

Coding Challenge: Farm Yield Optimization

You are a data analyst at "Agri-Innovate," a company that provides data-driven solutions to farmers. Your mission is to help a client, a large-scale agricultural operation, analyze their farm data to improve crop yields and optimize resource allocation. The farmer wants to understand the relationship between different factors like planting, irrigation, and harvest to make better decisions for the next season.

The Database Schema

You have been given access to a database with the following four tables:

- **farmers:** Contains information about the farmers managing different plots.
 - `farmer_id` (INT, PRIMARY KEY): Unique ID for each farmer.
 - `first_name` (VARCHAR): Farmer's first name.
 - `last_name` (VARCHAR): Farmer's last name.
 - `email` (VARCHAR): Farmer's email address.
 - `hire_date` (DATE): Date the farmer was hired.
- **plots:** Contains details about each agricultural plot.
 - `plot_id` (INT, PRIMARY KEY): Unique ID for each plot.
 - `plot_name` (VARCHAR): Name of the plot (e.g., 'West Field', 'North Pasture').
 - `farmer_id` (INT, FOREIGN KEY): ID of the farmer managing the plot.
 - `crop_type` (VARCHAR): Type of crop grown on the plot (e.g., 'Wheat', 'Corn', 'Soybeans').
 - `soil_type` (VARCHAR): Soil type of the plot (e.g., 'Loam', 'Clay', 'Sand').
- **yields:** Records crop yield data for each harvest.
 - `yield_id` (INT, PRIMARY KEY): Unique ID for each yield record.
 - `plot_id` (INT, FOREIGN KEY): ID of the plot where the yield was recorded.
 - `harvest_date` (DATE): Date of the harvest.
 - `yield_kg` (DECIMAL): Yield in kilograms.

- weather_condition (VARCHAR): General weather condition during the growing season (e.g., 'Sunny', 'Rainy', 'Mild').
 - irrigation_logs: Tracks irrigation events.
 - log_id (INT, PRIMARY KEY): Unique ID for each log entry.
 - plot_id (INT, FOREIGN KEY): ID of the plot that was irrigated.
 - irrigation_date (DATE): Date of the irrigation.
 - water_amount_liters (DECIMAL): Amount of water used in liters.
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The Tasks

Write **SQL queries** to answer the following questions. Provide the queries and the resulting tables.

1. Productivity & Performance

- Identify the **top 3 most productive plots** based on average yield per harvest. Show the plot_name, crop_type, and average_yield_kg.
- Calculate the **total water consumption** for each plot and rank them from highest to lowest. Show plot_name and total_water_liters.

2. Yield & Environmental Analysis

- Determine the **average yield for each crop type** under different weather conditions. The output should have crop_type, weather_condition, and average_yield_kg.
- Find the **highest-yielding plot for each soil type**. Show the soil_type, plot_name, and highest_yield_kg.

3. Farmer & Resource Management

- Identify the **farmer who manages the plots with the lowest average water consumption**. Show the first_name, last_name, and their plots' average_water_liters_per_plot.
- Calculate the **number of harvests per month** for the last 12 months. Show the month and the number of harvests.

4. Advanced Analysis (Bonus)

- Find plots that have a **below-average yield** for their specific crop type but an **above-average water consumption** compared to all other plots with the same crop. List the plot_name, crop_type, yield_kg, and water_amount_liters.
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Deliverables

Do should submit:

1. A **single SQL file** containing all the queries, clearly labeled with comments (e.g., -- Task 1: Most Productive Plots).
2. A brief **text file or document** with the results of each query, including the column names and data.