PROJECT REPORT

Team Members:-

1.Darshana Ajit Deshmukh

2.Sanika Manikasha Bhosale

3.Akanksha Vijay Koparde

1. INTRODUCTION

1.1Project Overview

This project is about predicting plant growth stages using environment and management data with Power BI. Plants grow in different stages, like seedling, vegetative, flowering, and maturity. Their growth depends on factors such as temperature, humidity, soil moisture**,** rainfall, and farming practices (like watering, fertilizing, and pesticide use).

With Power BI, we will:

- Collect and analyze data on plant growth and environmental conditions.
- Find patterns that affect plant growth.
- Create visual reports and dashboards to help farmers and researchers make better decisions.

1.2 Purpose

The purpose of this project is to predict how plants grow using weather and farming data with Power BI. Plant growth depends on things like temperature, rainfall, soil moisture, and how farmers take care of the plants.

This project will help to:

- by predicting plant growth stages.
- Help Make farming easier farmers and researchers make better decisions.
- Increase crop production by using data.
- Save resources like water and fertilizers by using them at the right time.

2. IDEATION PHASE

2.1 Problem Statement

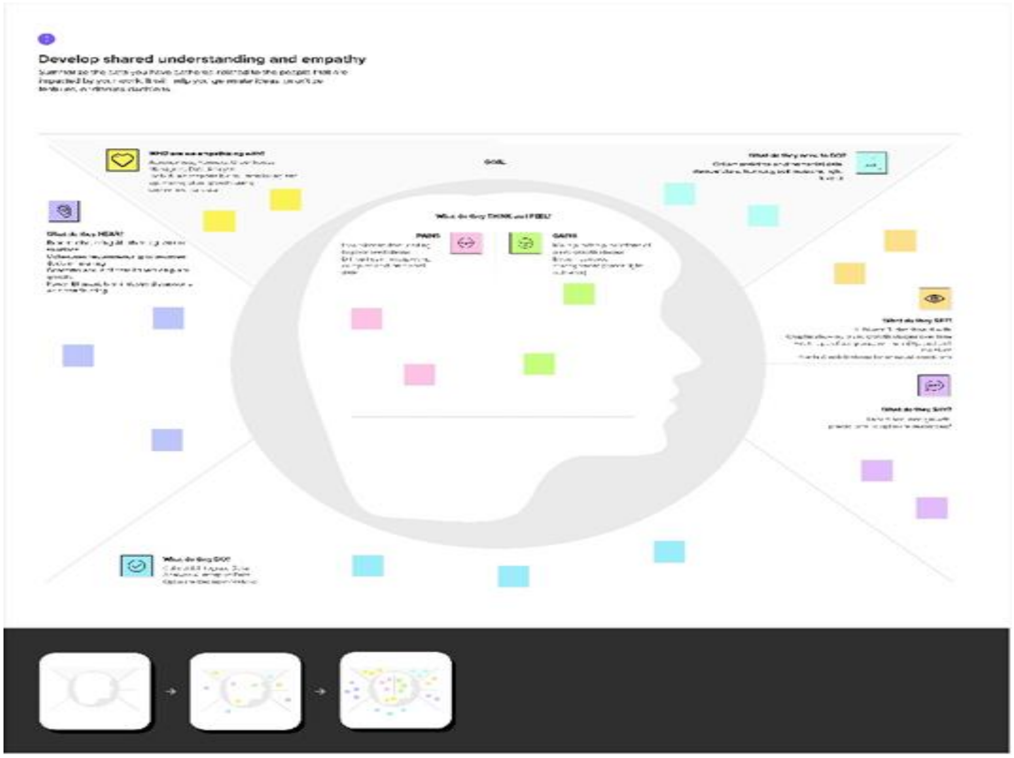
Farmers and researchers struggle to track and predict plant growth because of changing weather and farming methods. Factors like temperature, rainfall, soil moisture, and fertilizers affect plant growth, but without proper data, it is hard to make the right decisions.

Right now, many farmers use traditional methods or manual observation, which can be slow and less accurate. They need a better way to use data to understand how plants grow.

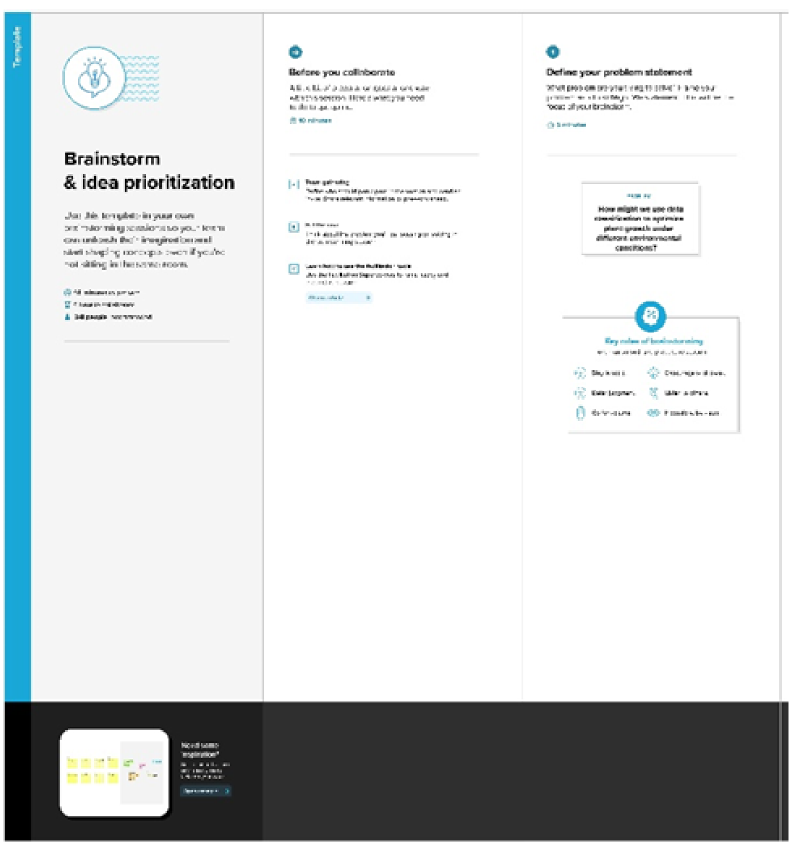
This project will solve this problem by using Power BI to:

- Analyze weather and farming data to understand plant growth
- Predict plant growth stages based on patterns in the data.
- Create easy-to-read dashboards for better decision-making.

2.2 Empathy Map Canvas



2.2Brainstorming



2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

Tohidealam Nadaf

- Temperature treands
- Line graph for trends
- Irrigation schdeules

Ayush Waghmode

- Humidity Patterns
- Fertilizer routines
- Interactive Fertilizers

Rohan Patil

- Soil moisture level
- Paste control method
- Forcasting tools

Tanuja Pawar

- Sunlight Exposure
- Crop roation plans
- Heat maps for hotspot

Cluster 1: Environmental Data

- Temperature trends
- Humidity patterns
- Rainfall data
- Sunlight exposure
- Soil moisture levels

Cluster 2: Management Data

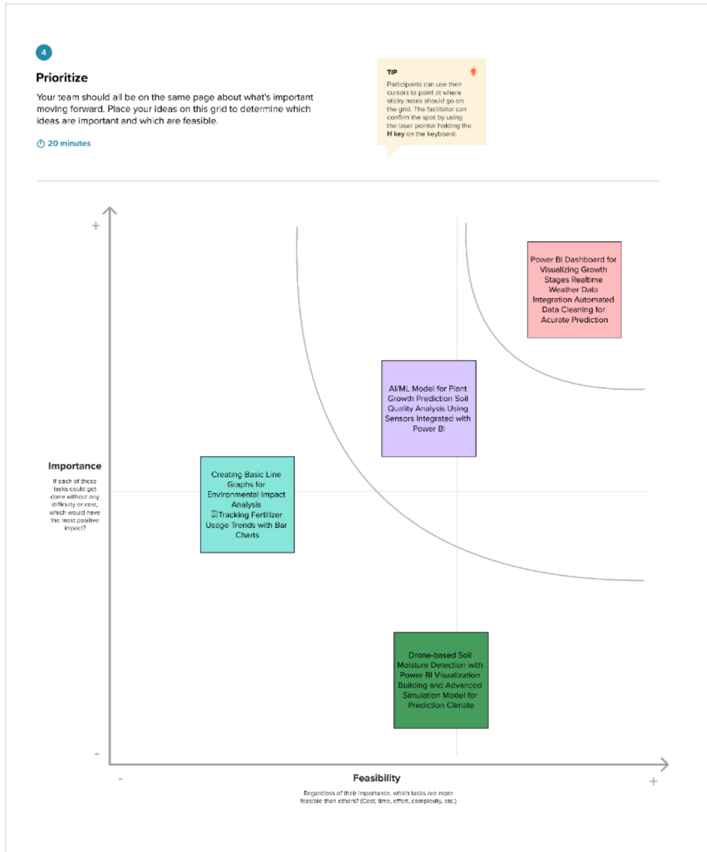
- Irrigation schedules
- Fertilizer routines
- est control strategies
- Crop rotation plans
- Harvest timing

Cluster 3: Power BI Features

- Line graphs for visualizing growth trends
- Interactive filters for comparison
- Forecasting tools for future growth stages
- KPI indicators for crop health insights
- Heat maps for environmental influence

Group of Similar Clusters

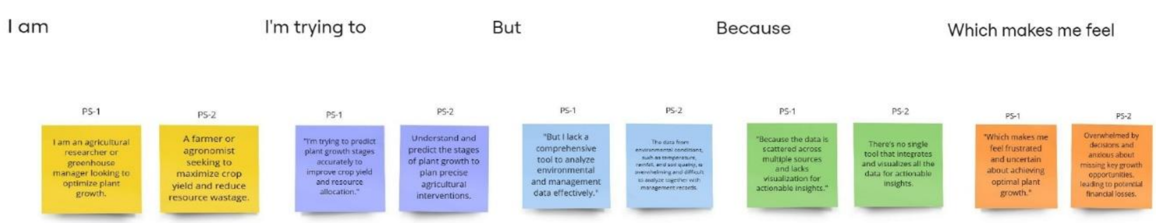
- Environmental impact on crop yield
- Reducing crop wastage through prediction
- Top-performing crop regions based on data
- Effects of climate change on plant growth



3 REQUIREMENT ANALYSIS

3.1 Customer Journey map

Customer Problem Statement Template



3.2 Solution Requirement

3.2.1 Functional Requirements

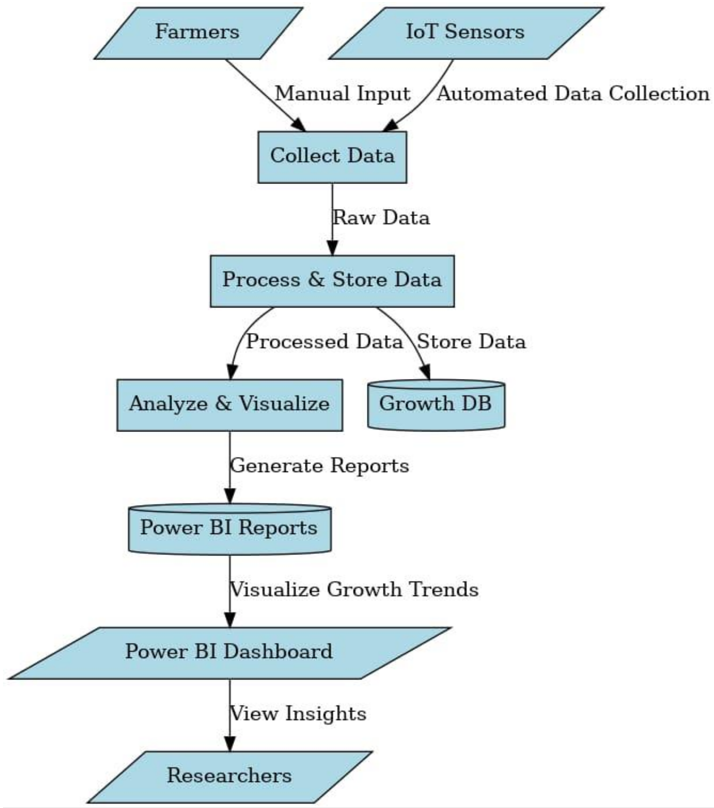
Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	- Registration through Form - Registration through Gmail - Registration through LinkedIn
FR-2	User Confirmation	- Confirmation via Email - Confirmation via OTP
FR-3	Data Integration	- Import Environmental Data - Import Management Data - Data Cleaning and Transformation
FR-4	Data Visualization	- Create Dashboards in Power BI - Display Trends and Correlations - Generate Customized Reports
FR-5	Prediction System	- Develop Machine Learning Models - Predict Plant Growth StagesRecommendations

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.

3.2Data 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
4	Application Logic-3	Virtual assistant to answer user queries related to plant growth predictions	IBM Watson Assistant

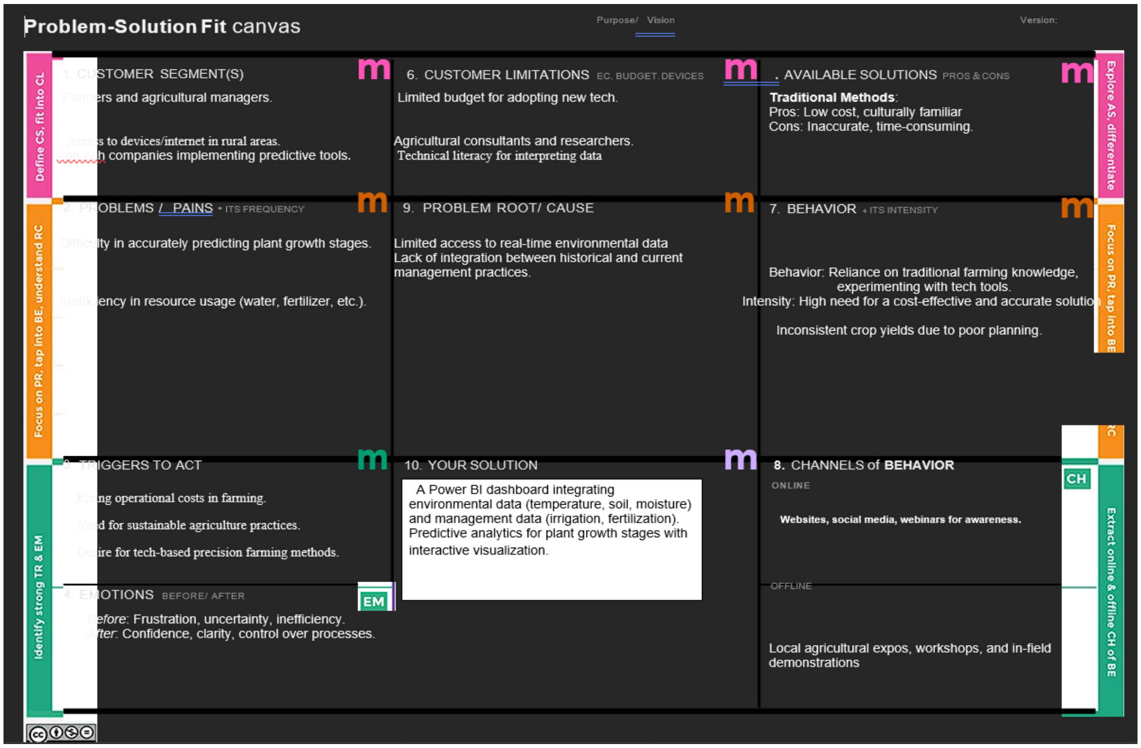
5	Database	Stores raw and transformed data, including historical plant growth and environmental factors	MySQL, NoSQL
6	Cloud Database	Centralized storage of large-scale data for scalability	IBM Cloudant
7	File Storage	Storage for large environmental datasets and model output	IBM Block Storage or Cloud-based 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
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

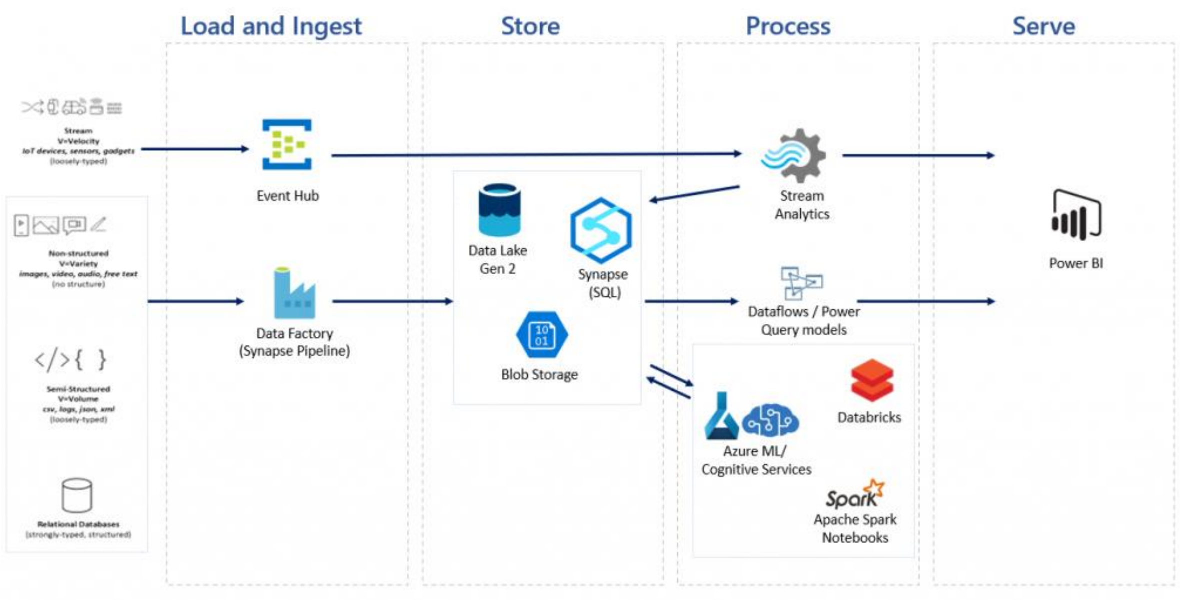
4.1Problem Solution Fit



4.2Proposed 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.
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	Assigned Members
Sprint-1	Registration	USN-2	As a user, I will receive a confirmation email once I have registered for the application.	1	High	Assigned Members
Sprint-1	Registration	USN-4	As a user, I can register for the application through Gmail.	2	Medium	Assigned Members
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password.	1	High	Assigned Members
Sprint-2	Registration	USN-3	As a user, I can register for the application through Facebook.	2	Low	Assigned Members
Sprint-3	Dashboard	To be defined	Define dashboard-specific tasks as necessary.	TBD	TBD	Assigned Members

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

- Velocity = Total Story Points / 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

Event Name	Component	Start Time	End Time	ID	Metrics
User Action	Report Canvas	2025-03-13T05:22:06.248Z	-	16a345400cd7d4964506	{'sourceLabel': 'UserAction_StartedMonitoring'}
User Action	Report Canvas	2025-03-13T05:22:27.280Z	-	79ebcc733599211c6840	{'sourceLabel': 'UserAction_ChangeSlicer'}
Visual Container Lifecycle	-	2025-03-13T05:22:27.286Z	2025-03-13T05:22:27.991Z	cd96dd60a877e110b5da-2bf14c7e7a2ac106deeb	{'status': 1, 'visualTitle': 'Slicer', 'visualId': 'cd96dd60a877e110b5da', 'visualType': 'slicer'}
Resolve Parameters	-	2025-03-13T05:22:27.290Z	2025-03-13T05:22:27.300Z	c80ceb69-2b21-4d94-bb4d-26fac79c27ab	-
Query	-	2025-03-13T05:22:27.300Z	2025-03-13T05:22:27.910Z	fc474219-db92-4da3-a9c1-3ab489175b91	-
Render	-	2025-03-13T05:22:27.909Z	2025-03-13T05:22:27.991Z	933e8b6f-3943-4160-b28f-72ca2d1580c5	-
Data View Transform	-	2025-03-13T05:22:27.955Z	2025-03-13T05:22:27.955Z	e5651264-ef3a-4777-8049-acd849580e84	-
Visual Update Async	-	2025-03-13T05:22:27.955Z	2025-03-13T05:22:27.989Z	57402337-0221-4d51-8f07-43e02f13bd19	-
Visual Update	-	2025-03-13T05:22:27.955Z	2025-03-13T05:22:27.955Z	b629ed28-f7de-4d2d-83dd-9ffcf98a9867	-
Execute	DSE	2025-03-13T05:2	2025-03-13T05:2	dfa639e9-0cd7-47e1-	-

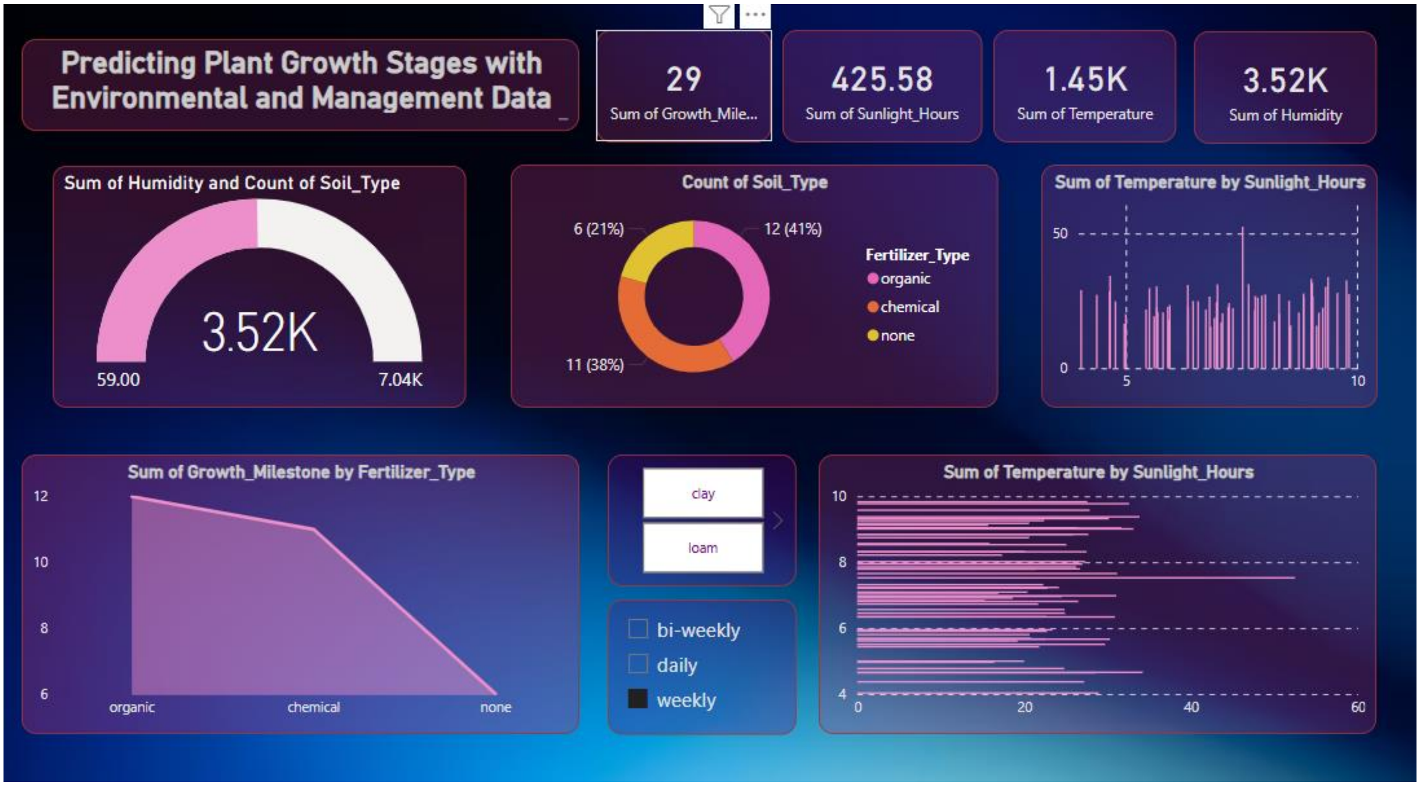
Semantic Query		2:27.615Z	2:27.819Z	8ea5-8359fdf98c48	
Query Generation	-	2025-03-13T05:22:27.305Z	2025-03-13T05:22:27.307Z	8214fdbf-73c0-45f9-bbd4-8ce83ff51dc1	-
Query Generation	-	2025-03-13T05:22:27.310Z	2025-03-13T05:22:27.310Z	dcbc4201-ca24-4627-a7d3-50886da5b958	-
Query Pending	-	2025-03-13T05:22:27.549Z	2025-03-13T05:22:27.559Z	14bed712-4154-4ab8-96c4-a959699e21eb	-
Parse Query Result	-	2025-03-13T05:22:27.908Z	2025-03-13T05:22:27.908Z	f9bc9a86-2115-4508-8c5d-d466bc3e9f6f	-
Execute DAX Query	DSE	2025-03-13T05:22:27.721Z	2025-03-13T05:22:27.817Z	c926a6be-2c0d-4983-976e-641fd08009f3	{'QueryText': "DEFINE\r\n\tVAR __DS0Core = \r\n\t\tVALUES('plant_growth_data'[Soil_Type])\r\n\r\n\tVAR __DS0PrimaryWindowed = \r\n\t\tTOPN(101, __DS0Core, 'plant_growth_data'[Soil_Type], 1)\r\n\r\nEVALUATE\r\n\t__DS0PrimaryWindowed\r\n\r\nORDER BY\r\n\t'plant_growth_data'[Soil_Type]", 'RowCount': 3}
Execute Query	AS	2025-03-13T05:22:27.793Z	2025-03-13T05:22:27.817Z	A248292D-E9FB-4474-89BE-2802571DD3CD	-
Serialize Rowset	AS	2025-03-13T05:22:27.817Z	2025-03-13T05:22:27.817Z	86FBCC51-32DA-4C84-A111-0C8F66EAECF2	-
Visual Container Lifecycle	-	2025-03-13T05:22:27.311Z	2025-03-13T05:22:27.940Z	7c539d65d440ca91be77-57106ebc973970da57ce	{'status': 1, 'visualTitle': 'Card', 'visualId': '7c539d65d440ca91be77', 'visualType': 'card', 'initialLoad': False}
Resolve Parameter	-	2025-03-13T05:22:27.312Z	2025-03-13T05:22:27.351Z	5dad0802-5531-428b-aa8e-d51fad9334b	-

s				5	
Query	-	2025-03-13T05:22:27.351Z	2025-03-13T05:22:27.904Z	9a39064e-7fac-4f1e-9ce1-6159fbfb1ada	-
Render	-	2025-03-13T05:22:27.904Z	2025-03-13T05:22:27.940Z	b77950df-9047-417b-9e4e-e27f6a5abf69	-
Data View Transform	-	2025-03-13T05:22:27.928Z	2025-03-13T05:22:27.929Z	6cee971f-3030-4290-a9ca-22e9f559f160	-
Execute Semantic Query	DSE	2025-03-13T05:22:27.615Z	2025-03-13T05:22:27.819Z	47b53657-fba5-43d2-9dba-69678f04ad99	-
Query Generation	-	2025-03-13T05:22:27.364Z	2025-03-13T05:22:27.365Z	f914a96d-34e5-4666-a2f7-64898989aed1	-
Query Pending	-	2025-03-13T05:22:27.550Z	2025-03-13T05:22:27.561Z	b9ff6e11-ac9d-4fb1-9b6a-013c1cfd3dde	-
Parse Query Result	-	2025-03-13T05:22:27.903Z	2025-03-13T05:22:27.903Z	53f34d73-213a-43a1-973f-bdbec487f054	-
Execute DAX Query	DSE	2025-03-13T05:22:27.723Z	2025-03-13T05:22:27.810Z	24d2ae62-fd6b-4ba0-89a7-8dc058b88a88	{'QueryText': 'EVALUATE\r\n\tROW(\r\n\t\t"AverageHumidity", CALCULATE(AVERAGE(\'plant_growth_data\'[Humidity]))\r\n\t)', 'RowCount': 1}
Execute Query	AS	2025-03-13T05:22:27.793Z	2025-03-13T05:22:27.803Z	181DCA49-F61E-45E8-A50C-12A7C7B6F10A	-
Serialize Rowset	AS	2025-03-13T05:22:27.803Z	2025-03-13T05:22:27.803Z	5D18CA1B-9FC4-4A66-9610-5DBEFD877D7B	-
Visual	-	2025-03-13T05:2	2025-03-13T05:2	1e10db5c9130db6e288d	{'status': 1, 'visualTitle': 'Card', 'visualId':

Container Lifecycle		2:27.314Z	2:27.944Z	-6cf610a74ac805142e40	'1e10db5c9130db6e288d', 'visualType': 'card', 'initialLoad': False}
Resolve Parameters	-	2025-03-13T05:22:27.315Z	2025-03-13T05:22:27.352Z	644bcab7-2833-4370-a59a-f2917fdf1b76	-
Query	-	2025-03-13T05:22:27.352Z	2025-03-13T05:22:27.901Z	06050895-268d-41e8-a80e-ba61548d5064	-
Render	-	2025-03-13T05:22:27.901Z	2025-03-13T05:22:27.944Z	2e944e90-1dd0-4e20-8f88-7bc051ff199e	-
Data View Transform	-	2025-03-13T05:22:27.941Z	2025-03-13T05:22:27.942Z	556513a1-c560-4417-acc1-e8fcdabbdb7f	-
Execute Semantic Query	DSE	2025-03-13T05:22:27.615Z	2025-03-13T05:22:27.819Z	381a1b93-5e5d-433b-82b8-f0dabafe7a57	-
Query Generation	-	2025-03-13T05:22:27.366Z	2025-03-13T05:22:27.367Z	31c4beb1-7264-4422-85bb-d11996b73a49	-
Query Pending	-	2025-03-13T05:22:27.550Z	2025-03-13T05:22:27.561Z	91f41889-4080-4244-9008-39d473c8f1cf	-
Parse Query Result	-	2025-03-13T05:22:27.900Z	2025-03-13T05:22:27.901Z	a592188c-c585-42e3-820f-68885cdcca0e	-
Execute DAX Query	DSE	2025-03-13T05:22:27.722Z	2025-03-13T05:22:27.810Z	2d3594e7-2614-4bff-b82b-b463fb93a775	{'QueryText': 'EVALUATE\r\n\tROW(\r\n\t\t"Sum Growth_Milestone", CALCULATE(SUM(\'plant_growth_data\'[Growth_Milestone]))\r\n\t)', 'RowCount': 1}
Execute Query	AS	2025-03-13T05:22:27.793Z	2025-03-13T05:22:27.803Z	E1EBC465-6C10-4B8F-B10F-08D24019B2	-

				B2	
Serialize Rowset	AS	2025-03-13T05:22:27.803Z	2025-03-13T05:22:27.803Z	7E57501E-F9D6-40B2-AC41-2CFD9CD9C9C9	-
Visual Container Lifecycle	-	2025-03-13T05:22:27.315Z	2025-03-13T05:22:27.947Z	74e7da750504ce7c8053-2ee300df88bddc0e0616	{'status': 1, 'visualTitle': 'Card', 'visualId': '74e7da750504ce7c8053', 'visualType': 'card', 'initialLoad': False}
Resolve Parameters	-	2025-03-13T05:22:27.316Z	2025-03-13T05:22:27.352Z	ab46e5b7-e3e9-4f49-a8b1-e2261c476c70	-
Query	-	2025-03-13T05:22:27.352Z	2025-03-13T05:22:27.898Z	3f6768fb-acd2-4948-ba29-13c98189edf6	-
Render	-	2025-03-13T05:22:27.898Z	2025-03-13T05:22:27.947Z	cfa84584-674c-44b6-9b85-0840404aa942	-
Data View Transform	-	2025-03-13T05:22:27.945Z	2025-03-13T05:22:27.946Z	77d35fee-5c3b-4898-ac84-ac3ce5a0dd08	-
Execute Semantic Query	DSE	2025-03-13T05:22:27.615Z	2025-03-13T05:22:27.819Z	4156ac15-1dcf-4c2f-a3fd-956f37ac318c	-
Query Generation	-	2025-03-13T05:22:27.368Z	2025-03-13T05:22:27.369Z	81e3d082-3e94-4b1f-b3a9-e3d15be21fae	-
Query Pending	-	2025-03-13T05:22:27.551Z	2025-03-13T05:22:27.560Z	9978867e-8cbb-41cc-800d-057a7c597b39	-
Parse Query Result	-	2025-03-13T05:22:27.897Z	2025-03-13T05:22:27.898Z	d07e2963-56ec-4e76-8311-7e75202297cb	-

7. RESULTS
7.1 Screenshots of Report and observation



7.2 Screenshot of Dashboard and observation

8. ADVANTAGES & DISADVANTAGES

Advantages

1. Helps farmers and researchers make data-driven decisions about irrigation, fertilization, and harvesting.
2. Predicting plant growth stages allows farmers to apply the right resources at the right time (e.g., water, fertilizers, pesticides)
3. Real-time environmental adaptation improves outcomes.

Disadvantages

1. If data is incomplete or inaccurate, predictions may not be reliable.
2. Farmers with limited technical knowledge may find it difficult to use Power BI dashboards.

9. CONCLUSION

This project shows how Power BI can help predict plant growth stages by using weather and farming data. Factors like temperature, rainfall, soil moisture, and fertilizers affect plant growth, and with data visualization, farmers and researchers can make better decisions.
With easy-to-understand dashboards, users can:

- See how plants grow over time.
- Use water, fertilizers, and pesticides at the right time.
- Find problems early and fix them.
- Improve crop health and yield.

10. FUTURE SCOPE

This project can be improved in many ways to make plant growth prediction even better. In the future, we can:

1. Use AI for Better Predictions
    - Add smart technology to make growth predictions more accurate.
2. Get Live Data from Sensors
    - Connect weather sensors to get real-time updates on temperature, soil, and rain.