Predicting Plant Growth Stages with Environmental and Management Data – Full Project Documentation

1. Problem Statement

With increasing challenges in agriculture due to climate change, soil degradation, and inconsistent irrigation, there is a growing need to understand how environmental and management factors influence plant growth. Identifying patterns in soil type, temperature, humidity, sunlight, and watering frequency is essential for improving plant yield and sustainability.

This Power BI project aims to explore historical plant growth data and uncover meaningful insights through visualizations. These findings will help agricultural researchers and farmers optimize their practices for better productivity.

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2. Project Proposal

- **Objective:**
  Analyze environmental and management factors affecting plant growth using Power BI.

- **Scope:**
  Focuses on visualizing plant growth trends based on soil type, water frequency, temperature, sunlight, humidity, and fertilizer usage. Key metrics like average, percentage, and growth milestone counts are calculated.

- **Tools Used:**
  Power BI, MS Excel, GitHub

- **Deliverables:**
  Interactive dashboard, visual charts, PDF report, video demo

- **Target Audience:**
  Agricultural researchers, students, environmentalists, farmers

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3. Initial Project Planning Report

- **Phase: Data Collection**
  Task: Download dataset from Kaggle
  Duration: 1 day

- **Phase: Data Preprocessing**
  Task: Cleaning, transforming data, creating DAX columns
  Duration: 2 days

- **Phase: Data Visualization**
  Task: Creating charts, graphs, and visuals in Power BI
  Duration: 3 days

- **Phase: Dashboard Development**
  Task: Slicers, KPIs, formatting, tooltips
  Duration: 2 days

- **Phase: Documentation & Reporting**
  Task: Writing final report, creating video demo
  Duration: 1 day

- **Phase: GitHub Upload**
  Task: Organize folders, upload .pbix, .csv, README.md
  Duration: 1 day

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4. Data Collection Plan

The dataset was collected from **Kaggle** and includes information on:

- Soil type, watering frequency, temperature, humidity, sunlight hours

- Fertilizer types

- Growth milestone counts and percentage

Each record captures environmental and input conditions and the corresponding plant growth outcomes.

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5. Data Sources Identification

- **Kaggle Dataset:** Plant Growth Dataset – Kaggle
- Fields: Soil_Type, Water_Frequency, Temperature, Humidity, Sunlight_Hours, Fertilizer_Type, Growth_Milestone

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6. Data Quality Report

- **Duplicates:** None found
- **Null Values:**
  Minimal; handled using fill or exclusion techniques.
- **Transformations Applied:**
  - Created calculated columns for category descriptions
  - Aggregated growth milestones
  - Converted numerical ranges into labeled categories (e.g., "Low", "Moderate", "High")

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7. Business Questions

1. Which soil type supports the highest plant growth milestones?
2. How does water frequency impact plant growth?
3. What is the effect of temperature on plant growth?

4. Which humidity level yields the best results?
5. What fertilizer type performs best?
6. What's the average value of temperature, humidity, and sunlight hours?
7. What is the distribution and percentage of growth milestones under different conditions?

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8. Final Report Insights

- **Soil:** Loam soil shows the highest growth milestone count
- **Water:** Daily watering results in the highest growth percentage
- **Temperature:** Warm temperature increases plant growth; cold reduces it
- **Humidity:** Humid conditions favor plant development
- **Sunlight:** Sandy soil receives highest sunlight; beneficial with proper watering
- **Fertilizer:** Chemical fertilizer leads to more growth milestones
- **Total Growth Milestone Count:** 96
- **Combined KPIs:** Display average humidity, temperature, and sunlight hours

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9. Tools Used

- **Power BI** – Visual analytics and dashboard
- **MS Excel** – Data cleaning and structuring
- **GitHub** – Project hosting

- **Google Docs** – Documentation writing

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10. Contributor

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- **Date:** June 2025
- **Project Title:** Predicting Plant Growth Stages With Environmental & Management Data