



Low Level Design Document

Introduction

This Low Level Design (LLD) document outlines the implementation details for **GreenYield - Agriculture Production Insights**. The project aims to deliver a Tableau dashboard that visualizes crop yields, farm locations, and seasonal trends using agricultural data, incorporating maps and time-series charts.

1. System Components

Component	Description	Key Responsibilities
Data Source	Agricultural data files (CSV/DB)	Store and provide raw data
Data ETL Pipeline	Data extraction, transformation, loading scripts	Clean, format, and load data to Tableau
Tableau Dashboard	Visualization layer	Display maps, time-series, and summary KPIs

2. Class/Interface Overview

Class/Interface	Description	Key Methods/Attributes
DataExtractor	Reads raw data	<code>extract()</code> , <code>source_path</code>
DataTransformer	Cleans/transforms data	<code>transform(data)</code> , <code>schema</code>
DataLoader	Loads data to Tableau data source	<code>load(data)</code> , <code>target_path</code>
TableauDashboard	Tableau workbook/dashboard	<code>refresh()</code> , <code>render()</code>

Relationships:

- `DataExtractor` → `DataTransformer` → `DataLoader`
- Tableau connects to the loaded data source

3. Data Structure Overview

Entity	Attributes
Farm	<code>farm_id</code> , <code>name</code> , <code>latitude</code> , <code>longitude</code> , <code>region</code>
CropYield	<code>farm_id</code> , <code>crop_type</code> , <code>season</code> , <code>year</code> , <code>yield_amount</code>
Season	<code>season_id</code> , <code>name</code> , <code>start_date</code> , <code>end_date</code>



4. Algorithms/Logic

ETL Flow Pseudocode:

```
data = DataExtractor.extract()
clean_data = DataTransformer.transform(data)
DataLoader.load(clean_data)
# Tableau dashboard refreshes to reflect new data
```

Dashboard Logic:

- Map: Plot farms using latitude / longitude
- Time-Series: Aggregate yield_amount by season / year
- Filters: Crop type, region, season

5. Error Handling

Scenario	Handling Approach
Data source unavailable	Log error, alert user, retry
Data format/schema mismatch	Validate schema, skip/flag bad records
ETL process failure	Log error, halt pipeline, notify admin
Tableau data refresh failure	Log error, prompt manual refresh

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