

Project Report

1. INTRODUCTION

a. Project Overview

The Agriculture is a most important field in life of human being. This project work have focused to solve the problem in manual agriculture operation sch gran cutting, seed sowing andpesticide spraying. The machine gets supply from solar powered butterfly. The de motor is used to operate the wheels of the machine. The ATmega Microcontroller is used to control all the system process The purpose of automation is to eradicate the human clerical effort and to provide accuracy in the operations. This robot is capable cutting the grass and digging the soil at a certain depth and the seeds from the hopper is dropped into the field at a particular time interval in order to achieve the seeds spacing and proper compaction over the seeds. Covering of seeds with soil is done by the bent rod which is at the backside of machine. The pesticide is pumped from the tank in order to sprays pesticides to the field, it protects the farmers and cultivators from harmful pesticides and chemicals.

Numerous operations are performed in agriculture field like ploughing, seeding, fertilizing, weeding, harvesting, spraying etc. Out of them grass cutting, seed sowing and pesticide spraying are one of the most important and day-to-day job of the farmers For developing our economical condition it is necessary to increase our agricultural productivity and quality also. With the help of automation the work becomes easy and errorless. The machine small sized wheels performs well, the lightweight of the machine do not compact the soil.

The conventional methods are very difficult and inconvenient to perform it. The development of the advanced technology in the field of farming is much needed, which results in the higher yield and reduce the efforts and stress of farmers.

1.2 Purpose

Agriculture is a backbone of our nation. Nowadays various operations are performed in agriculture field. The manual method for all these operation is difficult to handle. Thiswork aims to develop a machine, which can spray the pesticides, cut the grass and sow the seed easily with less human assistance. With the help of DC motor, this machine sprays pesticides on crop and prevent crop from insects, cut the unwanted grass efficiency, using rotating blades having a sharpened knife edge on both sides. In seed sowing operation, the seeds are stored in a funnel and sow the seed in ground at regular interval with hole in a slider. The machine is powered using solar powered battery. Due to use of solar power, it preserves fuel cost. The maintenance cost is low, in which a single machine can operate various operations. The microcontroller is used to control the machine, which is

programmed to respond to WIFI. The WIFI can transmit the corresponding command from the Android Application to the microcontroller for the required operation and movement of the machine. By using this designed machine, Farmer can reduce lot of labour cost and can save more time. By using this machine, the efforts of farmer can be reduced.

LITERATURE SURVEY

a. Existing problem

IIOT tendencies are often utilized in smart farming to boost the standard of agriculture. Farming the pillar of supports our country to the general commercial development. But our productivity is extremely low as associated to world standards. People from rural areas drift to an urban area for other worthwhile trades and they can't concentrate on agriculture. There are many disadvantages of the current traditional agricultural methods namely costlier and manual monitoring of the agriculture field. Specifically, small-scale smart irrigation systems are utilized to provide the solution for dissimilar variety of plants in spite of getting the solution for moisture related issues. Weather conditions like temperature, humidity and moisture are difficult to check manually frequently.

Farmer suicide is turning into big problem due to low productiveness amongst farms. This low productiveness is due to the fact of two main reasons, Crop ruined by means of untamed weather conditions, untamed animal attacks, small types of species, insects, some hazardous snakes and weather circumstances.



Within the existing system, electrical fencing is used to give up untamed animal assaults on agricultural vegetation which leads to the death of animals. The fundamental objective is to provide a fantastic answer to this problem, so that losses incurred will be minimized and farmers will have an accurate crop yield. This low productivity is because of the fact of two most important motives i.e. Crop destroyed via untamed animals and Crop damaged by using nature object. The main objective of this assignment is to furnish a fantastic answer to this trouble, as a result with the purpose of the economic losses incurred through the support of our farmers are minimized to get truthful crop yield. This ensures complete security of vegetation from animals and defending the farmers loss. In the proposed system Raspberry Pi, PIR sensor, web camera, ultrasonic sensor, LDR sensor, temperature sensor, humidity sensor, moisture sensor, buzzer and monitor are used. This field of this effort remains towards withdraw to monitor the system for crop security conflicting to subconscious

occurrences and meteorological conditions. When the moisture content is below a critical level which is determined by the sensor planted in the fields, as the system is automated the water pumps are switched on. This ensures complete safety of crops from animals also as from the weather conditions thus prevent the farmers loss.



References

2.1 SOLAR POWERED AUTONOMOUS MULTIPURPOSE AGRICULTURAL ROBOT USING BLUETOOTH/ANDROIDAPP

This paper designs a machine, which is solar powered hence it is renewable energy source. The operations are performed using Android app. This work is designed to perform sowing of two different sized seeds. The bluetooth module can be used to communicate between two microcontrollers like arduino or communicate with any device with bluetooth technology like a phone or laptop. This increases the efficiency of the system and also the problems encountered in manual planting. Using bluetooth/Android app, we can send signal for the required movement of the robot and for the required mechanism.

2.2 SOLAR AUTOMATIC PESTICIDE SPRAYER USING ZIGBEE

This paper deals with automatic pesticide sprayer with almost less human assistance. Solar energy can be stored in a form of electrical energy or heat. It may also stored as mechanical energy in the form of flywheel. Sprayer can spray liquids quickly and easily, which reduces the efforts of farmers. Zigbee is used for the wireless control and monitoring applications. A powerful, highly flexible and cost effective microcontroller is used for controlling the machine.

2.3 AUTONOMOUS SEED SOWING AGRICULTURAL ROBOT

Four wheel drive robot is used for seed sowing in ploughed agricultural land. It sows seed on ground at regular interval of time. This robot has the ability to detect no of seed sowing points and complete it automatically. In this project, the robot is powered by lead acid battery. The movement of the robot is controlled by the arduino through L298N motor driver.

2.4 AUTOMATIC SOLAR POWERED GRASS CUTTER INCORPORATED WITH ALPHABET

PRINTING AND PESTICIDE SPRAYER

In this project, the movement of the machine is done by wing motor. The manual pesticide sprayer can cause health hazards to farmers who operate it. This problem can be rectified by our automatic solar powered pesticide sprayer. The separate machine for these operations such as grass cutting and pesticide spraying requires more space and cost for buying separate machine will be more. The main advantage of this project is to reduce the cost of the machine, space and man power required for both operations.

2.5 SOLAR POWERED AUTOMATIC GRASS CUTTER AND PESTICIDE SPREADING ROBOT

Solar panel is used to provide the source to the battery charging. The source

is driven from the solar energy by using solar plate. The system control is done by Arduino UNO R3. Automation is achieved by using sensors and Arduino UNO R3. DC battery is utilized for powering and standby mode operation of the system. The whole supply for the machine is provided through battery and to charge the battery charger circuit and it is used to provide the charging for the battery.

2.6 NEW COMPARISON OF ZIGBEE, Z-WAVE, WI-FI, AND BLUETOOTH WIRELESS TECHNOLOGIES USED IN HOME AUTOMATION

This article presents about the wireless technology used for the automation purpose. The various wireless technologies used are Zigbee, Z-wave, WiFi and Bluetooth. This paper compares performance of these wireless technologies such as power consumption, range, and cost. WiFi is mostly used for wireless monitoring and management of home appliances. WiFi are easy to use. We can connect most of the devices easily to WiFi.

Problem Statement Definition

Problem Statement: Develop an efficient system & an application that can monitor and alert the users (farmers).

Idea / Solution description: IOT-based smart farming is a network typically designed with sensors (light, humidity, temperature, soil). To monitor the crop field and automate farming activities. The farmers are able to track the condition in the field from anywhere.

Novelty / Uniqueness: Real-time crop monitoring. Soil testing & its quality.
Fastest alerts to the farmers and increased yields.

Social Impact / Customer Satisfaction: Easy to install and compact. Efficient operation management. Better use of resources and assets. Improved work safety. Cost-effective operation.

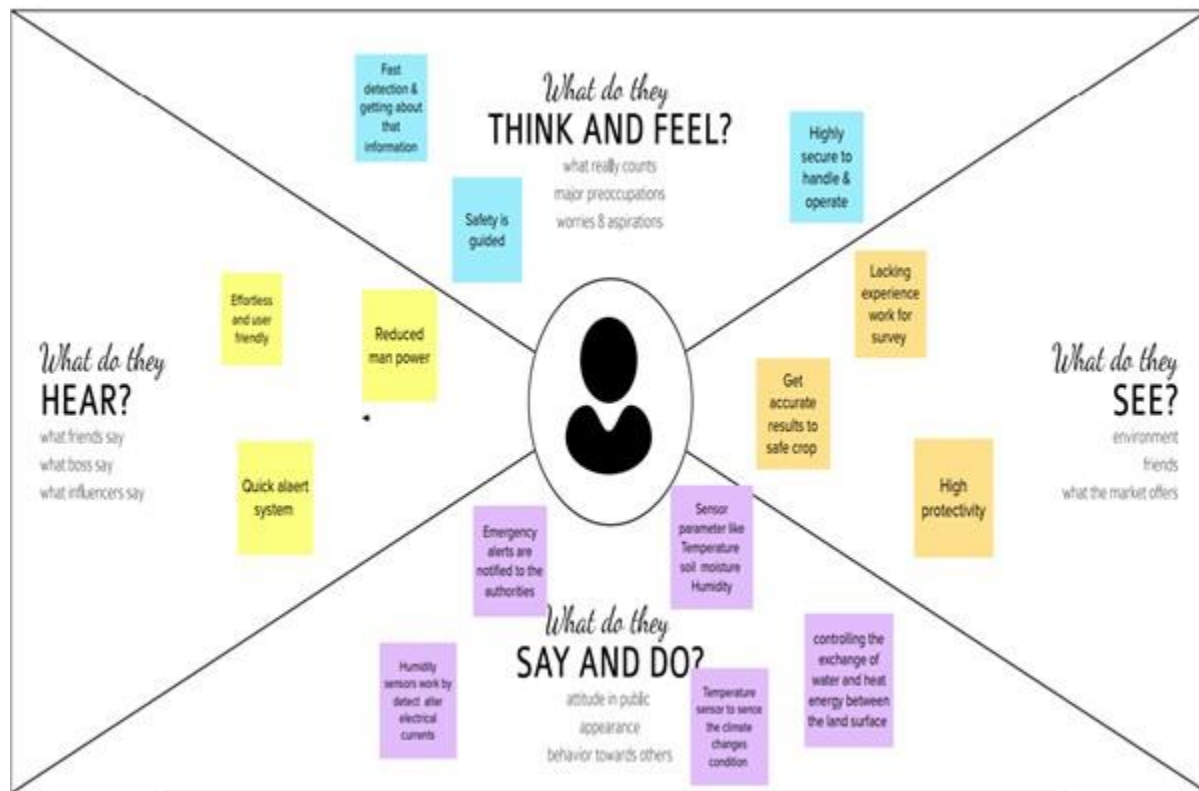
Business Model: Better business opportunities. Thorough marketing and business development. More trustworthy image of the company.

Scalability of the Solution: Monitoring crops, surveying, mapping the fields.

Providing data to farmers for rational farm management plans. To save both time & money.

IDEATION & PROPOSED SOLUTION

Empathy Map



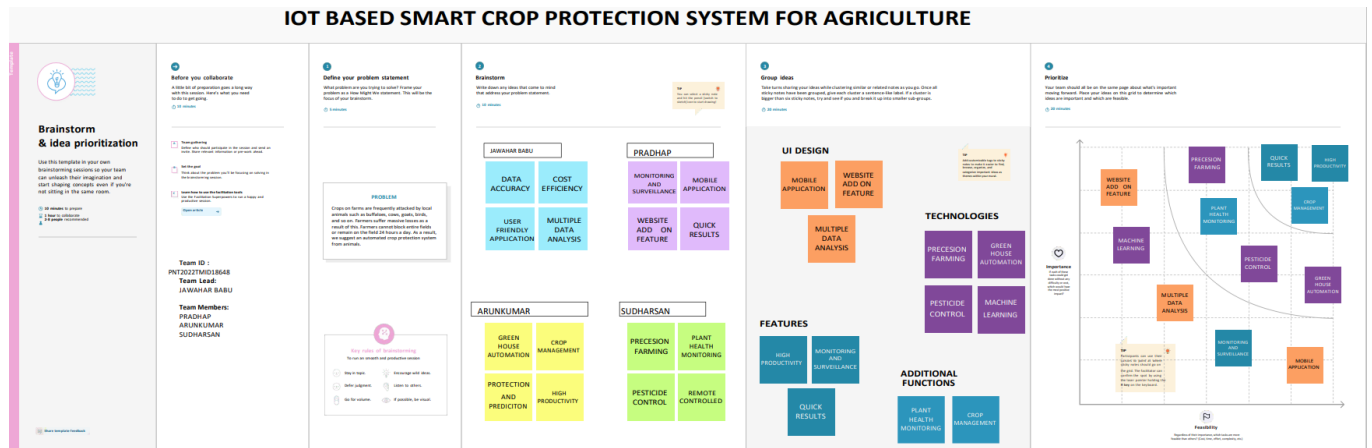
Ideation & Brainstorming

Step-1: Team Gathering, Collaboration and Select the Problem Statement

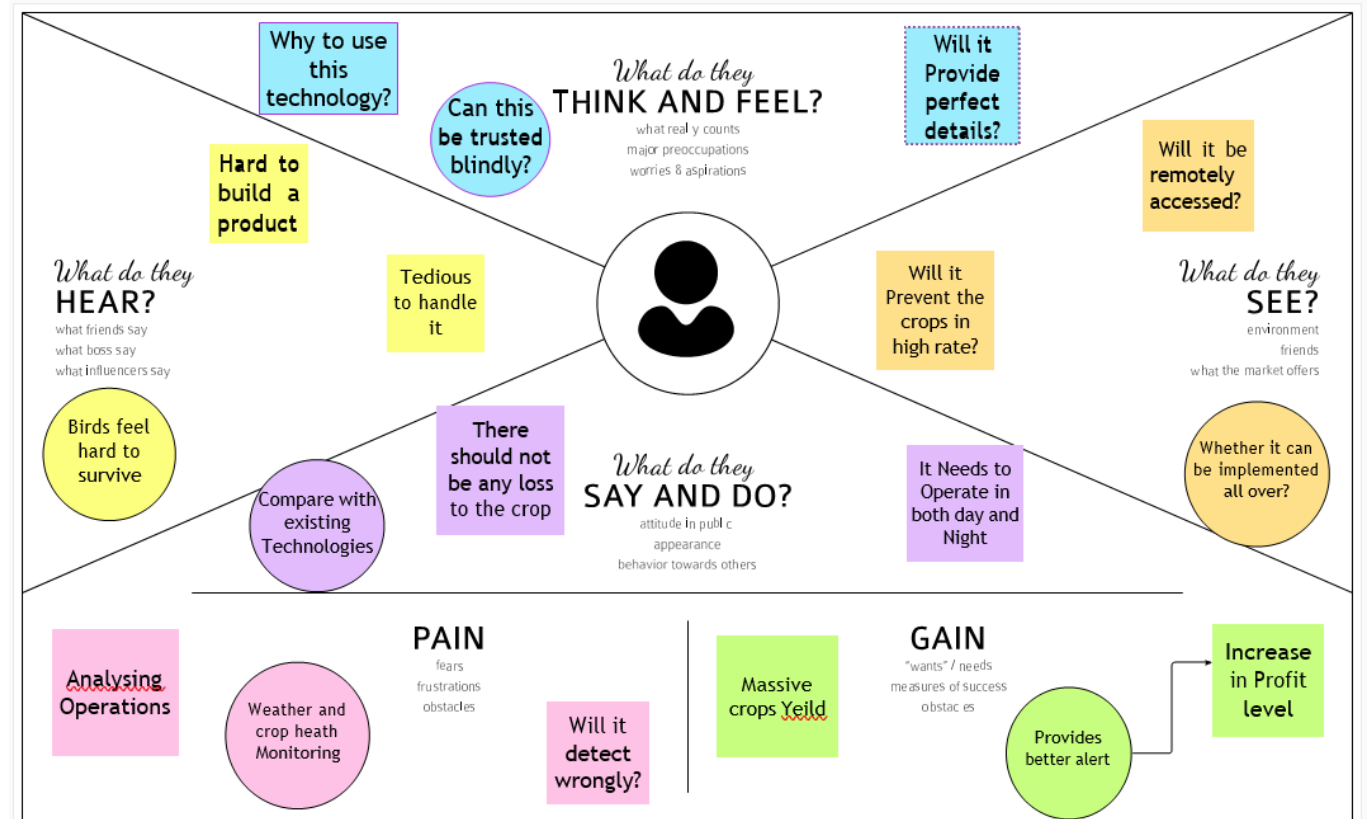


Our problem is to provide protection for crop when the farmer has unable to reach his field.

Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization



GROUP IDEAS:



Proposed Solution:

Project team shall fill the following information in proposed solution template.

| S.No. | Parameter | Description |
|-------|--|---|
| 1. | Problem Statement (Problem to be solved) | Develop an efficient system & an application that can monitor and alert the users(farmers) |
| 2. | Idea / Solution description | <p>This product helps the field in monitoring the animals other disturbance</p> <p>In several areas, the temperature sensors will be integrated to monitor the temperature & humidity</p> <p>If in any area feel dry or wetless is detected by admins, will be notified along with the location in the web application</p> <p>If in any area feel dry or wetless is detected by admins, will be notified along with the location in the web application</p> |
| 3. | Novelty / Uniqueness | <p>Fastest alerts to the farmers</p> <p>The increasing demand for quality foodUser friendly</p> |
| 4. | Social Impact / Customer Satisfaction | <p>Easy installation and provide efficient results</p> <p>Can work with irrespective of fear</p> |
| 5. | Business Model (Revenue Model) | <p>As the product usage can be understood by everyone, itis easy for them to use it properly for their safest organization</p> <p>The product is advertised all over the platforms. Sinceit is economical, even helps small scale farming land from disasters.</p> |
| 6. | Scalability of the Solution | Even when the interruption is more, the product sense the accurate location and alerts the farmers effectively |

Problem Solution fit

Problem Solution fit

| | | |
|---|---|--|
| 1. CUSTOMER SEGMENT(S) CS Define CS, fit into CL Farmer's! Who's not near his field | 6. CUSTOMER LIMITATIONS EG. BUDGET, DEVICES CL 1)High adoption <u>costs</u> , security concerns. 2)Not aware of the implementation of IoT in agriculture. | 5. AVAILABLE SOLUTIONS PLUSES & MINUSES AS Monitor different parameters and mobile or web application make easily to farm the crop <u>field</u> . |
| 2. PROBLEMS / PAINS + ITS FREQUENCY PR Focus on PR, tap into BE, understand RC <ul style="list-style-type: none"> It's difficult to monitor and control Ain't known if the application doesn't work properly. | 9. PROBLEM ROOT / CAUSE RC 1)If <u>temperature</u> <u>PH</u> level ,humidity & light intensity makes the serious cause for the environment. 2)Farmer affected by less productivity which will affect in their profit. | 7. BEHAVIOR + ITS INTENSITY BE Focus on PR, tap into BE, understand RC Direct related: Tries to find a solution to prevent this problem Indirect related: Located in rural where internet connectivity might not be strong enough to facilitate fast transmission speeds. |
| 3. TRIGGERS TO ACT TR Identify strong TR & EM Create opportunities to lift people out of poverty in developing nations. (Over 60%) 4. EMOTIONS BEFORE / AFTER EM BEFORE: Finances, Heavy work overload and conflict in relationship. AFTER: It will easier to make more yield in | 10. YOUR SOLUTION SL "IoT based Smart crop protection system for agriculture"!! It help farmers grow more food on less land by protection crops from pests, diseases <u>and</u> <u>weeds</u> as well as raising productivity per hectare. | 8. CHANNELS of BEHAVIOR CH Extract online & offline CH of BE ONLINE: The Data send through application for the farmers to know about the farms. OFFLINE: The control action is taken by the farmers to monitor the farms. |

REQUIREMENT ANALYSIS

Functional requirement

User Visibility: This smart agriculture using IOT system is powered by Arduino, it consists of Temperature sensor, Moisture sensor, water level sensor, DC motor and GPRS module. The IOT based agriculture monitoring system starts it checks the water level, humidity and moisture level.

User Reception: The Data like values of Temperature, Humidity, Soil moisture sensors are received via SMS.

User Understanding: Based on the sensor data value to get the information about present of farming land.

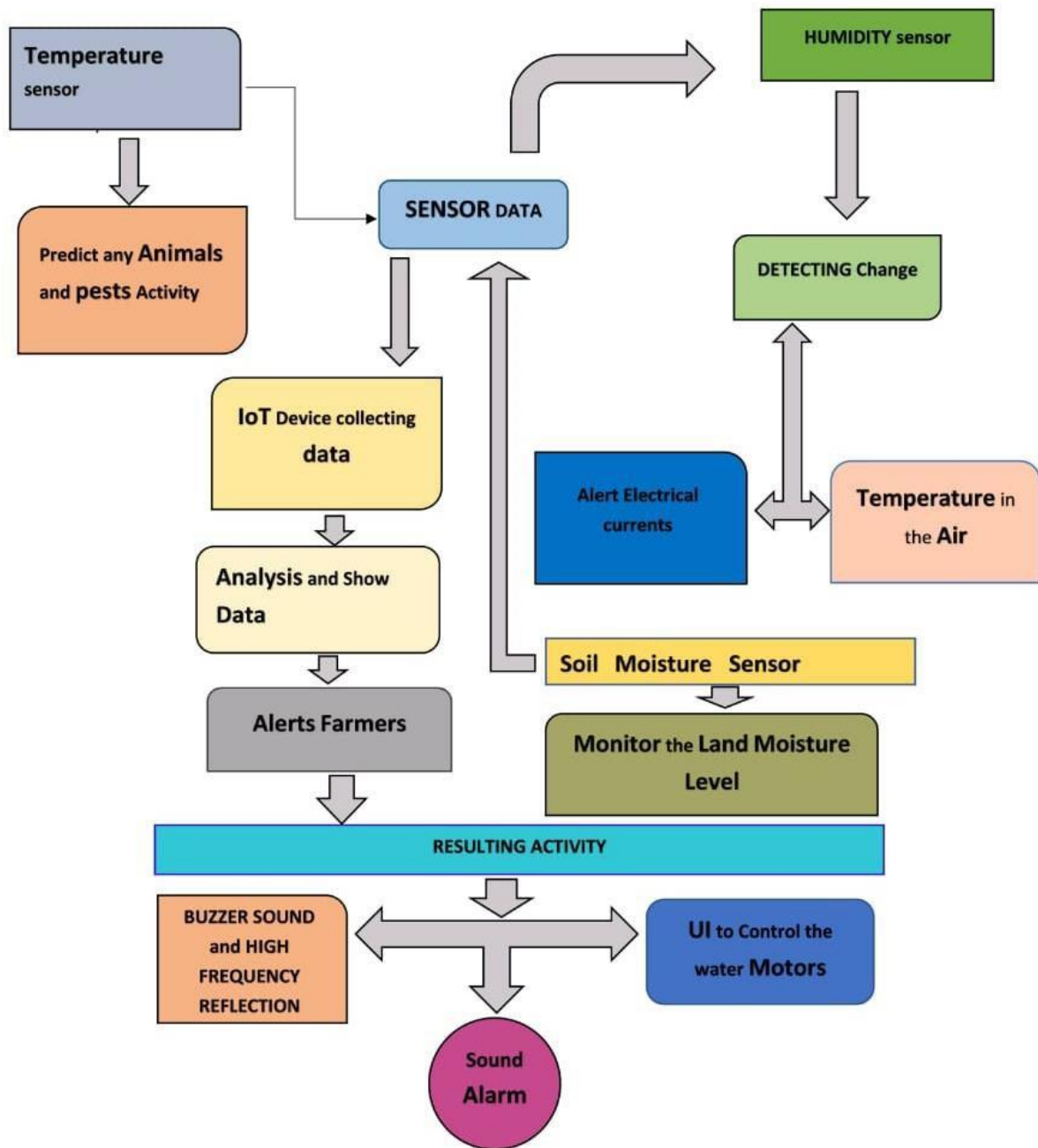
User Action: The user needs take action like destruction of crop residues, deep plowing, crop rotation, fertilizers, strip cropping, scheduled planting operations.

Non-Functional requirements

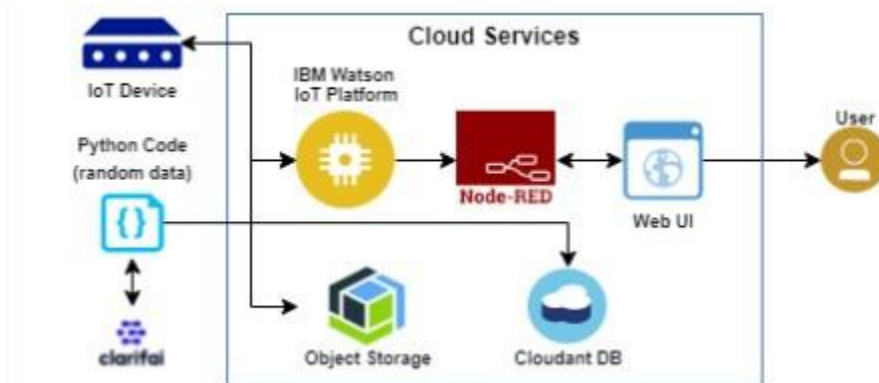
Numerous operations are performed in agriculture field like ploughing, seeding, fertilizing, weeding, harvesting, spraying etc. Out of them grass cutting, seed sowing and pesticide spraying are one of the most important and day-to-day job of the farmers. For developing our economical condition it is necessary to increase our agricultural productivity and quality also. With the help of automation the work becomes easy and errorless. The machine small sized wheels performs well, the lightweight of the machine do not compact the soil.

The conventional methods are very difficult and inconvenient to perform it. The development of the advanced technology in the field of farming is much needed, which results in the higher yield and reduce the efforts and stress of farmers.

DATA FLOW DIAGRAM:



Solution & Technical Architecture:



User Stories

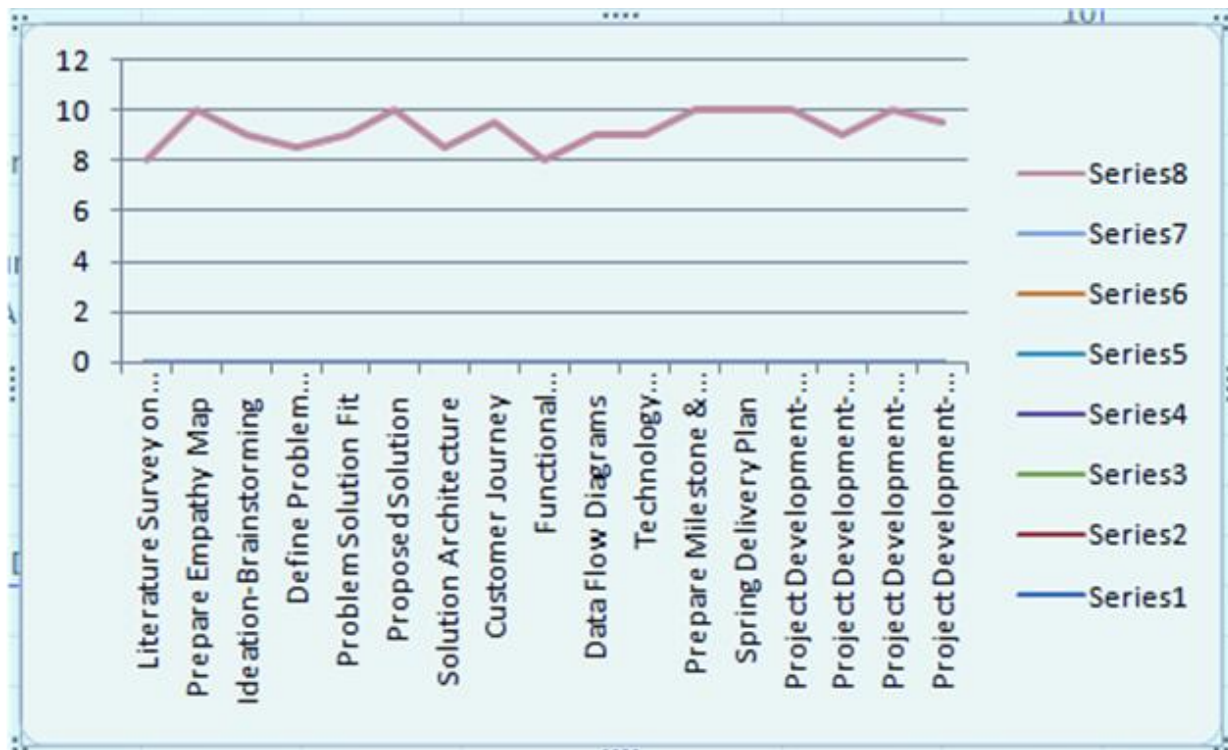
- The different soil parameters (temperature, humidity, light intensity, pH level) are sensed using different sensors and the obtained value is stored in IBM cloud.
- Arduino uno is used as a processing unit which processes the data obtained from sensors and weather data from weather API.
- Node red 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 which was developed. Depending upon the sensor values, Mobile Motor Pump controller waters the crop

PROJECT PLANNING & SCHEDULING

Sprint Planning & Estimation

- Create the IBM Cloud services which are being used in this project.
- Configure the IBM Cloud services which are being used in completing this project.
- IBM Watson IoT platform acts as the mediator to connect the web application to IoT devices, so create the IBM Watson IoT platform.

- In order to connect the IoT device to the IBM cloud, create a device in the IBM Watson IoT platform and get the device credentials.
- Configure the connection security and create API keys that are used in the Node-RED service for accessing the IBM IoT Platform.
- Create a Node-RED service.
- Develop a python script to publish random sensor data such as temperature, moisture, soil and humidity to the IBM IoT platform.
- After developing python code, commands are received just print the statements which represent the control of the devices.
- Publish Data to The IBM Cloud.
- Create Web UI in Node- Red.
- Configure the Node-RED flow to receive data from the IBM IoT platform and also use Cloudant DB nodes to store the received sensor data in the cloudant DB



Reports from JIRA:



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

Feature 1

The main feature of the project is to give the proper information about the field like temperature, humidity, soil moisture. This is for the purpose of reducing the workload of the farmers. The user can see the above details in his mobile by connecting it to the device kit.

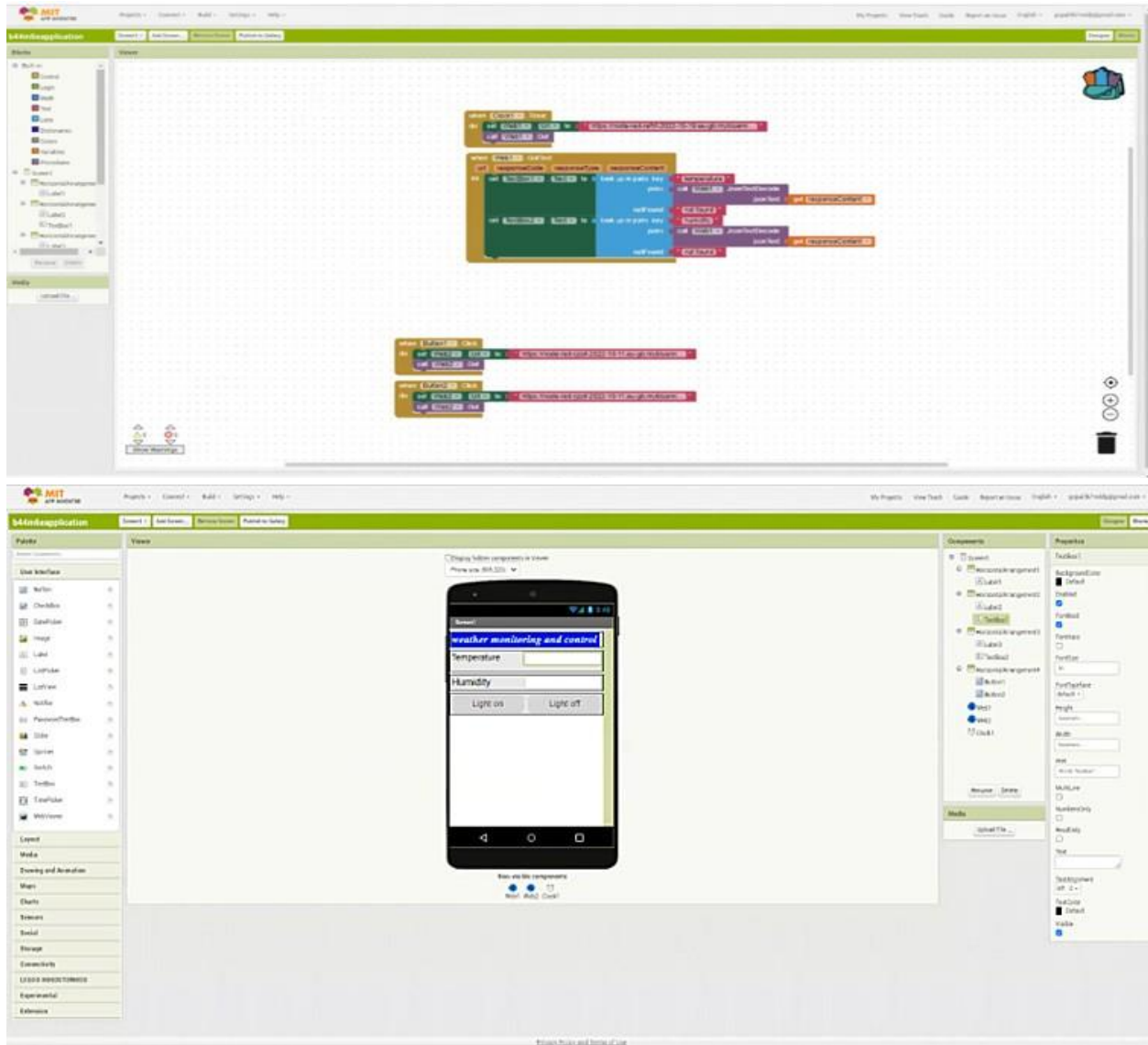
Feature 2

The next feature of the project is to control the water dispense in the field. It is the main process which takes more time to finish. Now it can be easily done by the user at any time by clicking on a button.

Database Schema (if Applicable)

TESTING:

Test Cases

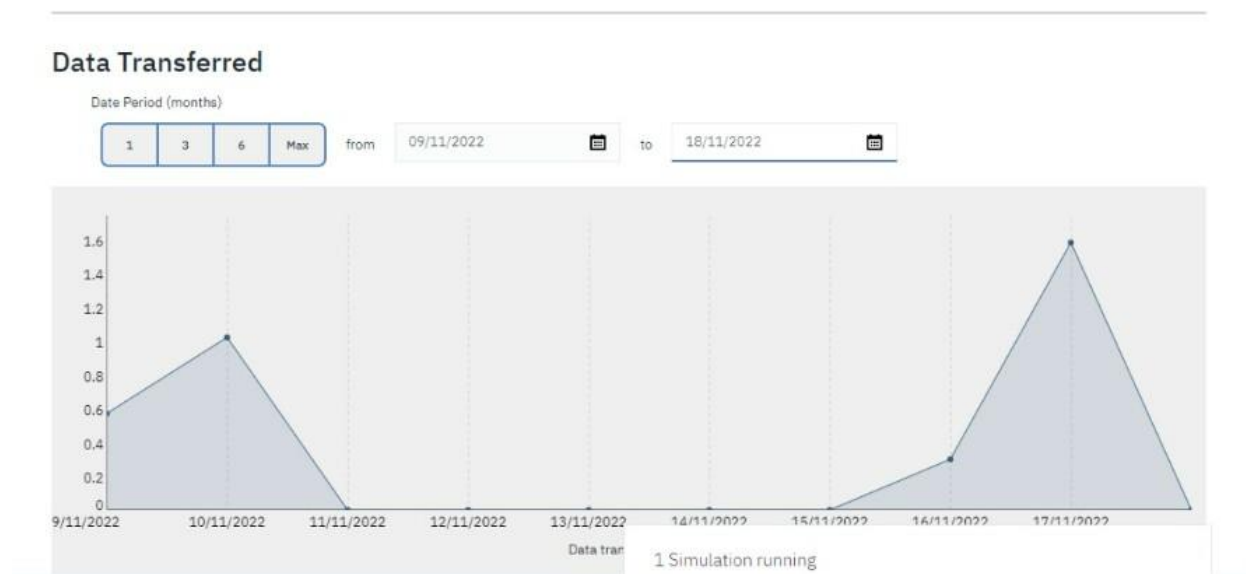


User Acceptance Testing:



RESULTS

Performance Metric



ADVANTAGES & DISADVANTAGES

ADVANTAGES

- 1.Reduce the manual work
- 2.Easy to operate.
- 3.Can transmit the command lastly without any interruption

DISADVANTAGES

- 1.Still runs on 5 V, so legacy 5 V stuff interfaces cleaner.
- 2.Even though it's 5 V capable, newer parts can run to 1.8V.
- 3.This wide range is Everywhere.

CONCLUSION:

The machine is meant to operate automatically in the field of agriculture. The main thing is to automate the operation like pesticide spraying, grass cutting and seed sowing, in order to obtain the greater yield and assist the farmer to move towards using of advanced technology. It helps them to achieve automation. The seeds are sown in a proper sequence which results in proper germination of seeds and sprays pesticides automatically which solves the problems encountered in manual operation. This advancement in agricultural sector is quite possible to achieve greater productivity rate and reducing the power consumption and labor requirement. This Smart machine is designed to increase the productivity and to decrease the human efforts. As it is operated on solar energy, it is the best application that does not affect our environment.

FUTURE SCOPE:

In this system we are operating all control systems like pesticide spraying, seed sowing and grass cutting through an automated machine and which is operated by rechargeable battery. In future it can be replaced with solar cells to reduce power consumption.

13.APPENDIX

SOURCE CODE

```
import time
import sys
import ibmiotf.application # to install pip install ibmiotf import ibmiotf.device

# Provide your IBM Watson Device Credentials organization = "8gyz7t" # replace the ORG ID deviceType =
"weather_monitor" #replace the Device type deviceId = "b827ebd607b5" # replace Device ID authMethod =
"token" authToken = "LWVpQPpVQ166HWN48f" # Replace the auth token

def myCommandCallback(cmd): # function for Callback if

cm.data['command'] == 'motoron':

print("MOTOR ON IS RECEIVED")
elif cmd.data['command'] == 'motoroff': print("MOTOR OFF IS RECEIVED") if cmd.command ==
"setInterval":

else:

if 'interval' not in cmd.data:
print("Error - command is missing required information: 'interval'")
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, "authmethod": 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()
```

```
SENSOR.PY
```

```
import time import sysimport ibmiotf.application importibmiotf.device  
import random
```

```
# Provide your IBM Watson Device Credentials organization = "8gyz7t" # replace the ORG ID deviceType =  
"weather_monitor" #replace the Device type deviceId = "b827ebd607b5" # replace Device ID authMethod =  
"token" authToken = "LWVpQPpVQ166HWN48f" # Replace the authtoken
```

```
def myCommandCallback(cmd):
```

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

```
try:  
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId,  
"auth-method": authMethod, "auth-token": authToken} deviceCli = ibmiotf.device.Client(deviceOptions)  
#.....
```

```
exceptException 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 oftype "greeting" 10 times  
deviceCli.connect()
```

```
while True:  
temp=random.randint(0,1  
00)  
pulse=random.randint(0,100) soil=random.randint(0,100)
```

```
data = { 'temp': temp, 'pulse': pulse ,'soil':soil} #print data      def  
myOnPublishCallback():  
print ("Published Temperature = %s C" % temp, "Humidity = %s %" % pulse,"Soil Moisture = %s %" %  
soil,"to IBM Watson")
```

```

success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0, on_publish=myOnPublishCallback)
    if not success: print("Not connected to
IoT")time.sleep(1)

```

```

deviceCli.commandCallback = myCommandCallback

```

```

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

```

Node-RED FLOW

```

[
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```

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```

```
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"finalize":"","
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],

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49
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},
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},
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