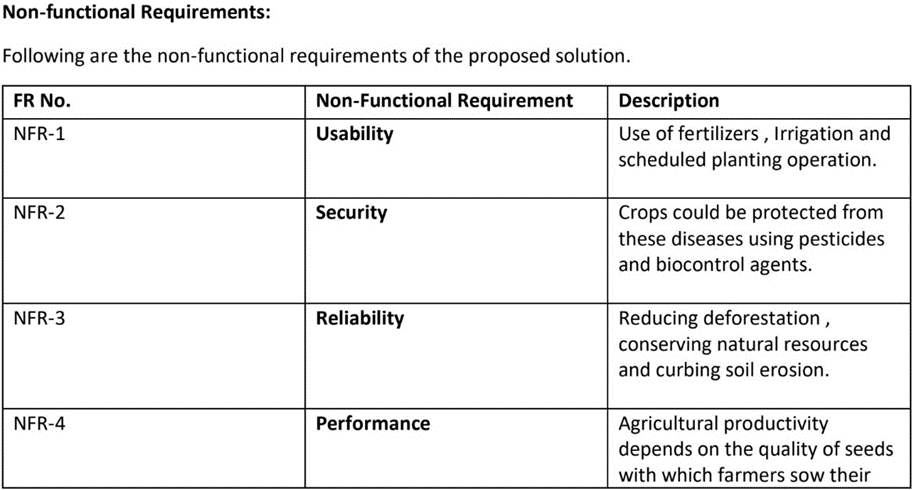
**3.4 Problem Solution fit**

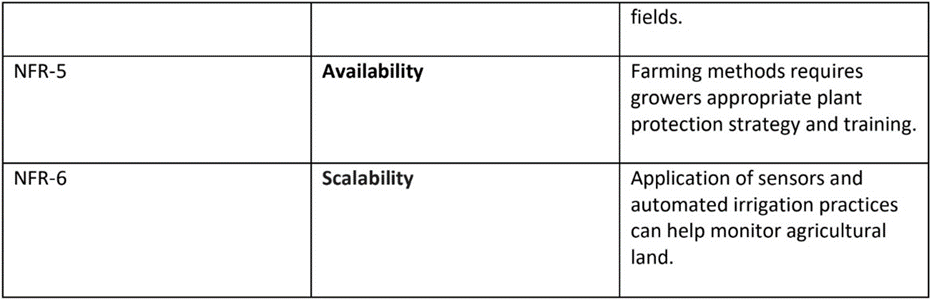


**3.5 Functional requirement**



**3.6 Non-Functional requirement**

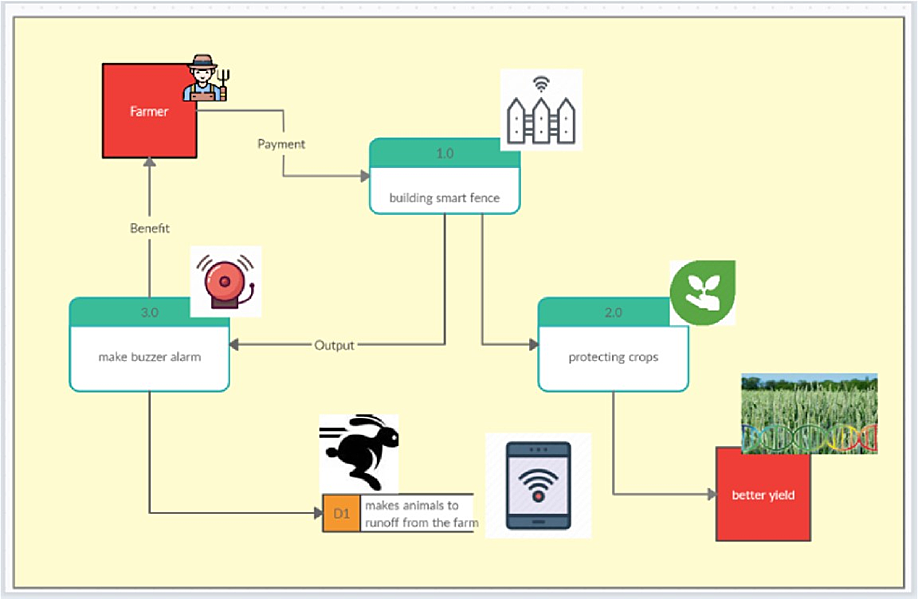




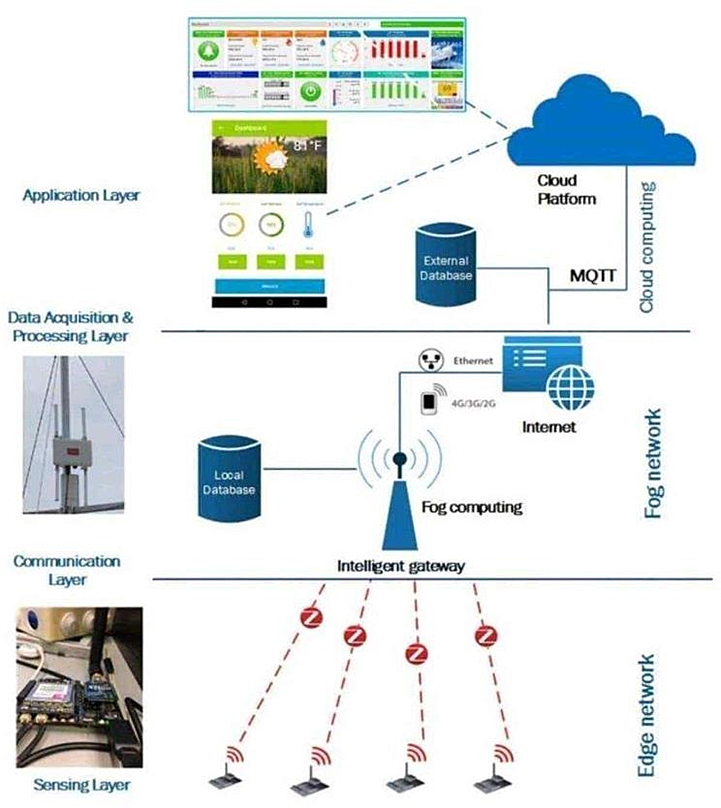
**4.PROJECT DESIGN**

**4.1SOLUTION** **& TECHNICAL ARCHITECTURE**

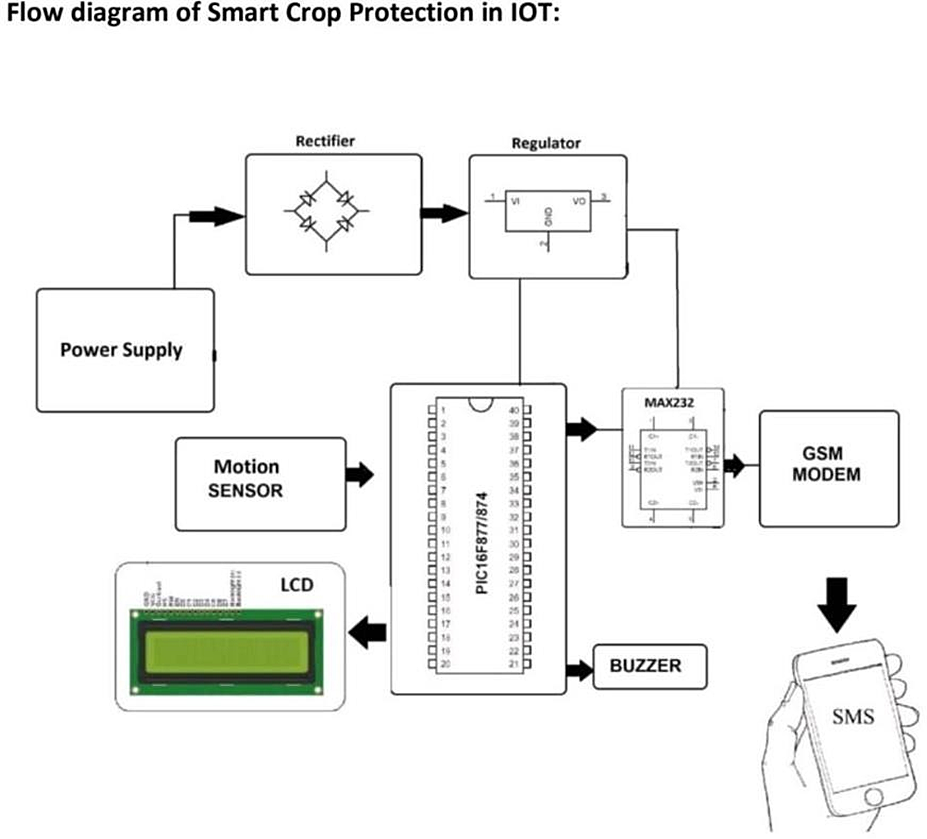
**SOLUTION ARCHITECTURE:**



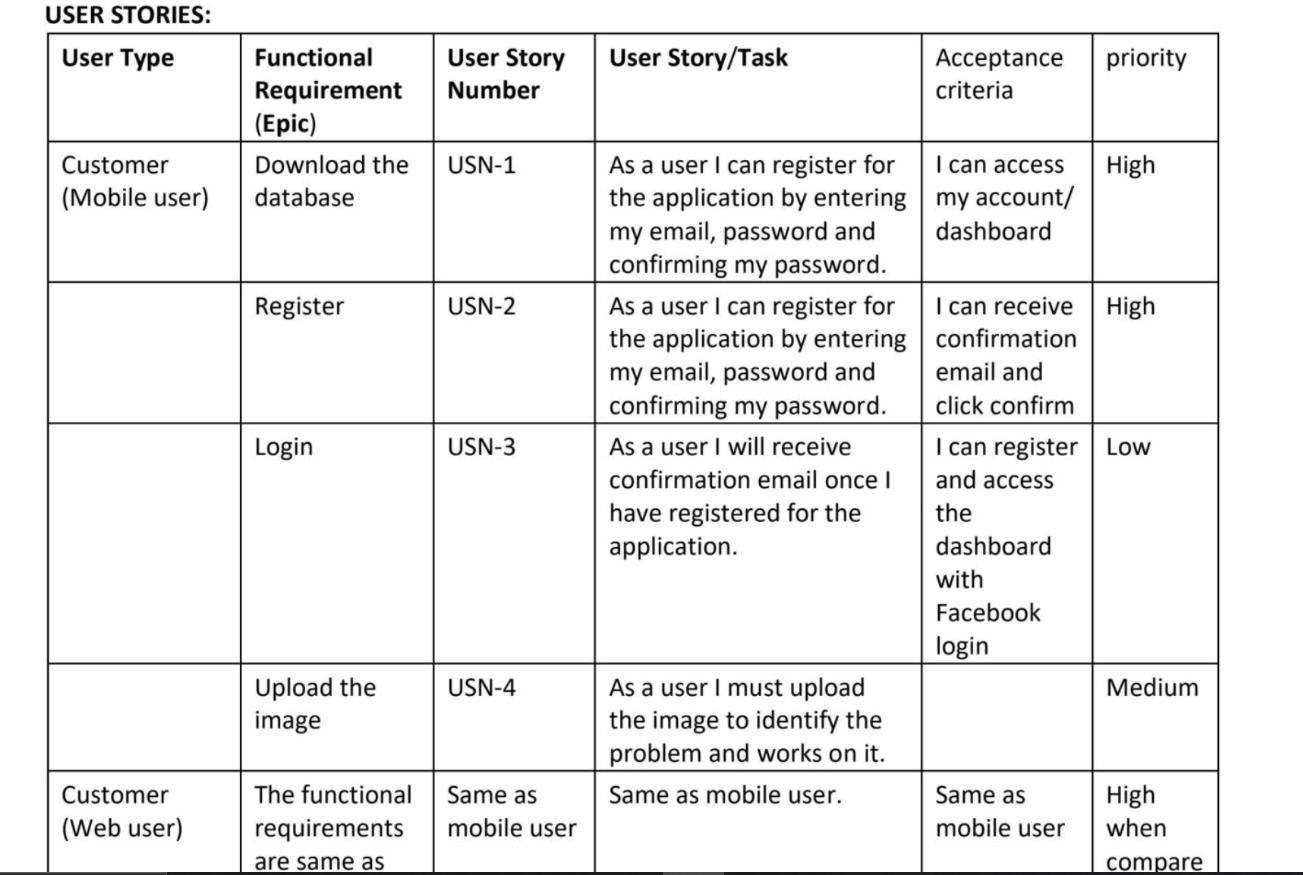
**TECHNICAL ARCHITECTURE**



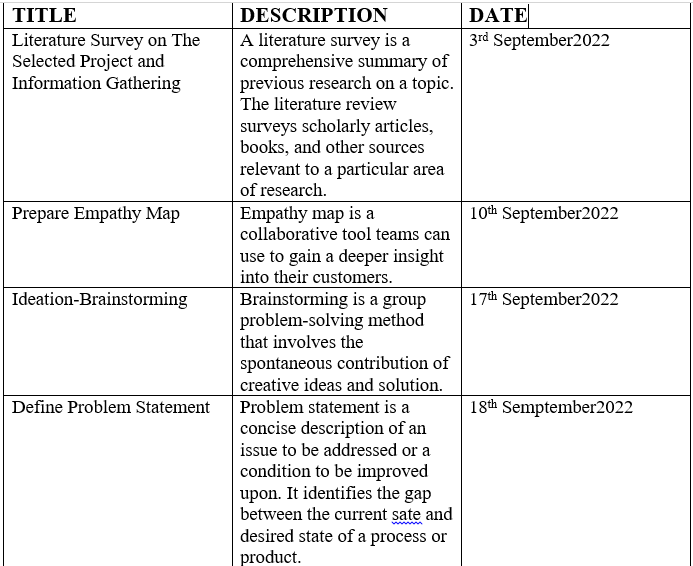
**4.2DATAFLOW DIAGRAMS**

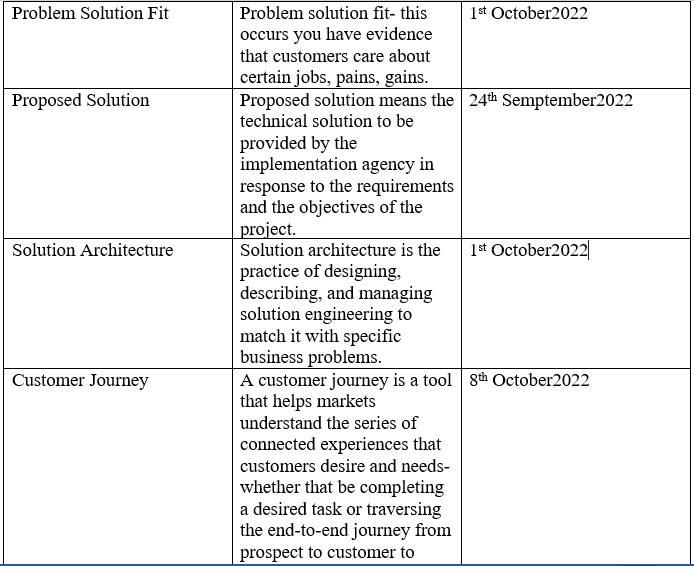


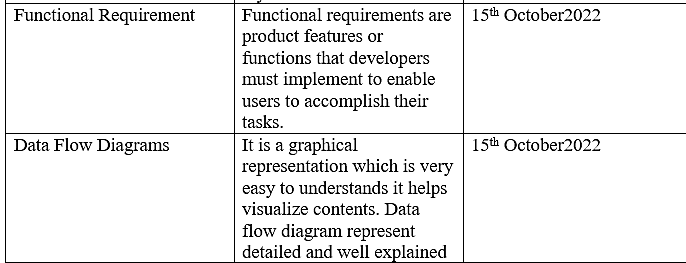
**4.3 USER STORIES**

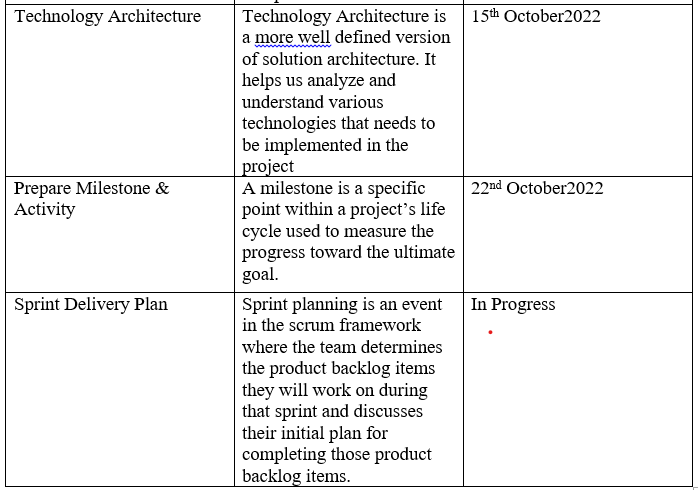


**5.PROJECT PLANNING & SCHEDULING**



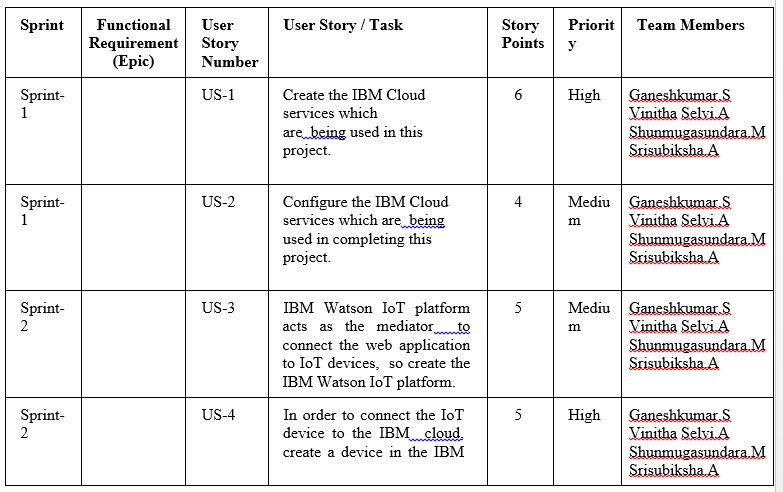


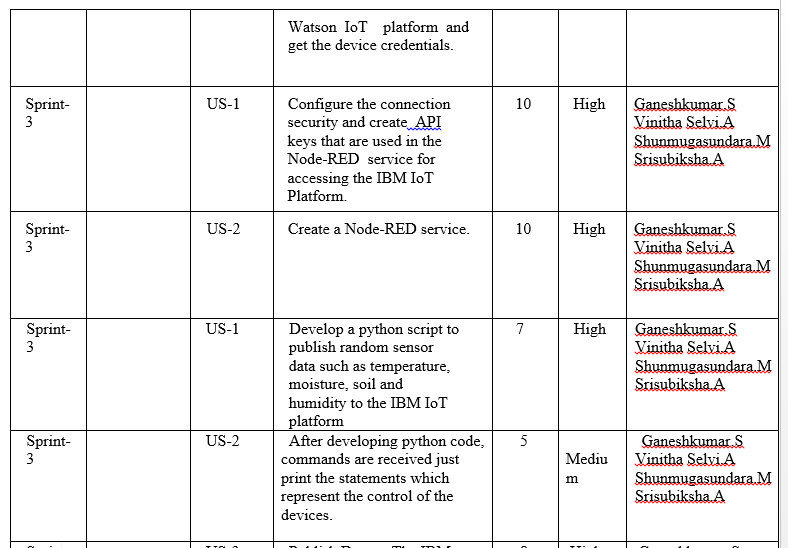


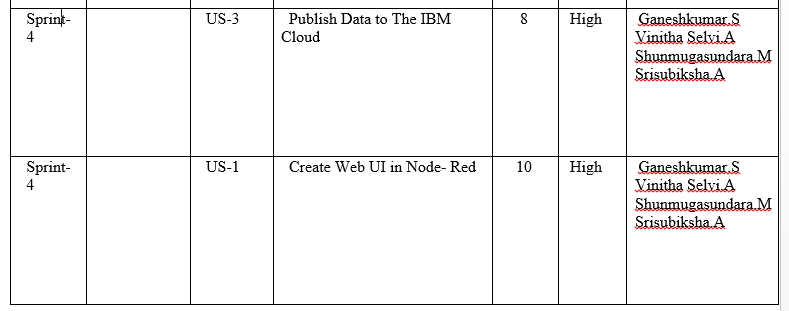


**6**

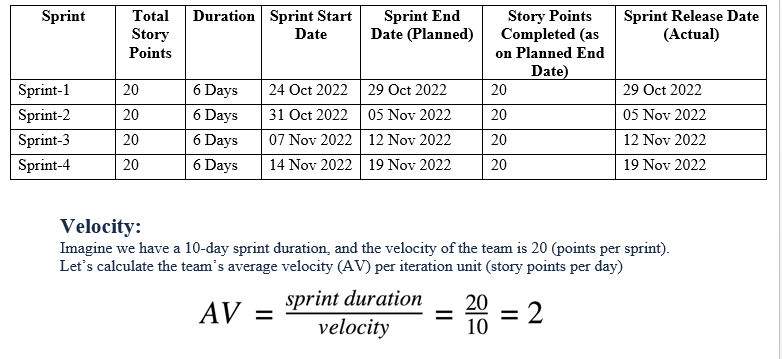
**6.1 Sprint Planning & Estimation**



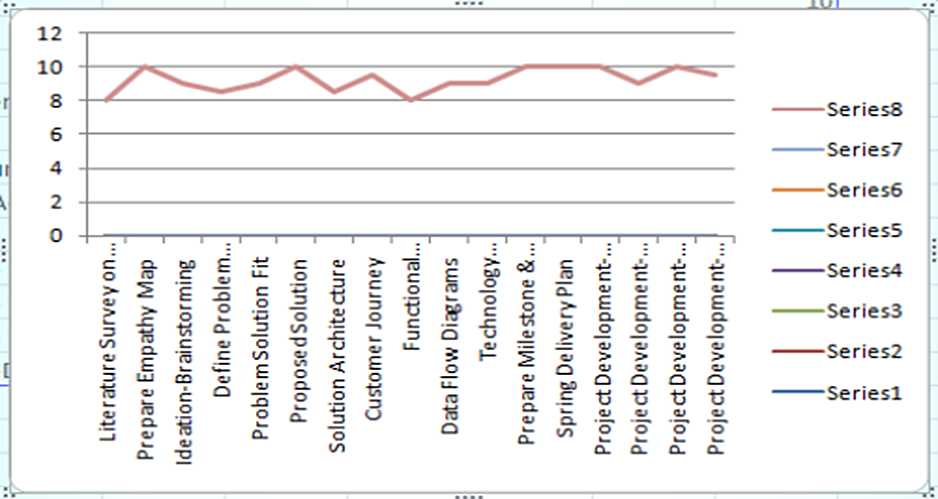




**6.2 Sprint Delivery Schedule**



**BURNDOWN CHART**



**7. Coding And Solutioning**

**7.1 Features**

Feature 1: Detect the Temperature

Feature 2: Detect the Humidity

Feature 3: Detect the Moisture

Feature 4: Detect the Animals

Codes:

PYTHON CODE TO IBM:

import time

import sys

import ibmiotf.application

import ibmiotf.device import random

#Provide your IBM Watson Device Credentials

organization = "prcaq4"

deviceType = "IOT"

deviceId = "15072002"

authMethod = "token"

authToken = "1911113abcdefgh"

# Initialize GPIO

def myCommandCallback(cmd):

print("Command received: %s" % cmd.data['command'])

status=cmd.data['command']

if status=="lighton":

print ("led is on")

elif status == "lightoff":

print ("led is off")

else : print ("please send proper command")

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:

#Get Sensor Data from DHT11

temp=random.randint(90,110)

Humid=random.randint(60,100)

Moist=random.randint(20,100)

Animal\_dect=random.randint(1,20)

data = { 'temp' : temp, 'Humid': Humid, 'Moist' : Moist, 'Animal\_dect' : Animal\_dect }

#print data

def myOnPublishCallback():

print ("Published Temperature = %s C" % temp, "Humidity = %s %%" % Humid, "to IBM Watson", "Published Moisture= %s" % Moist, "Published Animal detection = " , Animal\_dect)

success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0, on\_publish=myOnPublishCallback)

if not success:

print("Not connected to IoTF")

time.sleep(10)

deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud deviceCli.disconnect()

**NODE RED CODE:**

**TEMPERATURE**:

msg.payload=msg.payload.”temp”

return msg;

**HUMIDITY:**

msg.payload=msg.payload.”Humid”

return msg;

**MOISTURE:**

msg.payload=msg.payload.”Moist”

return msg;

**ANIMAL DETECTION:**

msg.payload=msg.payload.”Animal\_dect”

return msg;

**8. TESTING:**

**8.1 TESTING :**

• PYTHON CODE TO IBM

• IoT SENSOR OUTPUT

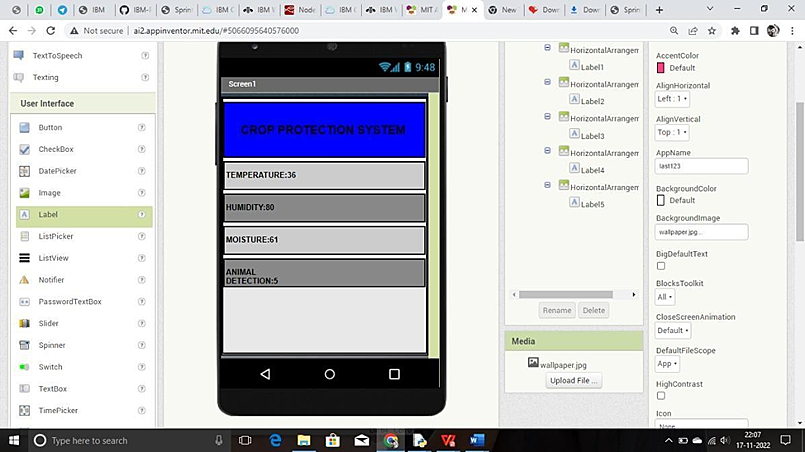
• IBM CLOUD TO NODE RED OUTPUT

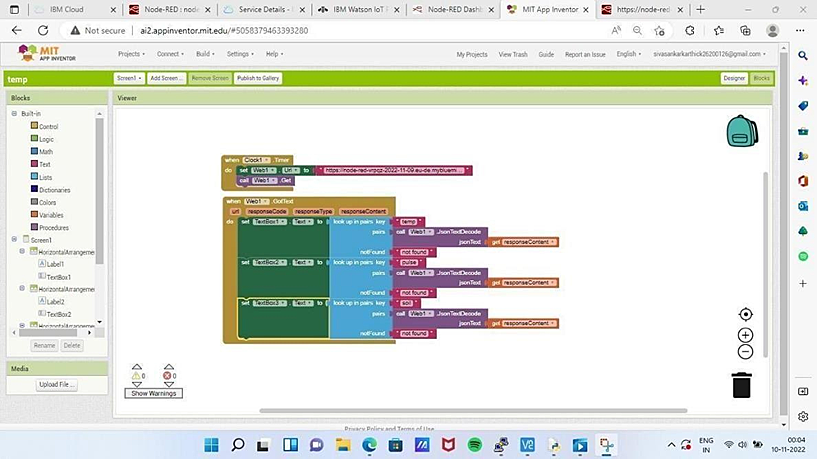
**8.1.1 User Acceptance Testing:**

**8.2 Purpose of Document**

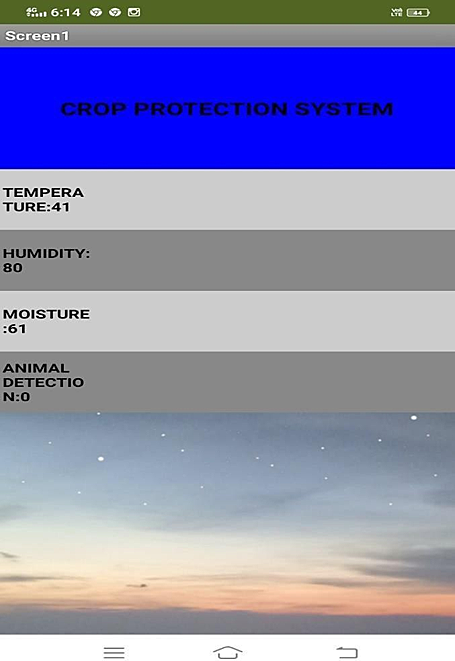
The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

**9.RESULT FOR MIT APP INVENTOR- TO DESIGN THE APP**





MIT AI2 COMPANION APP – TO DISPLAY THE OUTPUT VIA QR CODE



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**9.1Results**

Thus the IOT based Smart Crop Protection has been build successfully with the help of MIT app, Node.Js, and node red. And the output has been tested and verified using MIT app.

# 9.1.1ADVANTAGES :

* Sensors in Agriculture invented to meet the increasing demand for food with minimum resources such water, fertilizers and seeds.
* They are easy to operate and use and easy to maintain.
* Sensors are cheaper in price and best in quality.
* They can used for measuring pollution and global warming for their fields and crops.

# 9.1.2DISADVANTAGES:

* Farms are located in remote areas and are far from access to the internet.
* A farmer needs to have access to crop data reliably at any time from any location, so connection issues would cause an advanced monitoring system to be useless.
* High Cost: Equipment needed to implement IoT in agriculture is expensive.

**10.CONCLUSION:**

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

# 11.FUTURE SCOPE

IoT smart agriculture products are designed to help monitor crop fields using sensors and by automating irrigation systems. As a result, farmers and associated brands can easily monitor the field conditions from anywhere without any hassle.

**THANK YOU!**