

# **SMART FARMER- IoT ENABLED SMART FARMING USING APPLICATION**

**A PROJECT REPORT**

*Submitted by*

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**TEAM ID: PNT2022TMID27262**

## **BONAFIDE CERTIFICATE**

**Certified that this project report titled “Smart Farmer - IoT Enabled Smart Farming Application” is the bonafide work of “BALAJI R(311019104013), PRIYAN A (311019104065), MATHAN KUMAR(311019104046), POZHILAN S (311019104059)” who carried out the project work under my supervision.**

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**Swati Saxena**

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Submitted the report for the final release of the project on **19/11/2022**





## **ABSTRACT**

IoT plays a major role in the agricultural field. This project is mainly applied to the agricultural field. Smart irrigation and farming can help farmers to grow healthy plants. The existing system only checks the soil water stress and automates the process of watering. The project is about IoT-based smart farming and irrigation systems. The ultimate agenda of this project is to monitor the farm and water plants using the mobile application. This work helps us to know the values of various parameters such as humidity, moisture, location, and temperature of plants and water them accordingly just by tapping the motor ON/OFF button from the user's Mobile. We used firebase to store user data and python code for the backend process of our application and linked our designing process in the MIT inventor app with the IBM cloud by using NODE-RED. The ultimate significance of this project is that most of the manual work is reduced and the watering process is automated with the help of devices as a result of which healthy plants can be grown, Water and electricity usage are saved by this project. Even elderly people can easily do farming. This methodology with the use of IoT-enabled mobile application technology had made us achieve healthy farming. An increase in agriculture also helps us to increase the economical state of the country.

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## INTRODUCTION

### 1.2 PROJECT OVERVIEW

The objectives of this report are to propose a Smart farmer-IoT Enabled Smart Farming Application that will enable farmers to have live data of soil moisture, environment temperature, and humidity level at a very low cost so that live monitoring can be done. The structure of the report is as follows: chapter I will cover an overview of IoT Technology and agriculture concepts and definition, IoT enabling technologies, IoT application in agriculture, benefits of IoT in agriculture, and IOT and agriculture current scenario and future forecasts. Chapter II will cover the existing problem, references, and the detection of the problem statement. Chapter III will cover the empathy of farmers, the solutions and brainstorming, the proposed solution for the problem, customer constraints, and the available solution. Chapter IV consists of the functional requirement and also the Non-functional requirement of the project. Chapter v will cover the design of the project with data flow, Solution architecture, and User stories in it. Chapter VI consists of the planning of the sprint and the estimation, the delivery schedule of the sprint, and the roadmap of our sprint deliverables from JIRA. Chapter VII will consist of the solutioning of the project and also point out the features along with the code. Chapter VIII will have the test analysis of the application such as the registration page, login portal, and dashboard with temperature, humidity, moisture, pressure level, and also the location. Chapter IX results and performance metrics of the project application. Chapter X will consist of the advantages and disadvantages of our project. Chapter XI will cover the conclusion and vision of the project. Chapter XII defines the future scope of this project. Chapter XIII consists of the source code with a GitHub link and with the project Demo link.

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## 1.2 PURPOSE

The purpose of our project is to monitor the agriculture field smartly by farmers using IoT enabled Smart Farming application that aims to **improve the entire Agriculture system by monitoring the field in real-time as it** shows the temperature value of the environment, the humidity level in the air, and the pressure level and the weather condition. This system assists farmers by helping them automatically ON/OFF the motor based on the moisture level of the soil. The main purpose of this project is to help the farmers to monitor their fields from anywhere and anytime. The status of the farm is updated every five minutes so the farmers can be updated with the weather condition and also prevent their crops from some species by using ultrasonic sensors and information will send to their mobile through the notification. 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.



## **LITERATURE SURVEY**

### **2.1 Existing problem**

In the existing system, there may be some difficulties with the login page and also the registration page where the user finds trouble while entering their credentials which results in farmers getting frustration and reducing the usage of existing applications. But in our project, the login process is easy and effective as our application is user-friendly.

In the existing system, only the soil moisture level is monitored by using a moisture sensor, and also internet connection is lower in some rural areas, this may cause some difficulties while sending notifications to the user when water is required for the plants. Even though it sends a notification to the user there will be automatic ON/OFF motor control button is not available in the application.

### **2.2 REFERENCES**

1. Smart farming: IoT-based smart sensor agriculture stick for live temperature and humidity monitoring  
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K Phasinam, T Kassanuk, M Shabaz - Journal of Food Quality, 2022 - [hindawi.com](https://hindawi.com)

## IDEATION AND PROPOSED SOLUTION

### 3.1 EMPATHY MAP CANVAS


# Empathy Map - IOT based smart-farming



The term “empathy” is used to describe a wide range of experiences. Emotion researchers generally define empathy as the ability to sense other people's emotions, coupled with the ability to imagine what someone else might be thinking or feeling. The empathy of farmers can help us to understand the recent problems and the current situation of agriculture.




## 3.2 IDEATION & BRAINSTORMING


Template




### Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.


 10 minutes to prepare  
 1 hour to collaborate  
 2-8 people recommended


 Share template feedback





#### 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

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

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


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

[Open article](#) →




#### 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**  
Farmers need to deal with many problems like cope with climate change, soil erosion and bio-diversity loss.





#### Key rules of brainstorming


To run a smooth and productive session


 Stay in topic.


 Defer judgment.

 Go for volume.

 Encourage wild ideas.

 Listen to others.

 If possible, be visual.



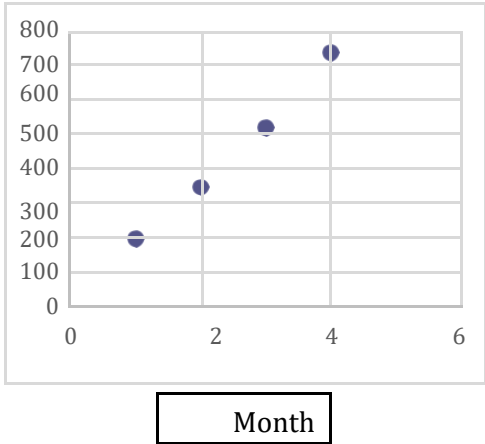
**Need some inspiration?**

See a finished version of this template to whet your team's appetite.

[Open example](#) →

### 3.3 PROPOSED SOLUTION

| S.No. | Parameter                                | Description  |
|-------|--|--|
| 1.    | Problem Statement (Problem to be solved) | <p>The main problems include</p> <ul style="list-style-type: none"> <li>• Climate change affects farmers' ability to grow vital food.</li> <li>• Adding to that volatile weather and extreme events like sudden floods and droughts can lead to the change in growing seasons, limit the availability of water, lead to weeds, pests, and fungi thriving, and can reduce crop productivity.</li> <li>• Irrigation plays a major role in agriculture for a tropical monsoon country like India where rainfall is uncertain, unreliable, and erratic.</li> <li>• Watering the crop is one of the important tasks for farmers.</li> <li>• Crop rotation is also the main problem for farmers. It should be properly planned for yielding better outcomes. For example, if cereals are grown on a plot of land their fertility is reduced to some extent.</li> </ul> |
| 2.    | Idea / Solution description              | <ul style="list-style-type: none"> <li>• Using Local weather API, we can monitor the weather conditions.</li> <li>• moisture level, temperature, humidity, Object distance, and weather conditions will be monitored by sensors</li> <li>• Application will be created to monitor the user's farm status.</li> <li>• The login process is easy and effective as our application is user-friendly.</li> <li>• The user can also able on/off the motor and light from anywhere using our application.</li> <li>• Email Id of the user will be stored in our database (Firebase DB) which they entered during the signup process.</li> <li>• Automatic email will be sent to the user when moisture is below 30% (Turn on motor) and above 60% (Turn off motor) and if any object is less than or equal to 100m around their</li> </ul>                             |

|       |                                       | field then the user will get an email notification as (someone is near your field).  |       |    |   |     |   |     |   |     |   |     |
|-------|---------------------------------------|--|-------|----|---|-----|---|-----|---|-----|---|-----|
| 3.    | Novelty / Uniqueness                  | <ul style="list-style-type: none"><li>Email will be sent to users when there is a requirement for irrigation and sends a notification to switch off the motor when its reached the threshold level.</li></ul>  |       |    |   |     |   |     |   |     |   |     |
| 4.    | Social Impact / Customer Satisfaction | <ul style="list-style-type: none"><li>Doubles the farmer’s income</li><li>Higher Production and good yield</li><li>Reduces the wages for laborers who work in the agricultural field.</li><li>Healthy Crops</li></ul>  |       |    |   |     |   |     |   |     |   |     |
| 5.    | Business Model (Revenue Model)        | <div>Revenue (no. of users vs months)</div> <div><div>se</div><table><thead><tr><th>Month</th><th>se</th></tr></thead><tbody><tr><td>1</td><td>200</td></tr><tr><td>2</td><td>350</td></tr><tr><td>3</td><td>500</td></tr><tr><td>4</td><td>750</td></tr></tbody></table></div> | Month | se | 1 | 200 | 2 | 350 | 3 | 500 | 4 | 750 |
| Month | se                                    |  |       |    |   |     |   |     |   |     |   |     |
| 1     | 200                                   |  |       |    |   |     |   |     |   |     |   |     |
| 2     | 350                                   |  |       |    |   |     |   |     |   |     |   |     |
| 3     | 500                                   |  |       |    |   |     |   |     |   |     |   |     |
| 4     | 750                                   |  |       |    |   |     |   |     |   |     |   |     |
| 6.    | Scalability of the Solution           | Business-to-business and business the customer can be implemented and it can be used for enhancing the profit on a large scale.  |       |    |   |     |   |     |   |     |   |     |

### 3.4 PROBLEM-SOLUTION FIT

|                        |   |  |  |                         |
|------------------------|---|--|--|-------------------------|
| Define CS, fit into RC | <b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span><br>Who is your customer?<br>The main customers are the farmers who are going to grow different variety crops on different season. By the data collected they can use to check what types of crops can be grown which may result in better cultivation | <b>6. CUSTOMER CONSTRAINTS</b> <span>CC</span><br>What constraints prevent your customers from taking action or limit their choices of solutions? (i.e. spending power, budget, no cash, network connection, available devices).<br>Due to lots of sensors a lot of power and internet is needed to store the data and they may feel difficult if they don't have a great knowledge in using this data. It should also fulfill constraints like cost, space etc... | <b>5. AVAILABLE SOLUTIONS</b> <span>AS</span><br>or need to get the job done? What have they tried in the past? What pros &<br>The irrigation can be made automated using iot. Like when the amount water required after rain is not enough it can provide it through iot the farmers no need to go daily and irrigate the field using this the field can be irrigated | Explore AS, differentia |
|------------------------|---|--|--|-------------------------|

|  |   |   |  |  |
|--|---|---|--|--|
| Focus on J&P, tip into BE, understand RC | <b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <span>J&amp;P</span><br>Which jobs-to-be-done (or problems) do you address for your...<br>The main aim of the product to obtain different parameters using sensors to calculate certain factors like moisture and store them in cloud. Which will be a great resource for the farmer to cultivate right type of crops at right time        | <b>9. PROBLEM ROOT CAUSE</b> <span>RC</span><br>What is the real reason that this problem exists? What is the back story behind the need<br>Due to frequent change in weather, it is difficult for farmers to know the right amount of water to be done for plants. Due to lack of instruments for measuring soil moisture they may over give or lack of water for plants.  | <b>7. BEHAVIOUR</b> <span>BE</span><br>What does your customer do to address the problem and not this job.<br>i.e. directly related: find the right solar panel installer, calculate usage and<br>Many It companies are ready to install this setup on the fields. The farmer can use proper irrigation techniques which may increase production and reduce time.  | Focus on J&P, tip into BE, understand RC |
|  | <b>3. TRIGGERS</b> <span>TR</span><br>What triggers customers to act? (i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news).<br>The easy accessibility and reliability make the farmers use it properly and by the application the cultivation of farmers may increase and the production increase which results in profit | <b>10. YOUR SOLUTION</b> <span>SL</span><br>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.<br>If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.<br>The solution of this application is to collect data through sensors and store it in the cloud storage and using iot producing automated | <b>8. CHANNELS of BEHAVIOUR</b> <span>CH</span><br><b>8.1 ONLINE</b><br>What kind of actions do customers take online? Extract online channels from #7<br>Proper assistance and guidance should be given to the farmers about this application so it will be user friendly. Knowledge about the moisture level and irrigation techniques can be given.<br><b>8.2 OFFLINE</b><br>What kind of actions do customers take offline? Extract offline channels from #7 and |  |

|   |  |   |
|---|--|---|
| <b>4. EMOTIONS: BEFORE / AFTER</b> <span>EM</span><br>How do customers feel when they face a problem or a job and afterwards?<br>i.e. lost, insecure > confident, in control - use it in your communication strategy & design.<br><b>Before:</b> Lack of knowledge in weather prediction → Random decision → Less yield → Low profit<br><b>After:</b> Data collection from sources and knowledge in weather → Correct decision → Great yield → Great profit | irrigation technique according to the climatic condition like automatic on/off of water pump through application | use them for customer development.<br>Awareness camps can be organized to boost people's knowledge about iot and explain the advantages and impacts of it in farming. |
|---|--|---|

## REQUIREMENT ANALYSIS

### 4.1 FUNCTIONAL REQUIREMENT

Following are the functional requirements of the proposed solution.

| <b>FR No.</b> | <b>Functional Requirement (Epic)</b> | <b>Sub Requirement (Story / Sub-Task)</b>   |
|---------------|--------------------------------------|---|
| FR-1          | Basic Requirements                   | Smart Phone with minimum 2GB RAM & 8GB ROM  |
| FR-2          | User Registration                    | Registration through Email<br>Registration through Form<br>Registration through Mobile Number |
| FR-3          | User Confirmation                    | Confirmation via Email<br>Confirmation via OTP  |
| FR-4          | Access Permission                    | User should enable their Audio, Contacts, Location, Wi-Fi & Camera                            |
| FR-5          | User Details                         | Name, Mobile Number, Email-id, Address, Type of crop, Land details, etc                       |

## 4.2 NON-FUNCTIONAL REQUIREMENT

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

| FR No. | Non-Functional Requirement | Description   |
|--------|----------------------------|---|
| NFR-1  | <b>Usability</b>           | <ul style="list-style-type: none"><li>➤ Can be used in all agricultural fields.</li><li>➤ Can Monitor their field from anywhere at any time.</li><li>➤ Irrigation can be easily done to all crops at regular time intervals.</li></ul>  |
| NFR-2  | <b>Security</b>            | <ul style="list-style-type: none"><li>➤ Confidentiality-Requires information in a computer only is accessible for reading by authorized parties.</li><li>➤ Access be available only to authorized users.</li><li>➤ All the details about the user are protected from unauthorized access.</li><li>➤ Detection and identification of any malfunction of sensors.</li></ul> |
| NFR-3  | <b>Reliability</b>         | <ul style="list-style-type: none"><li>➤ High speed of data results in better monitoring.</li><li>➤ Efficient of the system consisting for a long period.</li><li>➤ Cost-effective.</li><li>➤ Easily Accessible by the users.</li></ul>  |
| NFR-4  | <b>Performance</b>         | <ul style="list-style-type: none"><li>➤ The idea of implementing integrating sensors with soil sensing and environmental or ambient parameters in farming will be more efficient for overall monitoring.</li></ul>  |

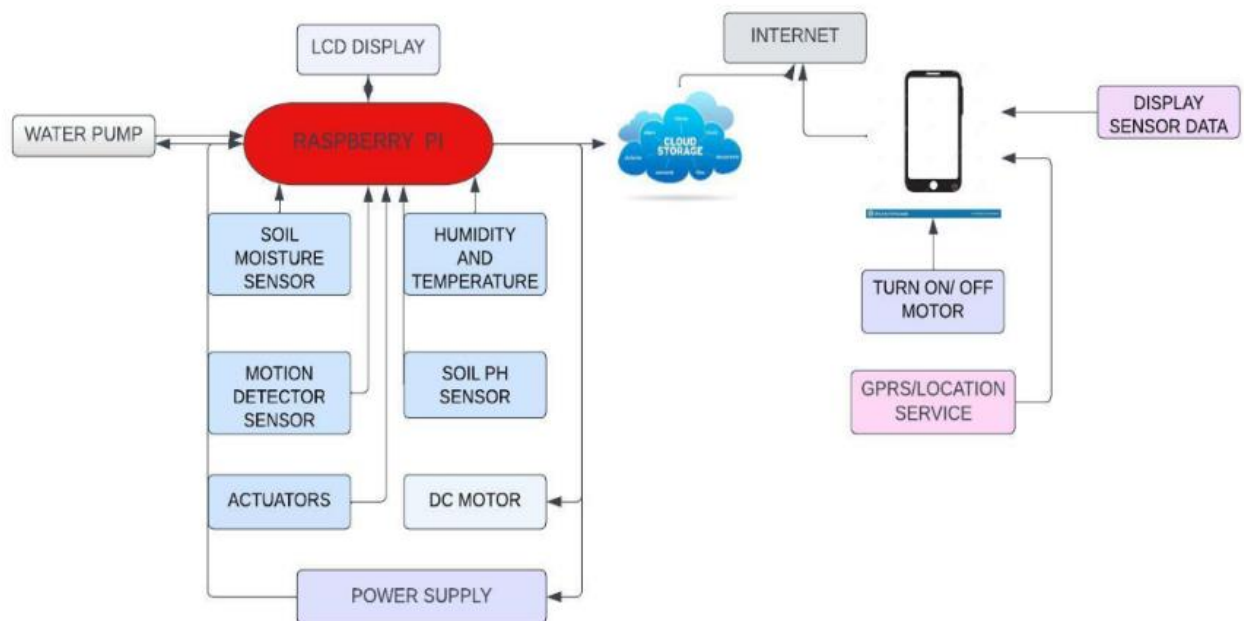


|       |                     |  |
|-------|---------------------|--|
| NFR-5 | <b>Availability</b> | <ul style="list-style-type: none"> <li>➤ Information about Water, Crop conditions, Soil, and Weather is available through the use of sensors that are linked to the cloud and can be accessed via an application or Website.</li> <li>➤ The application can be available in the Play Store.</li> </ul> |
| NFR-6 | <b>Scalability</b>  | <ul style="list-style-type: none"> <li>➤ Business-to-business and business the customer can be implemented and it can be used for enhancing the profit on a large scale.</li> </ul>  |

# PROJECT DESIGN

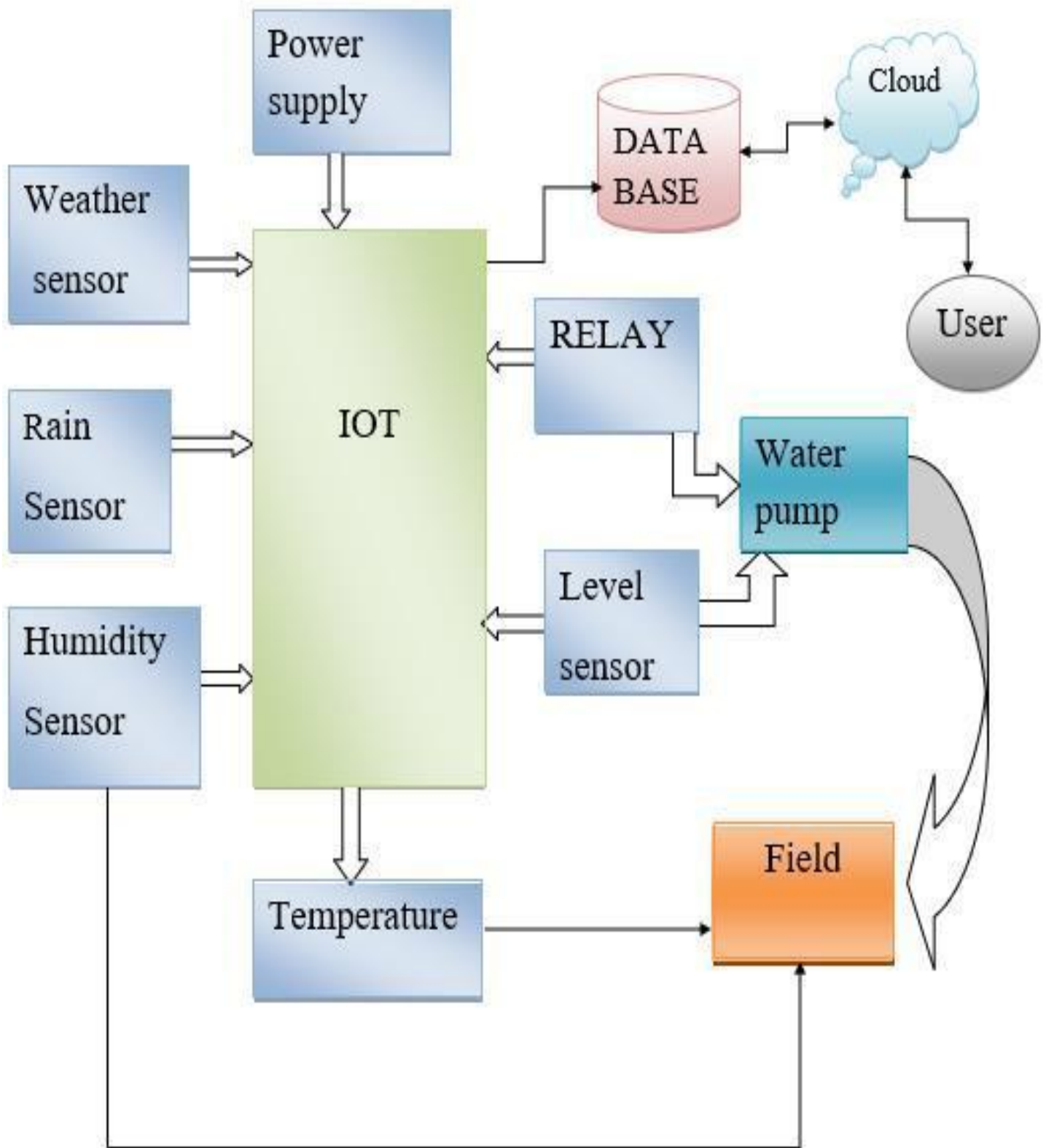
## 5.1 DATA FLOW DIAGRAM

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.

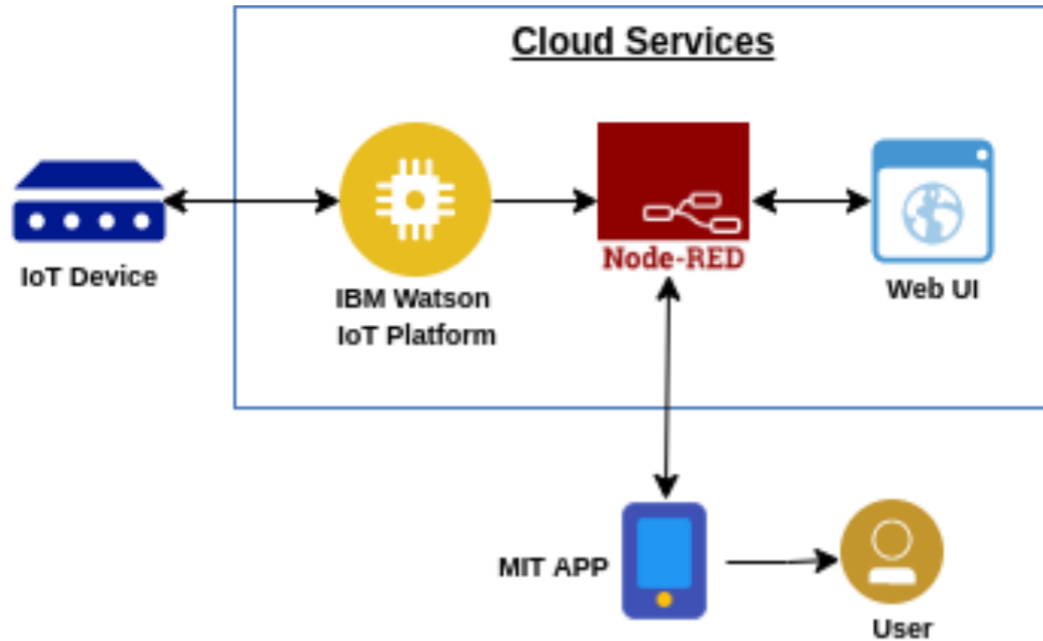




## 5.2 SOLUTION ARCHITECTURE



### 5.2.1 TECHNICAL ARCHITECTURE



| S.No | Component                       | Description   | Technology   |
|------|---------------------------------|---|--|
| 1.   | User Interface                  | How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.                                     | IBM Cloud, Node-RED, LoRa WAN                                  |
| 2.   | Application Logic-1             | Logic for a process in the application  | Python   |
| 3.   | Application Logic-2             | Logic for a process in the application  | IBM Watson STT service   |
| 4.   | Application Logic-3             | Logic for a process in the application  | IBM Watson Assistant   |
| 5.   | Cloud Database                  | Database Service on Cloud   | IBM DB2, IBM Cloudant etc.                                     |
| 6.   | File Storage                    | File storage requirements   | IBM Block Storage or Other Storage Service or Local Filesystem |
| 7.   | External API-1                  | Purpose of External API used in the application   | IBM Weather API  |
| 8.   | External API-2                  | Purpose of External API used in the application   | Open Weather API   |
| 9.   | Infrastructure (Server / Cloud) | Application Deployment on Local System / Cloud<br>Local Server Configuration:<br>Cloud Server Configuration : | Local, Cloud Foundry, Kubernetes, etc.                         |

### 5.3 USER STORIES

| User Type              | Functional Requirement (Epic) | User Story Number | User Story / Task   | Acceptance criteria                                       | Priority | Release  |
|------------------------|-------------------------------|-------------------|---|---|----------|----------|
| Customer (Mobile user) | Registration                  | USN-1             | As a user, I can register for the application by entering my email, password, and confirming my password. | I can access my account / dashboard                       | High     | Sprint-1 |
|                        |                               | USN-2             | As a user, I will receive confirmation email once I have registered for the application                   | I can receive confirmation email & click confirm          | High     | Sprint-1 |
|                        |                               | USN-3             | As a user, I can register for the application through Gmail   | I can receive confirmation email & click confirm to login | Medium   | Sprint-1 |
|                        | Login                         | USN-4             | As a user, I can log into the application by entering email & password                                    |   | High     | Sprint-1 |
|                        |                               | USN-5             | If I forgot my password or username, I can reset it again through my email                                | I can receive reset Mail to the registered Email Id       | High     | Sprint-2 |
| Dashboard              |                               | USN-6             | I can monitor my farm status from my dashboard  | I can access it to the Node-red dashboard                 | High     | Sprint-3 |
| Feedback               | Google form                   | USN-7             | I Can give my feedback about the application and I can post my queries.                                   | I can post my feedback in google form                     | Low      |          |

## PROJECT PLANNING AND SCHEDULING

### 6.1 SPRINT PLANNING AND 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, and password, and confirming my password. | 2            | High     | 1.Padmapriya.p<br>2. Deeksha Kumari<br>3. Menaka<br>4. Majula<br>5. Chandra Kala |

|          |       |  |   |   |        |             |  |
|----------|-------|--|---|---|--------|-------------|--|
| Sprint-1 | USN-2 |  | As a user, I will   | 1 | High   | 1.Padmapriy |  |
|          |       |  | receive a confirmation email once I have registered for the application |   |        | a.p         |  |
|          |       |  |   |   |        | 2. Deeksha  |  |
|          |       |  |   |   |        | Kumari      |  |
|          |       |  |   |   |        | 3. Menaka   |  |
| Sprint-1 | USN-3 |  | As a user, I can  | 1 | Medium | 1.Padmapriy |  |
|          |       |  | register for the application through Gmail                              |   |        | a.p         |  |
|          |       |  |   |   |        | 2.Deeksha   |  |
|          |       |  |   |   |        | Kumari      |  |
|          |       |  |   |   |        | 3. Menaka   |  |
|          |       |  |   |   |        | 4. Majula   |  |
|          |       |  |   |   |        | 5.          |  |
|          |       |  |   |   |        | chandrakala |  |
|          |       |  |   |   |        |             |  |
|          |       |  |   |   |        |             |  |



|          |       |       |  |   |      |   |
|----------|-------|-------|--|---|------|---|
|          |       |       |  |   |      |   |
| Sprint-1 | Login | USN-4 | As a user, I can register for the application through Gmail                | 2 | High | 1.Padmapriya.p<br>2. Deeksha Kumari<br>3. Menaka<br>4. Majula<br>5. chandrakala |
| Sprint-2 |       | USN-5 | If I forgot my password or username, I can reset it again through my email | 1 | High | 1.Padmapriya.p<br>2.Deeksha Kumari<br>3. Menaka<br>4. Majula<br>5.              |

|          |              |       |   |   |      |   |
|----------|--------------|-------|---|---|------|---|
|          |              |       |   |   |      | chandrakala   |
| Sprint-2 | Web register | USN-6 | As a user, I can register by entering my email, and password, and confirming my password  | 2 | High | 1.Padmapriya.p<br>2. Deeksha Kumari<br>3. Menaka<br>4. Majula<br>5. Chandrakala |
| Sprint-2 |              | USN-7 | As a user, I will receive a confirmation email once I have registered for the application | 1 | High | 1.Padmapriya.p<br>2. Deeksha Kumari<br>3. Menaka<br>4. Manjula                  |

|          |           |       |   |   |        |  |
|----------|-----------|-------|---|---|--------|--|
|          |           |       |   |   |        | 5.<br>Chandrakala  |
| Sprint-2 |           | USN-8 | As a user, I can register for the application through Gmail               | 1 | Medium | 1.Padmapriya.p<br><br>2. Deeksha Kumari<br><br>3. Menaka<br><br>4. Majula<br><br>5.<br>chandrakala |
| Sprint-2 | Web login | USN-9 | As a user, I can log into the application by entering my email & password | 2 | High   | 1.Padmapriya.p<br><br>2. Deeksha Kumari<br><br>3. Menaka<br><br>4. Majula<br><br>5.                |

|          |      |        |  |   |      |  |
|----------|------|--------|--|---|------|--|
|          |      |        |  |   |      | chandrakala  |
| Sprint-3 |      | USN-10 | If I forgot my password or username, I can reset it again through my email   | 1 | High | 1.Padmapriya.p<br><br>2. Deeksha Kumari<br><br>3. Menaka<br><br>4. Majula<br><br>5. Chandra Kala |
| Sprint-3 | Help | USN-11 | If I have any doubts about using an application or web, I can clarify them by clicking the Help option in the dashboard. | 1 | High | 1.Padmapriya.p<br><br>2. Deeksha Kumari<br><br>3. Menaka<br><br>4. Majula<br><br>5. Chandra Kala |

|          |          |        |   |   |     |  |
|----------|----------|--------|---|---|-----|--|
| Sprint-4 | Feedback | USN-12 | I Can give my feedback about the application and I can post my queries. | 1 | Low | 1.Padmapriya.p<br>2. Deeksha Kumari<br>3. Menaka<br>4. Majula<br>5. Chandra Kala |
|----------|----------|--------|---|---|-----|--|

## 6.2 SPRINT DELIVERY SCHEDULE

| Sprint   | Functional Requirement (Epic)                | User Story Number | User Story / Task  | Story Points | Priority | Team Members              |
|----------|--|-------------------|--|--------------|----------|---------------------------|
| Sprint-1 | Registration (Farmer Mobile App user)        | USN-1             | As a user, I can register for the application by entering my email, password, and confirming my password.  | 2            | High     | Team Leader (MathanKumar) |
| Sprint-1 | Login  | USN-2             | As a user, I will receive confirmation email once I have registered for the application  | 1            | High     | Team Member 1 (R. Balaji) |
| Sprint-2 | User Interface                               | USN-3             | As a user, I can register for the application through Facebook   | 2            | Low      | Team Member 2 (Pozhilan)  |
| Sprint-1 | Data Integration                             | USN-4             | As a user, I can register for the application through Gmail  | 2            | Medium   | Team Member 3 (Priyan)    |
| Sprint-1 | Registration (Chemical Manufacture-Web user) | USN-1             | As a new user, I want to first register using my organization email and create a password for the account for the whole organization. So that important representatives can access it. | 2            | High     | Team Member 1 (R. Balaji) |

| Sprint     | Functional Requirement (Epic)                      | User Story Number | User Story / Task  | Story Points | Priority | Team Members              |
|------------|--|-------------------|--|--------------|----------|---------------------------|
| Sprint-4   | Login  | USN-2             | As a registered user, I need to easily log in using the registered account via the web Page, so that web page should be user interactive and easy to use | 3            | High     | Team Leader (MathanKumar) |
| Sprint 3   | Web UI   | USN-3             | As a user, I need to have a user-friendly interface to easily view and access the Resources, the UI should be easy and user interactive                  | 3            | Medium   | Team Member 2 (Pozhilan)  |
| Sprint-3   | Registration (Farmer-Web User)                     | USN-1             | As a user, I can log into the application by entering email and password I can create account using my Gmail, Facebook etc..                             | 3            | High     | Team Leader (MathanKumar) |
| Sprint - 2 | Login  | USN-2             | As a registered user, I need to easily login log into my registered account via the web page in minimum time   | 3            | Medium   | Team Member 3 (Priyan)    |
| Sprint-4   | Web Ui   | USN-3             | As a user, I need to have a friendly user interface to easily view and access the resources  | 3            | Medium   | Team Member 1 (R. Balaji) |
| Sprint-1   | Registration (Chemical Manufacturer - Mobile User) | USN-1             | As a user, I want to first register using my email and create a password for the account.  | 1            | High     | Team Member 3 (Priyan)    |
| Sprint-1   | Login  | USN-2             | As a registered user, I need to easily log in to the application   | 2            | Low      | Team Member 2 (Pozhilan)  |

### 6.3 REPORTS FROM JIRA

A burndown chart is a tool used by Agile teams to gather information about work completed on a project and work to be done in a given time period. So that we are using JIRA software, to make burndown chart for our team project as a prediction tool that allows us to visualize when our project will be completed.

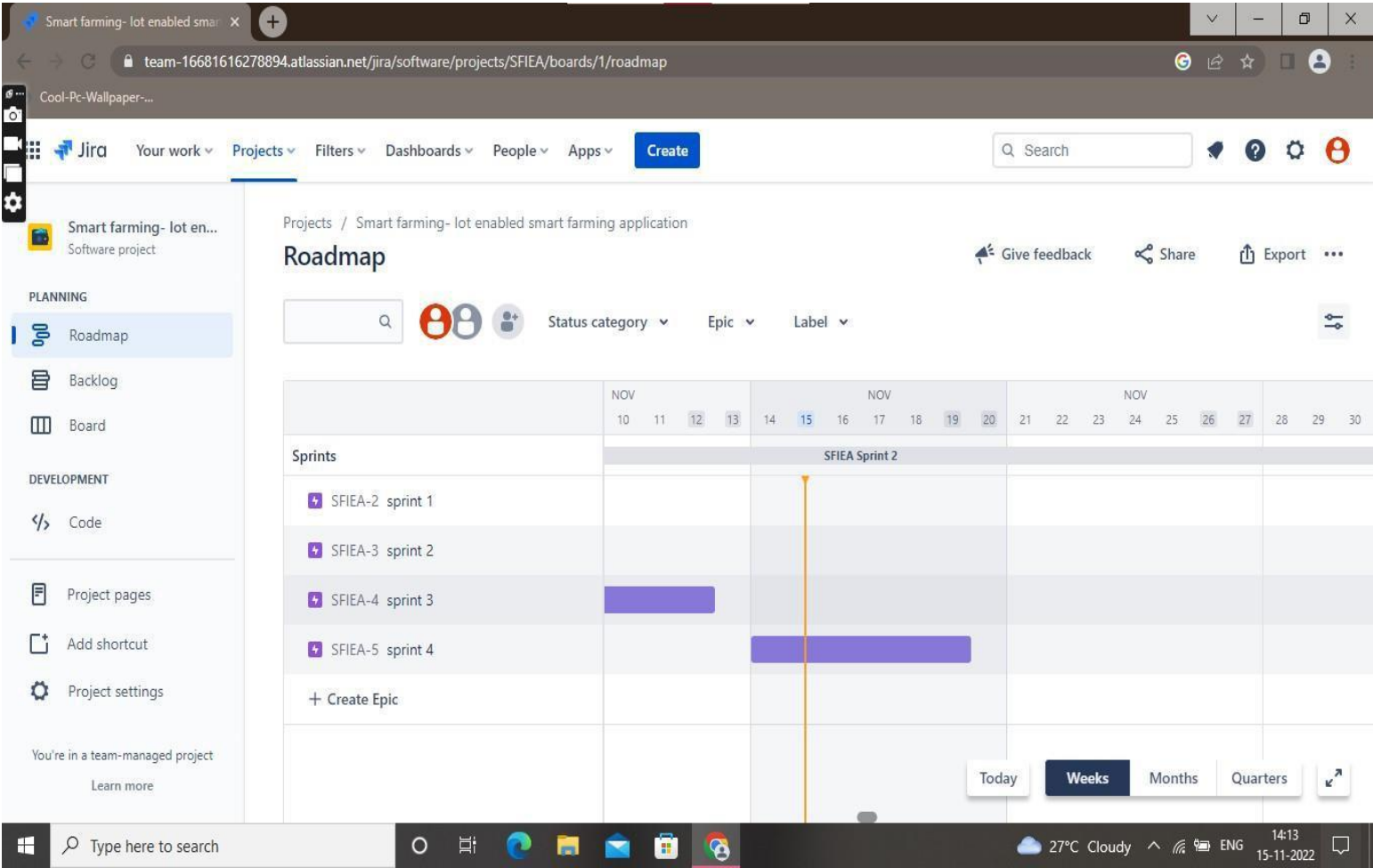
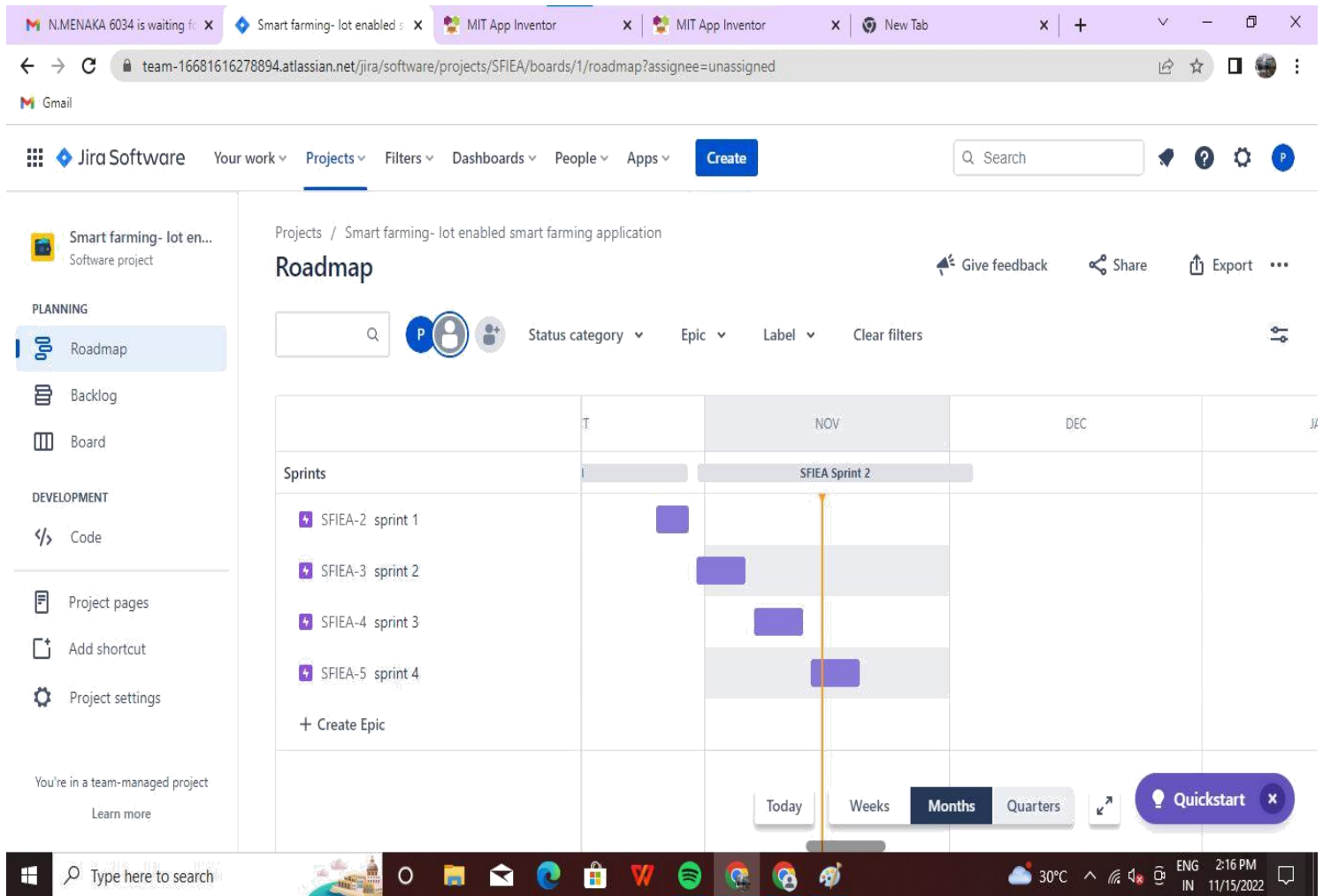


Fig: 6.3.1

The above image represents the roadmap data for the sprint release as per the schedule we planned to release our sprint-3 on 15<sup>th</sup> Nov 2022.



**Fig.6.3.2**

The above diagram shows the overall time duration for our estimation sprints that would be divided into four sprints such as sprint-1, sprint-2, sprint-3, sprint-4.



## CODING & SOLUTIONING

### 7.1 FEATURE

```
import sys
```

```
import ibmiotf.application
```

```
import ibmiotf.device
```

```
import random
```

```
#Provide your IBM Watson Device Credentials
```

```
organization = "vy60s0"
```

```
deviceType = "abcd"
```

```
deviceId = "1234"
```

```
authMethod = "token"
```

```
authToken = "12345678"
```

```
#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)
```

```
data = { 'temp': temp, 'Humid': Humid }
```

```
#print data
```

```
def myonPublishCallback():
```

```
    print ("Published Temperature = %s C" % temp,
```

```
    "Humidity = %s %" % Humid, "to IBM
```

```
Watson")
```

```
    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()
```



# TESTING

## 7.1 TEST CASES

### Step-1:

Screen 1 of the application has our project logo and it will display for 3 seconds then automatically it goes to screen.



### Step-2:

Next in screen 2, User has to sign up for the application if they are new to the application and those who have already registered can login to the application by using their username and password.





### Step-3

Users can log in with their username and password once they registered. If both the username and password are correct then it will go to screen 3 where the field data will be displayed in the dashboard.



## Result:

### 9.1 PERFORMANCE MATRICES

Thus, this project system has introduced an IoT-based smart farming system based on the MIT App Inventor. The objective of this project is to develop a smart farming system that can help to monitor and analyze data on temperature (0 °C - 100 °C), humidity (70%-100%), soil moisture (50% - 100%), and distance (<100m) of crops that have been stored in the firebase platform application. In addition to monitoring, the actuator system also can be controlled by an application developed in MIT 2 App Inventor. The system was tested using IBM Watson and the expected output has been delivered. The result revealed good



smart farming system

## **ADVANTAGES**

- By using our project farmers can easily monitor their fields from anywhere and anytime
- So, it will reduce the labor work.
- Also, the time spent by the farmers on the field will be reduced therefore time saving will be achieved
- Objects that enter in farm field will be effectively monitored and a notification sent to user to prevent their crops from negative impacts.
- User can monitor and control their farm just by touch, even elderly people can easily do farming.
- It can save the resources such as water and electricity by monitor and controlling Motor ON/OFF button from the application.

## **DISADVANTAGES**

- Rural part of most the developing countries do not fulfil this requirement.

Moreover, the internet connection is slower which results in difficulties in transferring data

- The smart farming-based equipment requires farmers to understand and learn the use of technology.

## **CONCLUSION**

Smart farmer-IoT-based SMART FARMING APPLICATION for Live Monitoring of Temperature, Soil Moisture, humidity, and distance monitoring with the live location has been proposed using Python script (IDE 7), node-red, Mit2 app inventor, firebase DB, and IBM Watson. The System has high efficiency and accuracy in fetching the live data of temperature, soil moisture, and humidity. The IoT-based smart farming application being proposed via this report will assist farmers in increasing the agricultural yield and taking efficient care of food production as the System will always provide helping hand to farmers for getting accurate live feed of environmental temperature and soil moisture with more than 99% accurate results.

## **FUTURE SCOPE**

Future work would be fetched more on data especially with regard to Pest Control by integrating UV light and by also integrating GPS module in this system to enhance this Agriculture IoT Technology to full-fledged Agriculture Precision ready product.

## APPENDIX

### 13.1SOURCE CODE

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

#Provide your IBM Watson Device Credentials

organization = " vy60s0"
deviceType = "abcd"
deviceId = "1234"
authMethod = "token"
authToken = "12345678"

#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)

    data = { 'temp': temp, 'Humid': Humid }
    #print data
    def myonPublishCallback():
        print ("Published Temperature = %s C" % temp, "Humidity = %s %" % Humid,
        "to IBM Watson")
        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()

```

## 13.2 GITHUB

GitHub link- <https://github.com/IBM-EPBL/IBM-Project-313-1658252587>

### **App Inventor:**

<http://ai2.appinventor.mit.edu/#5281843113754624>

### **Demo Video Link:**

<https://drive.google.com/uc?id=1YATtHkQcCBi3zv8-xJsQTRkedS75XohF&export=download>







