Tables

1. CROP_DIM

Attribute	Туре	Key	Description
crop_ID	INT	(PK)	Unique identifier for each crop
crop_name	VARCHAR(100)		Name of the crop
crop_type	VARCHAR(50)		Type of crop
planting_season	VARCHAR(50)		Optimal season for planting
average_yield	DECIMAL		Average yield per hectare
market_demand	DECIMAL		Current market demand for the crop

- **Grain**: One row per crop.
- **Explanation**: The crop dimension provides detailed information about each crop grown on the farm, such as crop type (e.g., wheat, corn, rice). It allows analysis of production data at the crop level, enabling users to track crop performance, yields, and profitability across different time periods and locations.
- Attributes: crop_ID (PK), crop_name, crop_type, planting_season, average_yield,
 market_demand

2. FARMER_DIM

Attribute	Туре	Key	Description
farmer_ID	INT	(PK)	Unique identifier for each farmer
farmer_name	VARCHAR(100)		Name of the farmer
location_ID	INT	(FK)	Links to the Location dimension
farm_size	DECIMAL		Size of the farm (in acres)
contact_info	VARCHAR(255)		Contact information for the farmer

- **Grain**: One row per farmer.
- Explanation: This dimension contains individual details for each farmer responsible for growing crops. It supports analysis at the farmer level, allowing stakeholders to assess the productivity of each farmer and compare how different farmers contribute to the overall yield and profitability of the farm.
- Attributes: farmer ID (PK), farmer name, location ID (FK), farm size

3. SELLER DIM

Attribute	Туре	Key	Description
seller_ID	INT	(PK)	Unique identifier for each seller
seller_name	VARCHAR(100)		Name of the seller
seller_address	VARCHAR(255)		Address of the seller
contact_info	VARCHAR(255)		Contact information of the seller
type	VARCHAR(50)		Type (e.g., wholesaler, retailer)

- Grain: One row per seller.
- **Explanation**: The seller dimension records information about the entities selling crops. It is used to track market transactions, allowing users to analyze which buyers are purchasing crops, the prices they are paying, and how these transactions affect overall revenue and market trends.
- Attributes: seller ID (PK), seller name, seller address, contact info, seller type

4. BUYER DIM

Attribute	Туре	Key	Description
buyer_ID	INT	(PK)	Unique identifier for each buyer

buyer_name	VARCHAR(100)	Name of the buyer
buyer_address	VARCHAR(255)	Address of the buyer
contact_info	VARCHAR(255)	Contact information of the buyer

• **Grain**: One row per buyer.

- Explanation: The buyer dimension records information about the entities buyer crops. It is used to track market transactions, allowing users to analyze which buyers are purchasing crops, the prices they are paying, and how these transactions affect overall revenue and market trends.
- Attributes: buyer ID (PK), buyer name, address, contact info

5. FACILITY DIM

Attribute	Туре	Key	Description
facility_ID	INT	(PK)	Unique identifier for each facility
facility_name	VARCHAR(100)		Name of the facility
facility_type	VARCHAR(100)		Type of facility
rental_fee	DOUBLE		Rental fee of the facility

- **Grain**: One row per facility.
- Explanation: This dimension captures information about facilities involved in agricultural operations, such as storage units or processing plants. It supports logistics and resource management by helping analyze how various facilities are utilized and their impact on the efficiency of production and distribution.
- Attributes: facility_ID (PK), facility_name, facility_type, rental_fee

6. STAFF_DIM

Attribute	Туре	Key	Description
staff_ID	INT	(PK)	Unique identifier for each staff member
staff_name	VARCHAR(100)		Name of the staff member
staff_role	VARCHAR(50)		Role of the staff member
contact_info	VARCHAR(255)		Contact information

- Grain: One row per staff member.
- Explanation: The staff dimension records data about the farm's employees. It supports labor management analysis by tracking which workers are involved in different parts of the production process. This helps optimize workforce allocation and productivity analysis.
- Attributes: staff_ID (PK), staff_name, staff_role, contact_info

7. DATE DIM

Attribute	Туре	Key	Description
date_ID	INT	(PK)	Unique identifier for each date
date	DATE		Actual date
quarter	VARCHAR(2)		Quarter of the year
weekday	VARCHAR(10)		Day of the week

- **Grain**: One row per day.
- **Explanation**: The date dimension stores specific dates, allowing time-based analysis such as production trends, seasonal comparisons, and yield forecasting. The granularity is at the day level, but it can also roll up into weeks, months, quarters, and years for higher-level analysis.
- Attributes: date ID (PK), date, quarter, weekday

8. LOCATION_DIM

Attribute	Туре	Key	Description
location_ID	INT	1	Unique identifier for each location
location_name	VARCHAR(255)		Name of the location
location_address	VARCHAR(255)		Address of the location

- Grain: One row per location (barangay, municipality).
- **Explanation**: This dimension captures geographic information such as the farm's barangay and municipality. It allows for geographic analysis, enabling users to understand how location affects production, climate, and market dynamics.
- Attributes: location ID (PK), location name, location address

9. FIELD_DIM

Attribute	Туре	Key	Description
field_ID	INT	(PK)	Unique identifier for each field
field_name	VARCHAR(255)		Name of the field
location_ID	INT	(FK)	Links to the Location dimension
soil_type	VARCHAR(100)		Type of soil
occupation	DOUBLE		Occupation of the field

- **Grain**: One row per field.
- Explanation: The field dimension provides data about individual fields where crops are grown. It allows detailed analysis at the field level, helping stakeholders monitor how specific fields perform in terms of yield, soil conditions, and resource usage (e.g., water, fertilizer).
- Attributes: field_ID (PK), field_name, location_ID (FK), soil_type, occupation

FACTS AND GRAINS

1. PRODUCTION_FACT

Attribute	Туре	Key	Description
production_fact_ID	INT	(PK)	Unique identifier for each production record
date_ID	INT	(FK)	Links to the date dimension
crop_ID	INT	(FK)	Links to the crop dimension
farmer_ID	INT	(FK)	Links to the farmer dimension
field_ID	INT	(FK)	Links to the field dimension
seller_ID	INT	(FK)	Links to the seller dimension
buyer_ID	INT	(FK)	Links to the buyer dimension
staff_ID	INT	(FK)	Links to the staff dimension
facility_ID	INT	(FK)	Links to the facility dimension
volume	DOUBLE		Amount of crop produced (e.g., tons, kg)
price	DOUBLE		Selling price per unit of crop
total_sales	DOUBLE		Total sales value (Volume × Price per Unit)

- Definition: The Production Fact table captures key quantitative data related to crop production and sales, such as yield, prices, and the associated transactions with buyers.
- Grain: The grain of the Production Fact table is per crop per field per farmer per season per day.

Attributes:

- 1. production_fact_ID (PK):
- 2. **date_ID (FK)**: Helps identifying when the production occurred (e.g., day, week, or quarter). This enables the tracking of production trends over time.

- 3. **crop_ID (FK)**: Holds information about the type of crop being produced (e.g., wheat, rice, corn). This allows analysis of production at the crop level.
- 4. **farmer_ID** (**FK**): Identifies the farmer responsible for the crop production. This attribute supports analysis at the farmer level, helping track individual productivity.
- 5. **field_ID (FK)**: Specifies the field where the crop was grown. This enables detailed field-level production analysis and helps optimize resource use for each field.
- **6. seller_ID (FK):** Helps identifying the sellers involved in the crop transaction. This attribute helps analyze sales transactions and market dynamics, including buyer behaviors.
- 7. **buyer_ID** (**FK**): Helps identifying the buyers involved in the crop transaction. This attribute helps analyze sales transactions and market dynamics, including buyer behaviors.
- 8. **staff_ID (FK)**: Identifies the workers involved in the production process. This allows for labor productivity analysis and staff management.
- 9. **facility_ID (FK)**: Identifies any facilities involved in storing, processing, or selling the crop. This is important for analyzing logistics and facility utilization.
- 10. **volume**: This attribute records the quantity of crop produced or sold, typically measured in tons, kilograms, bushels, etc. It is the core metric for yield and production performance analysis.
- 11. **price:** This attribute captures the selling price per unit of the crop (e.g., price per ton or kg). It allows for revenue tracking and helps assess market pricing trends.

12. **total_sales**: This field calculates the total monetary value of the crop sold, computed as Volume × Price per Unit. This metric supports financial analysis, profitability tracking, and sales revenue forecasting.

Purpose:

- Yield Analysis: The volume attribute allows stakeholders to assess yield performance for different crops, fields, and farmers.
- Revenue & Profitability: The price and total_sales attributes help track revenue
 generated from the sale of crops. This is crucial for evaluating financial performance and
 profitability.
- Market Dynamics: The buyer_ID attribute helps analyze which buyers are purchasing crops, which helps to identify market trends and demand patterns.
- Labor & Resource Management: The staff_ID and facility_ID attributes help analyze
 labor efficiency and the effectiveness of facilities in crop storage and processing.
- **Supply Chain Optimization**: By including the **field_ID** and **facility_ID**, this fact helps optimize logistics, track which facilities handle the crops, and manage the supply chain effectively.

2. INPUT USAGE FACT

Attribute	Туре	Key	Description
input_usage_fact_ID	INT	(PK)	Unique identifier for each input usage record
date_ID	INT	(FK)	Links to the date dimension
crop_ID	INT	(FK)	Links to the crop dimension
farmer_ID	INT	(FK)	Links to the farmer dimension

field_ID	INT	(FK)	Links to the field dimension
resource_usage	VARCHAR(50)		Quantity of the resource used (e.g., liters, kg)
cost	DOUBLE		Cost of the resource used
application_method	VARCHAR(255)		Method used for applying the resource (e.g., manual, automated)
efficiency	DOUBLE		Efficiency metric for resource usage

- Fact Definition: Input usage refers to the consumption of resources used to grow crops, such as fertilizers, water (liters), labor hours, and pesticides.
- Grain: The grain would be per input type per farm per crop per time period (daily, weekly, monthly).
- Input usage analysis helps in identifying resource efficiencies, optimizing input allocation, and managing costs. It can also be used to correlate input usage with crop yields for better decision-making.

Attributes:

- Input usage fact ID (PK): Unique identifier for each input usage record
- DateID (FK): Foreign key linking to the Date dimension, identifying the date of input usage.
- **CropID (FK)**: Foreign key linking to the Crop dimension, identifying the crop receiving the input.
- **FieldID** (**FK**): Foreign key linking to the Field dimension, identifying the field where the input was applied.
- **FarmerID** (**FK**): Foreign key linking to the Farmer dimension, identifying the farmer responsible for managing the input.

- **InputTypeID (FK)**: Foreign key linking to an Input Type dimension (could be water, fertilizer, pesticide, etc.).
- QuantityUsed: The total quantity of input used (e.g., liters of water, kg of fertilizer).
- **CostPerUnit**: The cost of one unit of the input (e.g., cost per liter of water or kg of fertilizer).
- **TotalCost**: The total cost for the input applied, calculated as QuantityUsed × CostPerUnit.

3. WEATHER_FACT

Attribute	Туре	Key	Description
weather_fact_ID	INT	(PK)	Unique identifier for each weather record
date_ID	INT	(FK)	Links to the Date dimension
location_ID	INT	(FK)	Links to the Location dimension
temperature	DECIMAL		Average temperature for the day
rainfall	DECIMAL		Amount of rainfall (mm)
wind_speed	DECIMAL		Wind speed (km/h)
humidity	DECIMAL		Average humidity (%)
soil_moisture	DECIMAL		Soil moisture level (percentage)

- Definition: This fact captures weather data that could impact farming decisions, including temperature, rainfall, humidity, and wind speed at different locations and times.
- Grain: The grain of the Weather Fact table is per location per day.

Attributes:

• weather fact ID (PK): Unique Identifier for each weather record

- date_ID (FK): Foreign key linking to the Date dimension, identifying the day of the weather measurement.
- **location_ID** (**FK**): Foreign key linking to the Location dimension, identifying where the weather was recorded (e.g., a farm or weather station).
- **temperature**: Average daily temperature in degrees Celsius (or Fahrenheit).
- rainfall: Amount of rainfall for the day in millimeters.
- **humidity**: Average daily humidity percentage.
- wind speed: Average wind speed in kilometers per hour (or miles per hour).
- soil moisture: Percentage of moisture in the soil, which affects crop growth.

Purpose:

- Yield forecasting: Weather conditions (especially rainfall and temperature) have a significant impact on crop yield. Tracking this data supports predictive models for yield outcomes.
- **Risk management**: Helps to manage the risk of adverse weather conditions affecting crops (e.g., frost, drought, high winds).
- **Input scheduling**: Weather data can be used to optimize when inputs like irrigation should be applied based on recent and expected weather conditions.

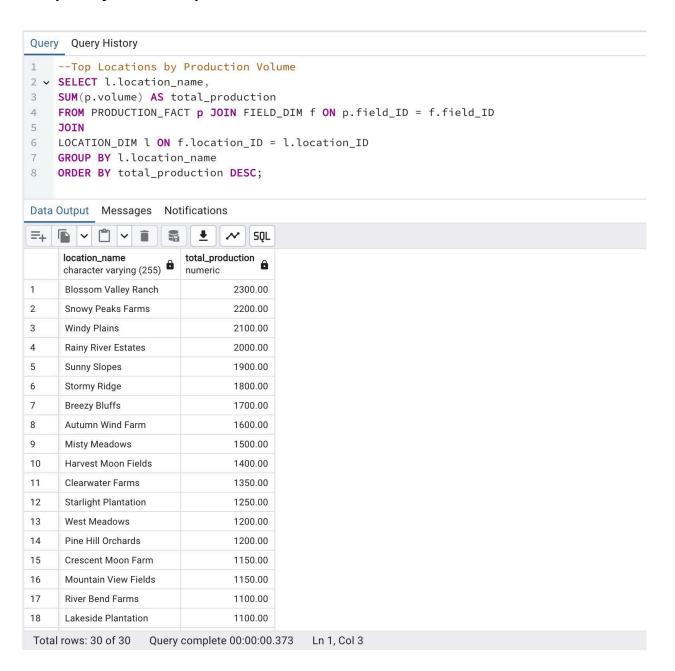
QUERIES:

Our queries include analysis of five different categories:

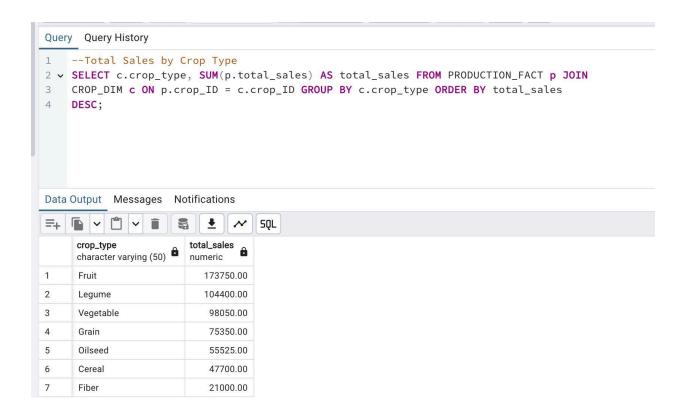
- Revenue analysis: Analyze total sales, revenue per crop, and buyer-seller performance using metrics like total revenue, sales distribution, and contribution to overall profits.
- Production trends: Uncover seasonal patterns and optimize planting and harvesting schedules.

- Resource efficiency: Measure efficiency metrics like average resource usage, cost per unit of yield, and resource application methods across crops or farmers.
- Weather impact on crops: To understand how weather conditions affect crop yield and market pricing.
- Crop Yield Analysis: Evaluate crop yield performance across farmers, locations, and seasons using different metric

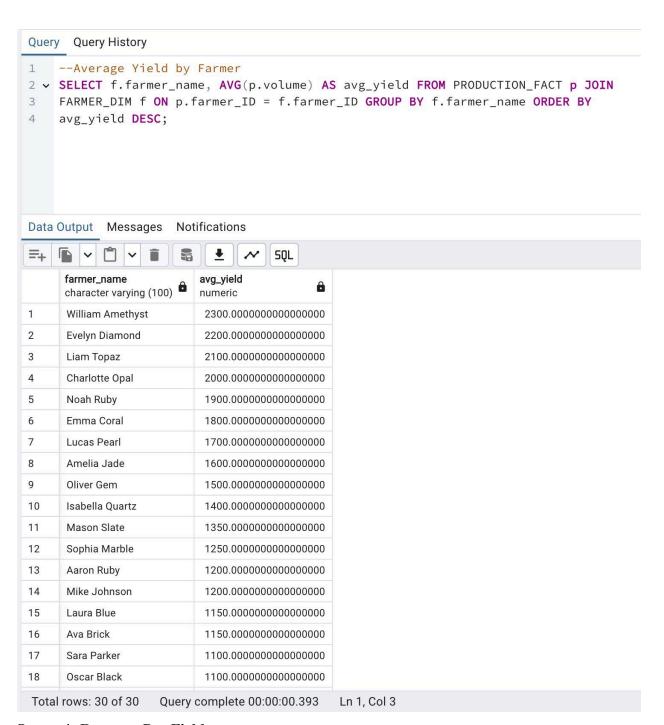
Query 1: Top Locations by Production Volume



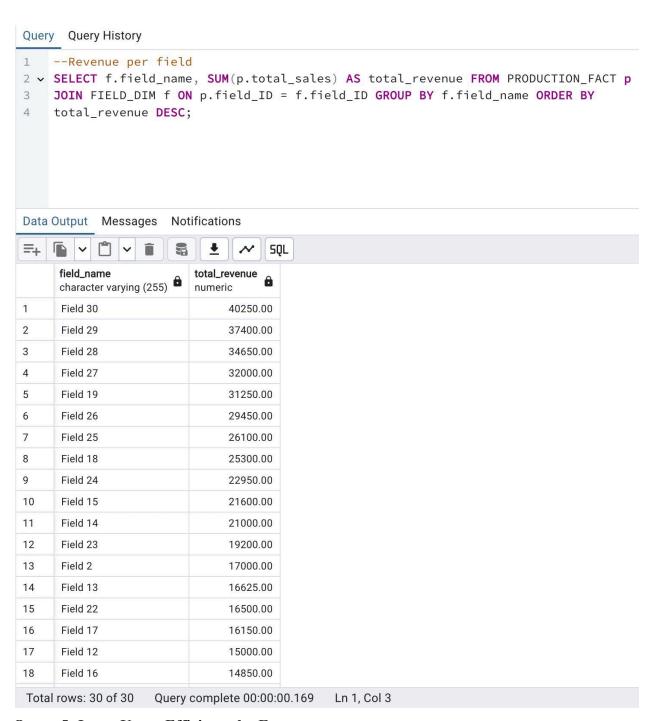
Query 2: Total Sales by Crop Type



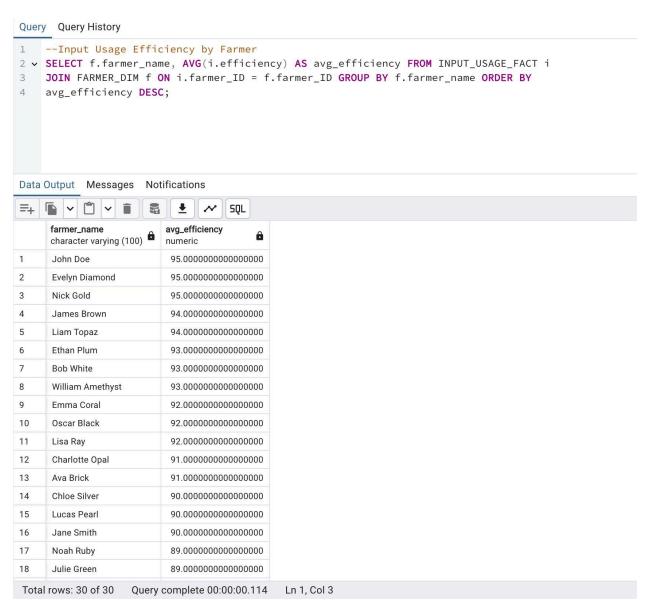
Query 3: Avg Yield By Farmer



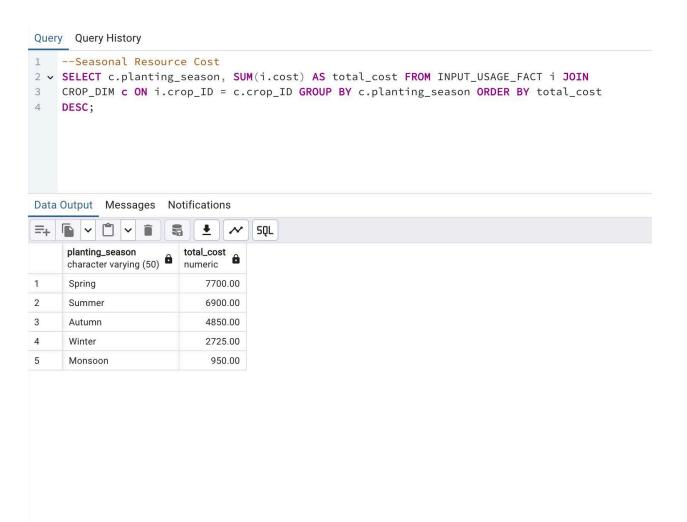
Query 4: Revenue Per Field



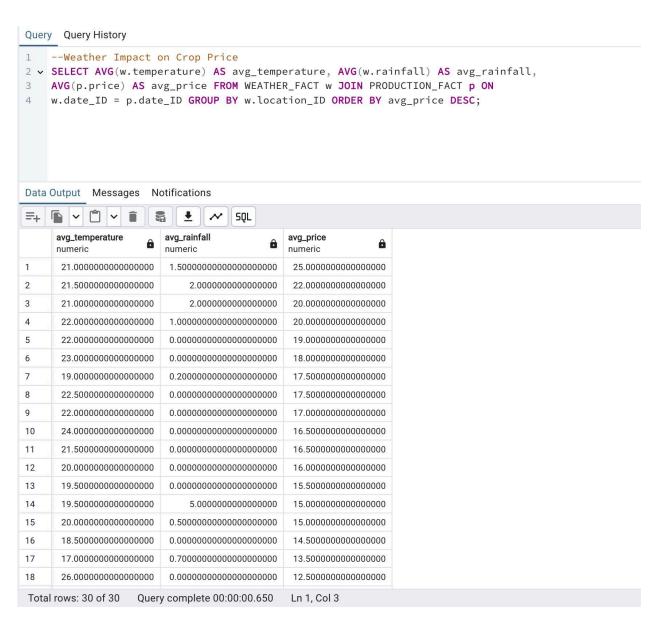
Query 5: Input Usage Efficiency by Farmer



Query 6: Seasonal Resource Cost



Query 7: Weather Impact on Crop Price



Query 8: Underutilized facilities

Query Query History 1 --Underutilized Facilities 2 v SELECT f.facility_name, COUNT(p.facility_ID) AS usage_count, SUM(p.total_sales) AS total_revenue FROM PRODUCTION_FACT p JOIN FACILITY_DIM f ON p.facility_ID = f.facility_ID GROUP BY f.facility_name HAVING COUNT(p.facility_ID) < 5 ORDER BY</pre> 4 total_revenue ASC; Data Output Messages Notifications ~ ° v + ~ SQL total_revenue facility_name usage_count 0 character varying (100) bigint numeric BioTech Lab 9500.00 1 1 2 Farmers Market Hub 1 9600.00 3 CropSort Warehouse 1 9900.00 4 Greenhouse Farms 1 10500.00 5 1 10800.00 FreshPack Facility **EcoPreserve Facility** 1 11000.00 7 1 11025.00 AgroMix Plant 1 11250.00 8 Central Grain Store 9 13300.00 **EcoStorage Complex** 1 10 Harvest Town Market 1 13500.00 QuickFreeze 1 13750.00 11 Farm Supply Store 1 14375.00 12 13 PureFoods Packaging 1 14850.00 14 HarvestPlus Silos 1 15000.00 15 SoilHealth Center 1 16150.00 16 FertilizePro Facility 1 16500.00 17 SeedGenetics Lab 1 16625.00 1 17000.00 18 AgriProcessing Unit

Query 9: Monthly Production trends

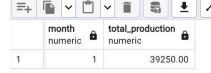
Query Query History

- 1 --Monthly Production Trends
- 2 v SELECT EXTRACT(MONTH FROM dd.date) AS month, SUM(p.volume) AS total_production
- 3 FROM PRODUCTION_FACT p JOIN DATE_DIM dd ON p.date_ID = dd.date_ID GROUP BY

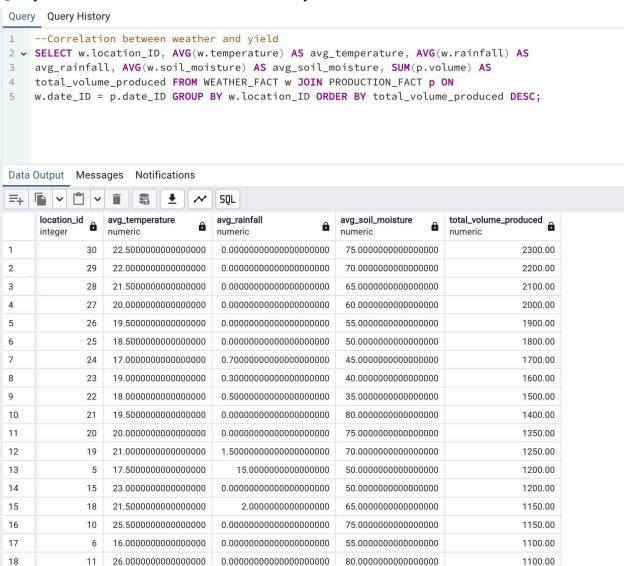
SQL

4 month ORDER BY month ASC;

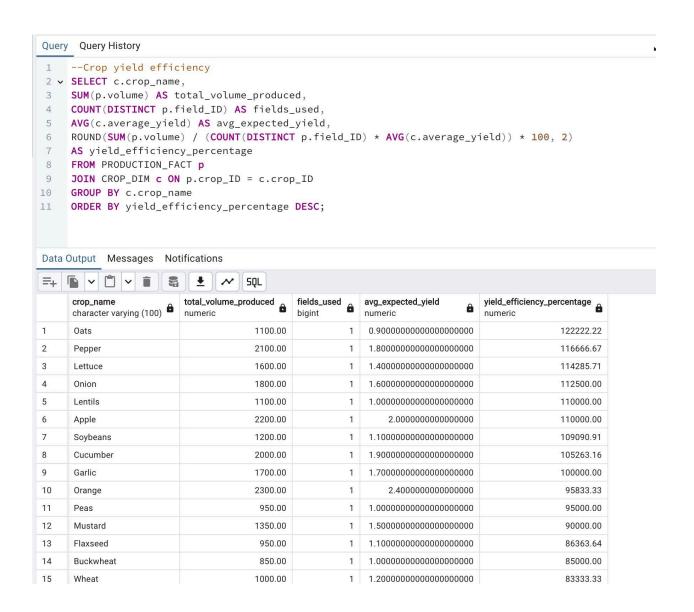
Data Output Messages Notifications



Query 10: Correlation between weather and yield



Query 11: Crop yield efficiency



Query 12: Identify Underperforming Locations

Query Query History 1 --Identify Underperforming Locations 2 v WITH AvgEfficiency AS (SELECT AVG(i.efficiency) AS avg_efficiency 3 FROM INPUT_USAGE_FACT i) 4 SELECT l.location_name, AVG(i.efficiency) AS location_efficiency FROM INPUT_USAGE_FACT i 5 JOIN LOCATION_DIM l ON i.field_ID IN (6 7 SELECT field_ID FROM FIELD_DIM WHERE location_ID = l.location_ID) 8 GROUP BY l.location_name 9 HAVING AVG(i.efficiency) < (SELECT avg_efficiency FROM AvgEfficiency)</pre> 10 ORDER BY location_efficiency ASC; Data Output Messages Notifications =+ **□** ∨ **□** ∨ **□** ₹ ~ SQL location_efficiency location_name character varying (255) numeric 1 Golden Wheat Farms 84.0000000000000000 2 West Meadows 85.00000000000000000 3 Pine Hill Orchards 85.0000000000000000 4 Mountain View Fields 86.0000000000000000 5 Harvest Moon Fields 86.0000000000000000 6 River Bend Farms 87.00000000000000000 7 Misty Meadows 87.00000000000000000 8 Springfield Acres 87.00000000000000000 9 Clearwater Farms 88.00000000000000000 10 Autumn Wind Farm 88.00000000000000000 88.0000000000000000 11 South Orchard

12

13

14

Starlight Plantation

Green Valley Lands

Sunny Slopes

89.0000000000000000

Query 13: Seasonal Analysis of Crop Production

