# Project Initialization and Planning Phase

| Date | 25 December 2025 |
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| Project Title | Predicting Plant Growth Stages with Environmental and Management Data Using Power BI. |
| Maximum Marks | 3 Marks |

## 1. Project Overview:

The agricultural sector faces significant challenges in maintaining consistent crop yields due to unoptimized environmental conditions and resource management. This project focuses on analyzing historical plant growth data to identify the critical drivers of successful cultivation. By utilizing a dataset containing 193 records of plant growth metrics, including soil type, sunlight hours, and fertilizer usage, we aim to transition from intuition-based farming to data-driven precision agriculture.

❖ **OBJECTIVE:**

The core objective is to develop an interactive Power BI Dashboard that visualizes the correlation between care inputs (water, fertilizer) and the "Growth Milestone" target variable. This tool will empower agricultural managers to predict growth outcomes and reduce the current 50% crop failure rate by prescribing optimal conditions for specific soil types.

## 2. Problem Statement:

Current farming practices are inefficient, resulting in a **49.7% success rate** for plant maturation. There is a lack of actionable insight into how variables like Temperature and Humidity interact with Soil_Type to affect growth. Specifically, the data reveals that while "Organic" fertilizers yield a 70% success rate, "Chemical" fertilizers lag behind at ~55%, and unfertilized plants fail ~70% of the time. Without a tool to visualize these disparities, growers continue to waste resources on ineffective chemical treatments and sub-optimal watering schedules (e.g., watering Clay soil daily despite low success).

## 3. Proposed Solution & Scope:

We propose the development of a **"Growth Prediction & Optimization Dashboard"** using Microsoft Power BI. This solution will analyze the provided plant_growth_data.csv to deliver three key capabilities:

❖ **Descriptive Analytics:** Visualizing the current state of operations.

- Bar charts comparing success rates across the three soil types: **Loam, Sandy, and Clay**.

- Analysis of water frequency efficiency (**Daily vs. Weekly vs. Bi-Weekly**).

❖ **Diagnostic Analytics:** Identifying why failures happen.

- A "Root Cause" breakdown showing that **Clay soil** combined with **Chemical fertilizer** significantly underperforms compared to Loam/Organic combinations.

- Scatter plots correlating Sunlight_Hours and Temperature against the binary Growth_Milestone to find the "sweet spot" for environmental controls.

❖ **Prescriptive Insight:**
- A "Golden Rule" matrix advising growers to switch to **Organic fertilizer** and **Loam soil** to maximize the probability of reaching Growth Milestone 1.

## 4. Resource Requirements:

❖ **Hardware:**
- **Workstations:** 1x Laptop/PC with minimum 8GB RAM (16GB recommended) and an i5 processor to handle Power BI data modeling and visualization rendering efficiently.
- **Storage:** Local drive space for storing the raw CSV dataset and the .pbix project file (approx. 500MB).

❖ **Software:**
- **Microsoft Power BI Desktop:** The primary tool for ETL (Extract, Transform, Load), data modeling, and visualization creation.
- **Microsoft Excel / CSV Editor:** For initial inspection of the plant_growth_data.csv file and raw data validation.
- **Microsoft Word:** For documentation, proposal writing, and final report generation.

❖ **Personnel:**
- **Data Analyst:** To build the data model and dashboard.
- **Domain Expert (Farmer/Botanist):** To validate the insights (e.g., confirming "Organic" efficacy).