

# Farm Yield Optimization – Documentation

## 1. Project Overview

The **Farm Yield Optimization** challenge aims to analyze farming operations (farmers, plots, crop yields, and irrigation) to identify opportunities for improving crop productivity and resource usage. The dataset captures multi-year records of harvests, irrigation patterns, and farmer assignments.

### Business Goal:

- Understand factors influencing yield (weather, soil type, irrigation).
  - Identify trends across seasons and years.
  - Provide recommendations to optimize water usage and maximize crop output.
- 

## 2. Database Schema

### farmers

- farmer\_id (PK) – Unique identifier for farmers.
- first\_name, last\_name – Farmer's name.
- email – Contact.
- hire\_date – Joining date.

### plots

- plot\_id (PK) – Unique identifier for farm plots.
- plot\_name – Name of the plot.
- farmer\_id (FK) – Owner/manager of the plot.
- crop\_type – Type of crop grown (Wheat, Corn, Soybeans).
- soil\_type – Soil classification (Loam, Clay, Sand).

### yields

- yield\_id (PK) – Unique identifier for harvest.
- plot\_id (FK) – Plot harvested.
- harvest\_date – Date of harvest.
- yield\_kg – Yield weight in kilograms.
- weather\_condition – Weather during harvest (Sunny, Rainy, Mild).

### irrigation\_logs

- log\_id (PK) – Unique identifier for irrigation.
- plot\_id (FK) – Plot irrigated.
- irrigation\_date – Date of irrigation.
- water\_amount\_liters – Amount of water used.

---

### 3. Dataset Summary

- **Farmers:** 5
  - **Plots:** 8
  - **Yields:** 20 harvest records across 2022–2024
  - **Irrigation Logs:** 15 records across 2023–2024
  - **Crops covered:** Wheat, Corn, Soybeans
  - **Soil Types:** Loam, Clay, Sand
- 

### 4. Key Business Questions

#### 1. Yield Trends

- How do yields vary across different crops and years?
- Which weather conditions lead to higher/lower yields?

#### 2. Farmer Performance

- Which farmers consistently achieve the highest yields?
- Are some farmers more efficient with irrigation?

#### 3. Irrigation Efficiency

- Is there a correlation between water usage and yield output?
- Which soil type requires the most water for optimal results?

#### 4. Crop & Soil Insights

- Which crop-soil combinations give the best productivity?
  - Does any soil type underperform despite high irrigation?
- 

### 5. Example SQL Queries

- **Crop yield trend per year:**

```
SELECT YEAR(harvest_date) AS year, crop_type, SUM(yield_kg) AS total_yield
FROM yields y
JOIN plots p ON y.plot_id = p.plot_id
GROUP BY YEAR(harvest_date), crop_type
ORDER BY year, crop_type;
```

- **Water usage vs yield per plot:**

```
SELECT p.plot_name, p.crop_type,
```

```
SUM(i.water_amount_liters) AS total_water,
SUM(y.yield_kg) AS total_yield
FROM plots p
LEFT JOIN irrigation_logs i ON p.plot_id = i.plot_id
LEFT JOIN yields y ON p.plot_id = y.plot_id
GROUP BY p.plot_name, p.crop_type;
```

6. Potential Insights

- Wheat on Loam shows consistently strong yields under Sunny weather.
- Corn on Clay is water-intensive but gives high returns.
- Soybeans on Sand underperform despite irrigation – possible inefficiency.
- Some farmers show higher yields with lower irrigation → best practices can be replicated.

7. Next Steps

- Conduct **Exploratory Data Analysis (EDA)** on yields vs weather, soil, and irrigation.
- Build **predictive models** for yield forecasting.
- Recommend **optimal irrigation schedules** per crop-soil combination.
- Share **dashboards** for farmer-level and crop-level performance monitoring.

8.Screenshots

plot_name	crop_type	avg_yield	total_water
West Field	Wheat	1400.17	294000.00
North Pasture	Corn	2050.25	441000.00
Plot B	Soybeans	865.45	96000.00
Valley View	Wheat	1400.30	110000.00

month	harvest_count
2024-10	2
2024-11	0
2024-12	0
2025-01	0
2025-02	0
2025-03	0
2025-04	0
2025-05	0
2025-06	0
2025-07	0
2025-08	0
2025-09	0

Result Grid

Filter Rows:

Export:

first_name	last_name	average_water_liters_per_plot
Alex	Chen	48000.00

Result Grid				Filter Rows:
	soil_type	plot_name	highest_yield_kg	
▶	Clay	Plot A	2200.10	
	Loam	High Plains	2350.40	
	Sand	South Farm	950.20	

Result Grid				Filter Rows:	Export
	crop_type	weather_condition	average_yield_kg		
▶	Corn	Rainy	2137.71		
	Corn	Sunny	2183.47		
	Soybeans	Mild	876.22		
	Wheat	Mild	1400.30		
	Wheat	Rainy	1475.00		
	Wheat	Sunny	1487.70		

Result Grid			Filter Rows:
	plot_name	total_water_liters	
▶	Plot A	158000.00	
	North Pasture	147000.00	
	High Plains	138000.00	
	West Field	98000.00	
	East Meadow	88000.00	
	South Farm	58000.00	
	Valley View	55000.00	
	Plot B	48000.00	

Result Grid				Filter Rows:	Export
	plot_name	crop_type	average_yield_kg		
▶	High Plains	Corn	2300.20		
	Plot A	Corn	2175.05		
	North Pasture	Corn	2050.25		