

1. INTRODUCTION

1.1 Project Overview

This project focuses on using Power BI to analyse environmental and management data, such as temperature, humidity, irrigation, and fertilization schedules, to predict plant growth stages. The goal is to provide actionable insights that optimize resource use, improve decision-making, and enhance crop productivity, supporting sustainable farming practices.

1.2 Purpose

The project aims to predict plant growth stages by analysing environmental and management data using Power BI. This helps optimize resource use, improve decision-making, enhance crop productivity, and promote sustainable farming practices.

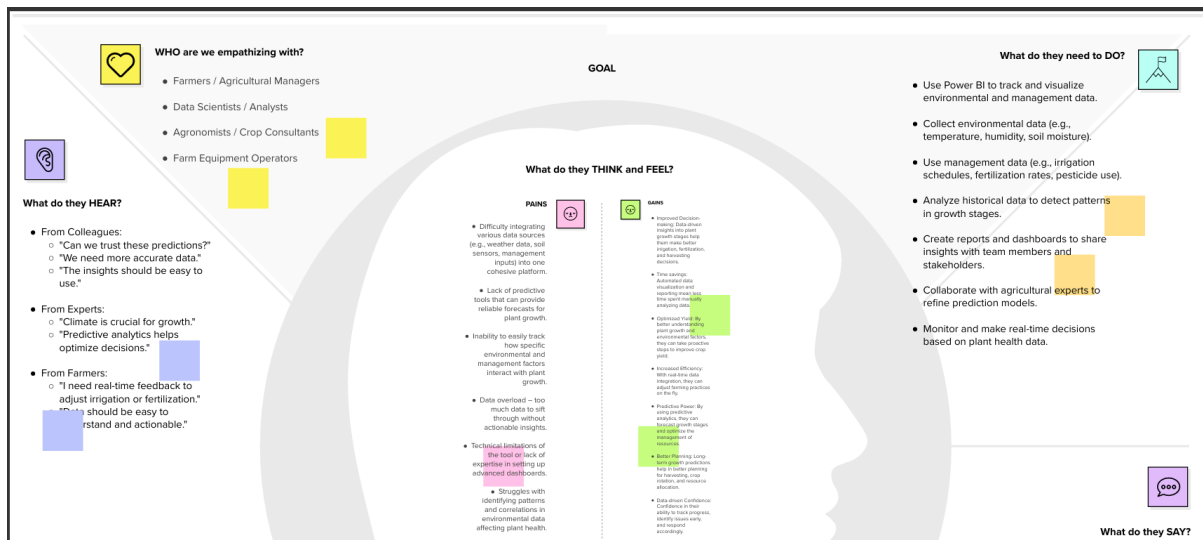
2. IDEATION PHASE

2.1 Problem Statement

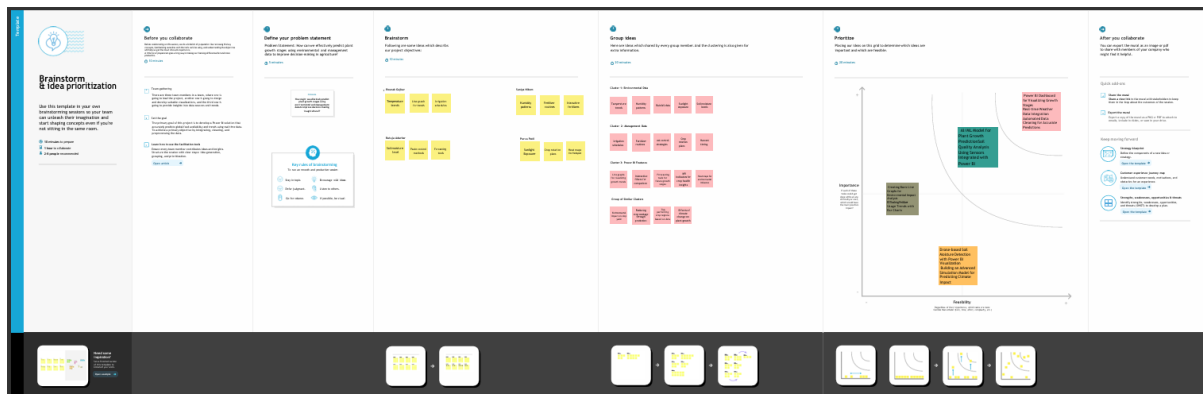
Crop growth is influenced by environmental conditions such as temperature, soil moisture, and sunlight, as well as management factors like irrigation and fertilization. Predicting plant growth stages is essential for optimizing resource allocation, reducing crop loss, and increasing yields.

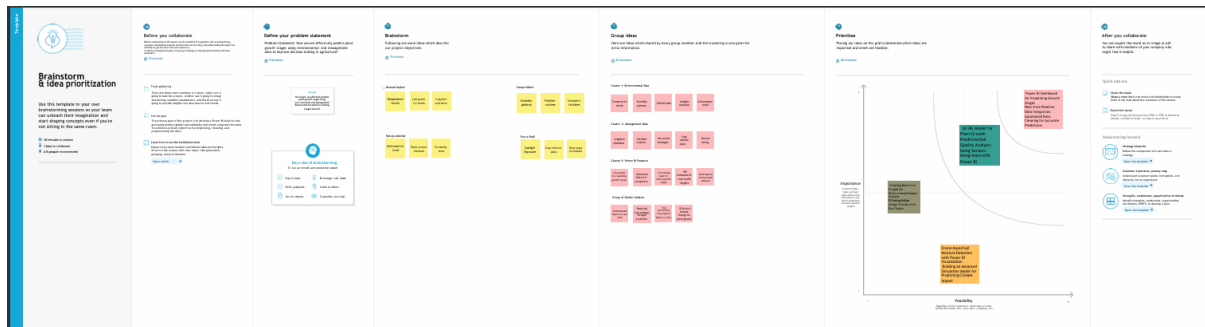
However, traditional plant growth prediction models rely on static datasets and lack real-time adaptability. Power BI can be used to create interactive dashboards that integrate environmental data, visualize growth patterns, and predict optimal farming decisions.

2.2 Empathy Map Canvas:



2.3 Brainstorming

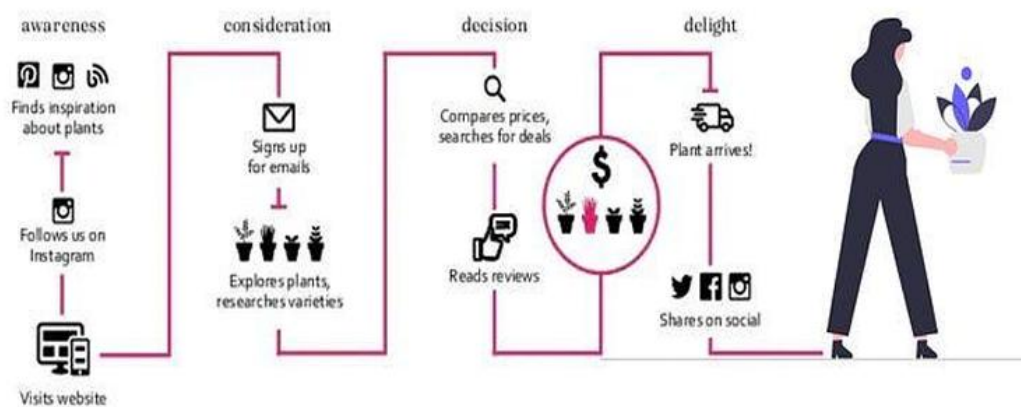




3. REQUIREMENT ANALYSIS

3.1 Customer Journey map

Customer Journey Map



3.2 Solution Requirement

3.2.1 Functional Requirements

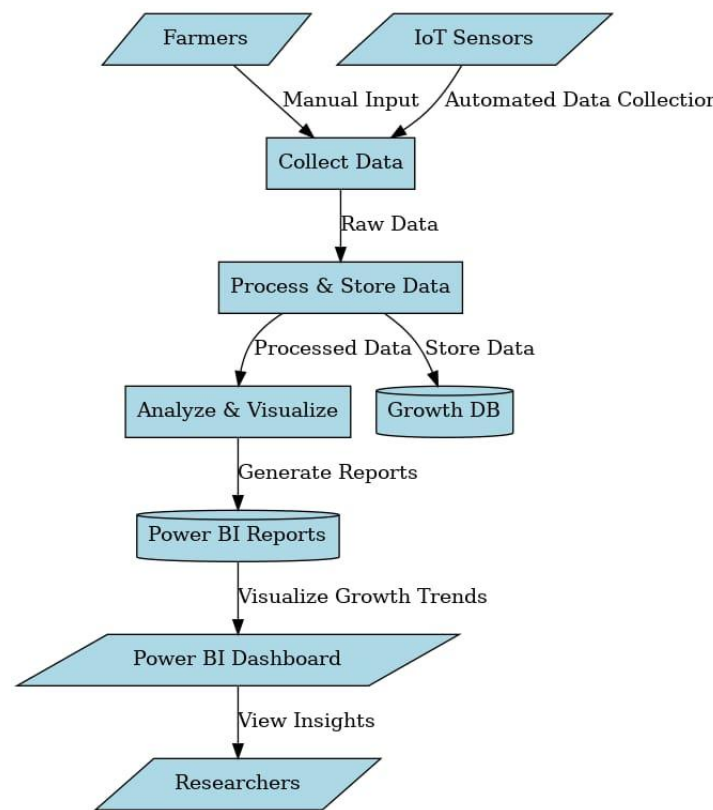
Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	<ul style="list-style-type: none">- Registration through Form- Registration through Gmail- Registration through LinkedIn
FR-2	User Confirmation	<ul style="list-style-type: none">- Confirmation via Email- Confirmation via OTP
FR-3	Data Integration	<ul style="list-style-type: none">- Import Environmental Data- Import Management Data- Data Cleaning and Transformation
FR-4	Data Visualization	<ul style="list-style-type: none">- Create Dashboards in Power BI- Display Trends and Correlations- Generate Customized Reports
FR-5	Prediction System	<ul style="list-style-type: none">- Develop Machine Learning Models- Predict Plant Growth Stages- Provide Recommendations

3.2.2 Non-Functional Requirements

NFR No.	Non-Functional Requirement	Description
NFR-1	Usability	The solution must have an intuitive and user-friendly interface.
NFR-2	Security	Ensure secure data storage and user authentication.
NFR-3	Reliability	The system should be highly dependable and provide accurate predictions.
NFR-4	Performance	Maintain fast processing and data visualization even with large datasets.
NFR-5	Availability	Ensure 99.9% system uptime to guarantee accessibility.
NFR-6	Scalability	The solution must be scalable to handle increasing data volumes and users.

3.3 Data Flow Diagram



3.4 Technology Stack

Table 1: Application Components

S.No	Component	Description	Technology
1	User Interface	User interfaces like Web UI or Mobile Apps to interact with the Power BI dashboards	HTML, CSS, JavaScript, ReactJS
2	Application Logic-1	Data ingestion logic to extract environmental and management data from various sources	Python
3	Application Logic-2	Speech-to-text logic for audio input (e.g., voice commands for querying plant growth stages)	IBM Watson STT service

S.No	Component	Description	Technology
4	Application Logic-3	Virtual assistant to answer user queries related to plant growth predictions	IBM Watson Assistant
5	Database	Stores raw and transformed data, including historical plant growth and environmental factors	MySQL, NoSQL
6	Cloud Database	Centralized storage of large-scale data for scalability	IBM Cloudant
7	File Storage	Storage for large environmental datasets and model output	IBM Block Storage or Cloud-based storage
8	External API-1	Provides real-time environmental data (e.g., weather conditions)	IBM Weather API
9	External API-2	Identity verification for restricted access (if required)	Aadhar API
10	Machine Learning Model	Predicts plant growth stages based on input data	Custom ML Model (developed in Python)
11	Infrastructure (Server/Cloud)	Deployment of application on a cloud platform for scalability and availability	Kubernetes on IBM Cloud

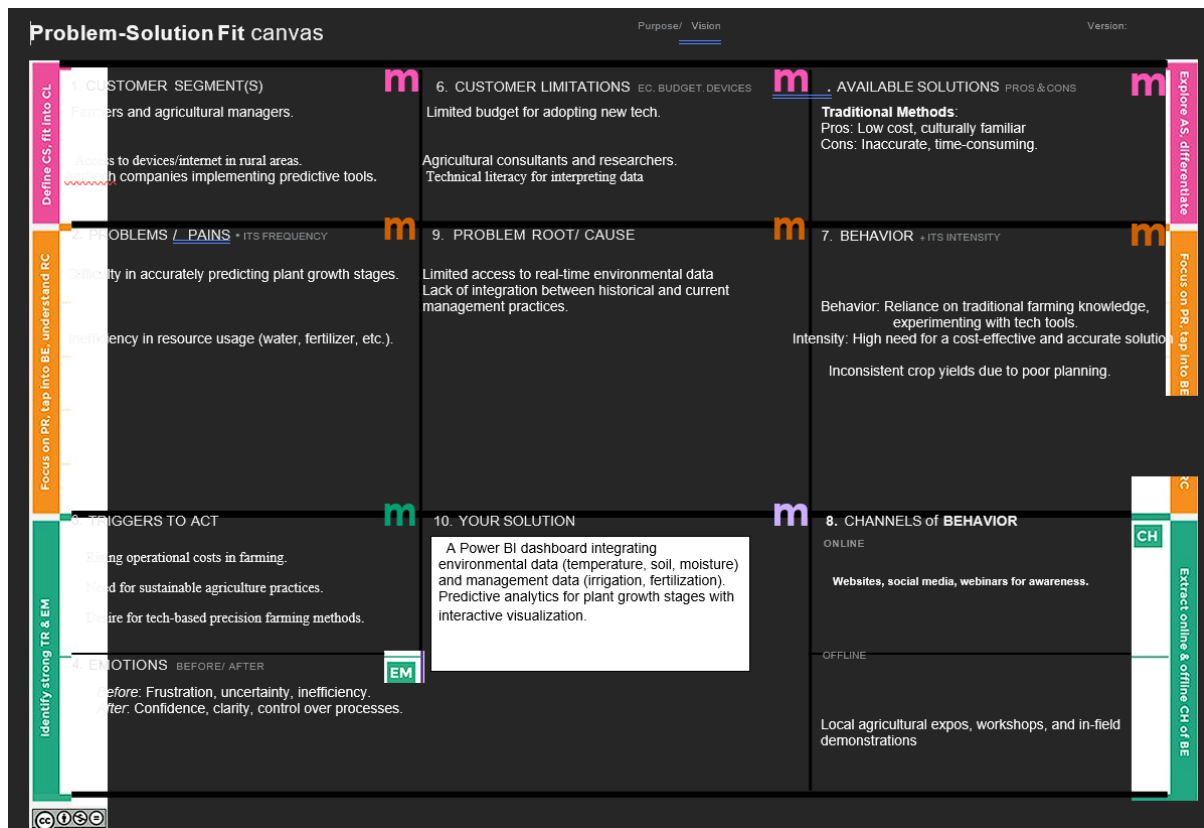
Table 2: Application Characteristics

S.No	Characteristics	Description	Technology
1	Open-Source Frameworks	Frameworks to build the application frontend or backend	ReactJS, Flask, Django

S.No	Characteristics	Description	Technology
2	Security Implementations	Implements access controls, encryptions, and secure API calls	SHA-256, IAM Controls, OWASP Guidelines
3	Scalable Architecture	Designed as microservices or a 3-tier architecture for scaling	Kubernetes, Docker
4	Availability	Load balancers and distributed servers ensure consistent access	Load Balancers, Distributed Cloud Servers
5	Performance	Performance optimization using caching and CDNs	CDN, Redis Cache

4. PROJECT DESIGN

4.1 Problem Solution Fit

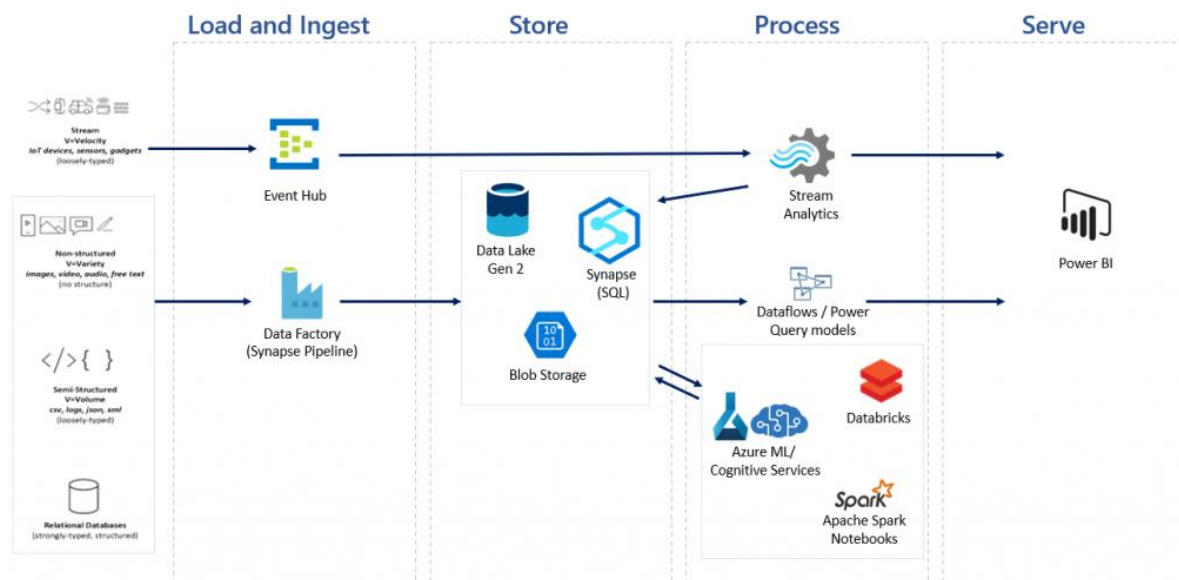


4.2 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement	Clearly define the problem that the solution aims to solve.
2.	Idea / Solution Description	Provide a detailed explanation of the proposed idea or solution.
3.	Novelty / Uniqueness	Highlight the innovative aspects or unique features of the solution.
4.	Social Impact / Customer Satisfaction	Explain how the solution benefits society or improves customer experience.

S.No.	Parameter	Description
5.	Business Model (Revenue Model)	Describe the financial sustainability of the solution, including how revenue is generated.
6.	Scalability of the Solution	Outline the potential for scaling the solution to reach larger markets or audiences.

4.3 Solution Architecture



5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Product Backlog and Sprint Schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task Description	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Saniya Nikam
Sprint-1	Registration	USN-2	As a user, I will receive a confirmation email once I have registered for the application.	1	High	Rutuja Adurkar
Sprint-1	Registration	USN-4	As a user, I can register for the application through Gmail.	2	Medium	Rounak Gajbar
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password.	1	High	Rounak Gajbar
Sprint-2	Registration	USN-3	As a user, I can register for the application through Facebook.	2	Low	Purva Patil
Sprint-3	Dashboard	To be defined	Define dashboard-specific tasks as necessary.	TBD	TBD	Whole Team

Project Tracker and Velocity

Sprint	Total Story Points	Duration (Days)	Start Date	End Date (Planned)	Story Points Completed (Planned)	Release Date (Actual)
Sprint-1	20	6	2 feb 2025	7 feb 2025	20	29 Oct 2022
Sprint-2	20	6	7 feb 2025	12 feb 2025	20	05 Nov 2022
Sprint-3	20	6	12 feb 2025	17 feb 2025	TBD	TBD
Sprint-4	20	6	17 feb 2025	22 feb 2025	TBD	TBD

Velocity Calculation

- $\text{Velocity} = \text{Total Story Points} / \text{Total Sprint Duration (in days)}$.
- If the team's average velocity is 20 points per sprint (10-day sprint duration), Average Velocity (AV) = 2 story points per day.

Burndown Chart

A burndown chart illustrates:

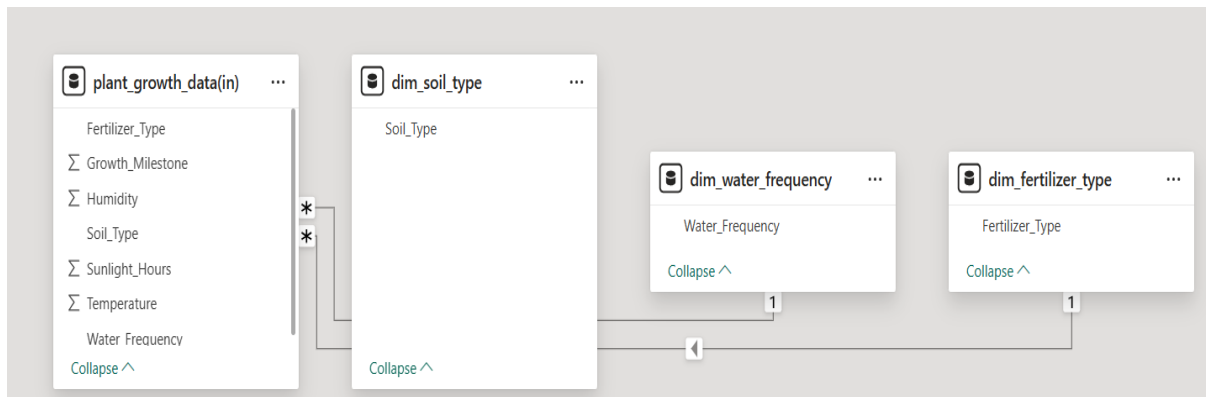
- X-axis: Sprint duration (time in days).
- Y-axis: Remaining story points.
- It starts with 20 story points at day 0 and decreases daily based on completed points.

6. FUNCTIONAL AND PERFORMANCE TESTING

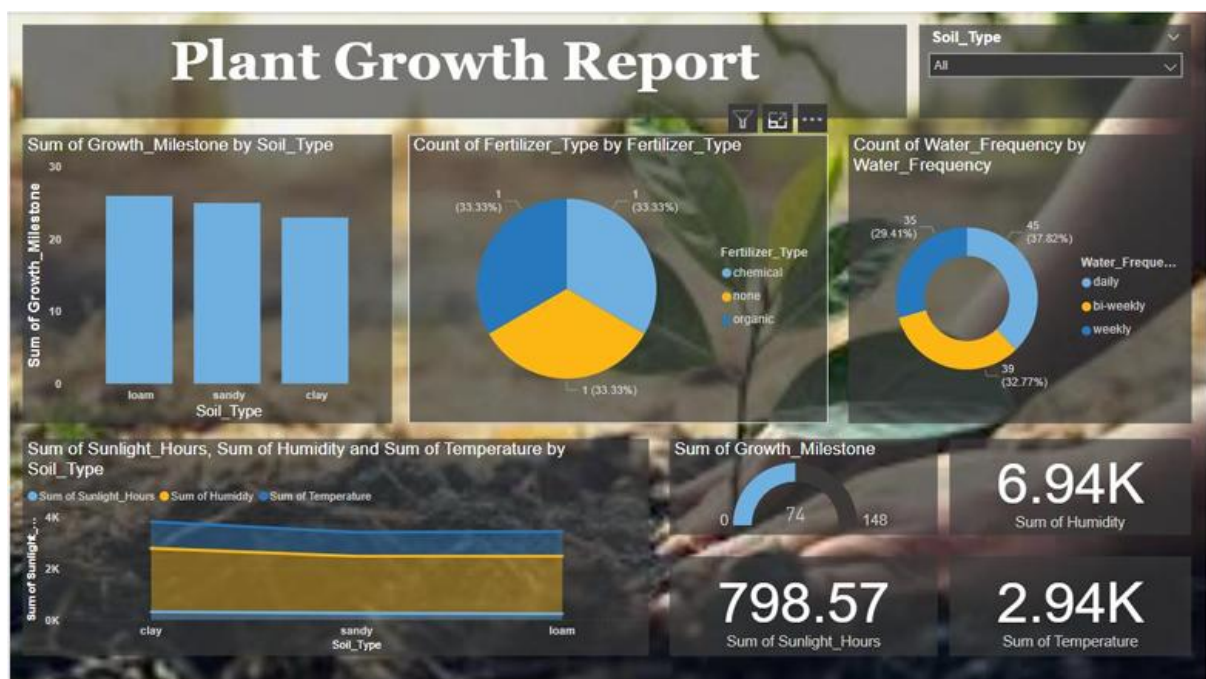
6.1 Performance Testing

7. RESULTS

7.1 Screenshots of Report and observation



7.2 Screenshot of Dashboard and observation



8. ADVANTAGES & DISADVANTAGES

Advantages

1. Provides data-driven insights for better decision-making.

2. Increases productivity and optimizes resource use.
3. Scalable and user-friendly with Power BI's visualizations.
4. Real-time environmental adaptation improves outcomes.

Disadvantages

1. High initial cost and technical expertise required.
2. Depends heavily on data quality for accuracy.
3. Accessibility challenges in remote areas.
4. Requires ongoing maintenance and retraining.

9. CONCLUSION

The project successfully demonstrates the ability to predict plant growth stages using environmental and management data. The integration of machine learning models with Power BI provides farmers with actionable insights, which can improve resource utilization, crop yield, and overall farm productivity. The solution is scalable, and with continuous data collection, predictions will improve over time.

10. FUTURE SCOPE

Integration with IoT Devices: Real-time integration with environmental sensors can enhance prediction accuracy.

- Advanced Analytics: The system can be extended to provide more advanced analytics, like pest and disease prediction.
- Multi-Crop Support: Expand the model to predict growth stages for various crops.