A Course based Project Report

On

AGRICULTURAL MANAGEMENT SYSTEM

Submitted in partial fulfilment of requirement for the completion of the

Database Management Systems Laboratory course.

B.Tech Computer Science and Engineering

By

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B.Tech Computer Science Engineering

Under the Guidance of

Dr. Madhu Bala Myneni

CSE Department

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING & TECHNOLOGY

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CERTIFICATE

This is to certify that the project entitled **"Agriculture Management System"** submitted in partial fulfilment for the course of Database Management Systems Laboratory being offered for the award of B.Tech (CSE-B) by VNR VJIET is a result of the bonafide work carried out by 22071A05A4, 22071A05B0, 22071A05B9, 22071A05C8 during the year **2023-2024**. This has not been submitted for any other certificate or course.

Signature of Faculty **Signature of Head of the Department**

ACKNOWLEDGEMENT

An endeavor over a long period can be successful only with the advice and support of many well wishers. We take this opportunity to express our gratitude and appreciation to all of them.

We wish to express our profound gratitude to our honorable **Principal and HOD, CSE** department**, VNR Vignana Jyothi Institute of Engineering and Technology** for their constant and dedicated support towards our career moulding and development.

With a great pleasure we express our gratitude to the internal guide **Dr. Madhu Bala Myneni, Professor, CSE department** for her timely help, constant guidance, cooperation, support and encouragement throughout this project as it has urged us to explore many new things.

Finally, we wish to express my deep sense of gratitude and sincere thanks to our parents, friends and all our well wishers who have technically and non-technically contributed for the successful completion of this course based project.

DECLARATION

We hereby declare that this Project Report titled **"Agriculture Managemnet System"** submitted by us of Computer Science & Engineering in **VNR Vignana Jyothi Institute of Engineering and Technology,** is a bonafide work under taken by us and it is not submitted for any other certificate /Course or published any time before.

Signature of the Student Date:

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ABSTRACT

Crop weather regions play a crucial role in determining agricultural outcomes, as specific climates influence crop growth and yield. These regions are characterized by distinct weather patterns, such as temperature, precipitation, and sunlight, affecting the choice of crops that can be cultivated successfully. Additionally, the price database associated with crop weather regions is essential for farmers and stakeholders in the agricultural sector. It provides valuable insights into market trends, price fluctuations, and supply-demand dynamics, enabling informed decision-making. Access to accurate and up-to-date price information helps farmers plan their cultivation strategies and optimize their economic returns, fostering a more resilient and efficient agricultural sector.

INTRODUCTION

Our Agricultural data outlines the following key schemas. Overview and description will be given below-

Region Table:

- Pincode: Unique identifier for the region.
- Village: Name of the village in the region.
- District: Geographic district of the region.
- State: State to which the region belongs.
- Region_Type: Type of region (e.g., rural, urban).
- Water_Resource: Source of water for agricultural activities.
- Agriculture_Land_in_Acres: Size of agricultural land in acres.

Weather Table:

- Village: Name of the village corresponding to weather data.
- AvgTemperature: Average temperature in the village.
- AvgHumidity: Average humidity in the village.
- AvgPrecipitation: Average precipitation in the village.

Crop Table:

- Crop: Name of the crop.
- Season: Growing season for the crop.
- Duration: Time taken for the crop to mature.
- Type: Type of crop (e.g., cereal, legume).
- Water_Required: Water needs for the crop.
- Fertilizer: Type of fertilizer recommended for the crop.

Price Table:

- Crop: Name of the crop associated with pricing data.
- InitialCostPrice: Initial cost incurred for cultivating the crop.
- SellingPrice: Price at which the crop is sold.
- Profit: Calculated profit or loss (negative value for loss).

Pesticide Table:

- Pesticide_ID: Unique identifier for pesticides.
- Crop_Name: Name of the crop associated with the pesticide.
- Name: Name of the pesticide.
- Effectiveness: Effectiveness rating of the pesticide.
- Cost_Per_Acre: Cost of the pesticide per acre.

This schema provides a foundation for organizing and analyzing diverse agricultural information, facilitating decision-making for farmers and stakeholders in the agricultural sector. It covers essential aspects such as geographic details, weather conditions, crop characteristics, pricing, and pest control measures.

The designed agricultural database can serve as a foundation for various applications in the field of agriculture. Here are some potential applications:

1. Crop Management System:

- Utilize the database to track information about different crops, their seasonal characteristics, required soil types, water and fertilizer needs, and suitable pesticides. This can help farmers plan their crop rotations and optimize yield.

2. Weather Analysis Tool:

- Connect the weather data to the database, allowing for the analysis of climate patterns and trends. Farmers can make informed decisions based on historical weather data, helping them adapt to changing weather conditions.

3. Profitability Analysis Tool:

- Use the database to calculate and analyze the profitability of different crops. By integrating cost and selling price data, farmers can assess the financial viability of their agricultural practices and make adjustments for better returns.

4. Pesticide Recommendation System:

- Employ the pesticide table to recommend suitable pesticides based on the type of crop and prevailing pests. This can assist farmers in managing crop health effectively while minimizing environmental impact.

5. Supply Chain Management:

- Integrate the database with supply chain management systems to optimize the distribution of agricultural products. This can include tracking the availability of crops in different regions, managing inventory, and coordinating transportation.

6. Government Agricultural Policy Analysis:

- Governments can use the database to analyze agricultural trends and formulate policies. Understanding crop yields, weather patterns, and pricing data can help policymakers make informed decisions to support the agricultural sector.

7. **Research and Development:**

- Researchers can use the database to access a comprehensive set of agricultural data for various studies. This can include analyzing the impact of different factors on crop yields, studying regional variations, and developing new agricultural techniques.

8. Educational Tools:

- Develop educational applications for farmers and agricultural students. These tools can use the database to provide insights into best practices, crop management strategies, and the impact of external factors on agriculture.

9. IoT Integration for Precision Agriculture:

- Combine the database with IoT (Internet of Things) devices to collect real-time data from sensors in the field. This integration can provide farmers with up-to-date information on soil moisture, temperature, and other relevant parameters.

10. Marketplace for Agricultural Products:

- Create an online platform where farmers can showcase their products. The database can be used to manage product listings, prices, and regional availability, facilitating trade between farmers and consumers.

These applications leverage the agricultural database to enhance decision-making, optimize resource utilization, and support various stakeholders in the agricultural ecosystem. The flexibility of the database design allows for scalability and adaptation to evolving agricultural needs.

DATABASE SCHEMA:

Requirements Gathering:

Understand the requirements of the system or application that will use the database. Talk to stakeholders, end-users, and subject matter experts to identify the necessary data and functionalities.

Conceptual Design:

Create an Entity-Relationship Diagram (ERD) to represent the high-level structure of the database. Identify entities, relationships, and attributes. In your case, entities could be regions, weather, crops, prices, and pesticides.

Normalization:

Normalize the tables to eliminate redundancy and ensure data integrity. Apply normalization rules to break down tables into smaller, related tables. This helps in reducing data duplication and anomalies**.**

Define Primary Keys:

Identify primary keys for each table. Primary keys uniquely identify each record in a table. For example, you might use the pincode as the primary key in the Region table.

Define Foreign Keys:

Establish relationships between tables using foreign keys. For instance, you can use the village field in the Weather table as a foreign key linked to the village field in the Region table.

Refine Attributes:

Refine the attributes for each table. Ensure that each field (attribute) contains atomic and relevant information. Remove any unnecessary or redundant fields.

Data Types and Constraints:

Define appropriate data types for each attribute. Specify constraints such as NOT NULL, UNIQUE, and CHECK to ensure data integrity and consistency.

Review and Iterate:

Review the database design with stakeholders, developers, or database administrators. Incorporate feedback and make necessary adjustments. Iterate through the design process as needed**.**

Implement the Database:

Use a database management system (MySQL) to implement the database. Create tables,

define relationships, and set up any necessary constraints.

Data Population:

Populate the tables with sample or real data. This helps in testing and validating the database schema and functionality.

Testing:

Conduct thorough testing to ensure the database functions as expected. Test various scenarios, including data retrieval, updates, and deletions**.**

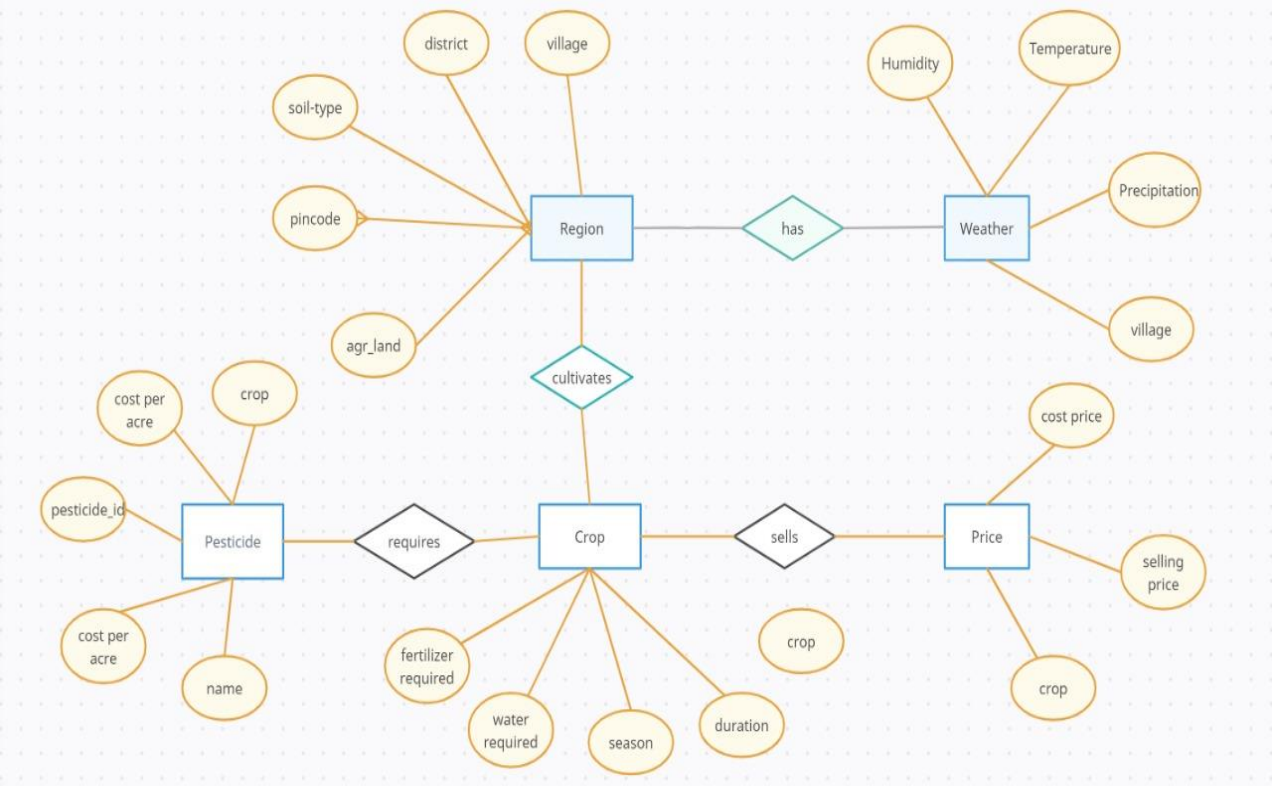
Documentation:

Document the database schema, relationships, constraints, and any other relevant information. This documentation will be valuable for future maintenance and understanding of the database structure.

Maintenance and Optimization:

Regularly monitor and optimize the database for performance. Make adjustments as needed based on usage patterns and evolving requirements.

ER DIAGRAM


district
village
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Region
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Weather
Humidity
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Precipitation
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cost per acre
crop
pesticide_id
Pesticide
requires
Crop
sells
Price
cost price
selling price
cost per acre
name
fertilizer required
water required
season
duration
crop
crop

IMPLEMENTATION AND RESULTS

Creation Of Tables:

1. Region Table:

```
CREATE TABLE Region (
    pincode INT primary key,
    village VARCHAR(50),
    district VARCHAR(50),
    state VARCHAR(50),
    soil_type VARCHAR(20),
    agr_land_acres int
);
```

2.Weather Table:

```
CREATE TABLE Weather (
    village VARCHAR(50) primary key,
    avg_temperature DECIMAL(4,1),
    avg_humidity INT,
    avg_precipitation decimal(3,1)
);
```

3. Crop Table:

```
CREATE TABLE Crop (
  crop VARCHAR(255),
  season VARCHAR(255),
  duration INT,
  water_requirement VARCHAR(255),
  soil_type VARCHAR(255),
  fertilizer_required varchar(255)
);
```

4. Price Table:

```
 CREATE TABLE Price (
  crop VARCHAR(255),
  selling_price DECIMAL(5,2),
  profit decimal(5,2)
```

);

5. Pesticide Table

```
CREATE TABLE Pesticides (
pesticide_id INT primary key,
crop_name VARCHAR(255),
name VARCHAR(255),
effectiveness VARCHAR(255),
cost_per_acre decimal(6,2)
);
```

Inserting Data Into Tables:

1.Region Table:

```
INSERT INTO Region (pincode, village, district, state, soil_type, agricultural_land)
VALUES
    (110001, 'Model Town', 'North Delhi', 'Delhi', 'Loamy Soil', 500),
    (400001, 'Colaba', 'Mumbai', 'Maharashtra', 'Sandy Soil', 700),
    (560001, 'MG Road', 'Bangalore', 'Karnataka', 'Clay Soil', 1000),
    (700001, 'Esplanade', 'Kolkata', 'West Bengal', 'Sandy Soil', 800),
    (600001, 'Parrys Corner', 'Chennai', 'Tamil Nadu', 'Red Soil', 600),
    (110021, 'Hauz Khas', 'South Delhi', 'Delhi', 'Loamy Soil', 450),
    (201301, 'Noida', 'Gautam Buddha', 'Uttar Pradesh', 'Sandy Soil', 900),
    (110058, 'Janakpuri', 'West Delhi', 'Delhi', 'Clay Soil', 550),
    (411001, 'Pune City', 'Pune', 'Maharashtra', 'Red Soil', 1200),
    (500001, 'Abids', 'Hyderabad', 'Telangana', 'Sandy Soil', 800),
    (380001, 'Lal Darwaja', 'Ahmedabad', 'Gujarat', 'Loamy Soil', 1000),
    (110070, 'Vasant Vihar', 'South Delhi', 'Delhi', 'Red Soil', 700),
    (600018, 'T. Nagar', 'Chennai', 'Tamil Nadu', 'Clay Soil', 600),
    (110085, 'Rohini', 'North Delhi', 'Delhi', 'Sandy Soil', 550),
    (411014, 'Kothrud', 'Pune', 'Maharashtra', 'Loamy Soil', 1000);
```

2.Weather Table:

```
INSERT INTO Weather (village, avg_temperature, avg_humidity, avg_precipitation)
VALUES
```

('Model Town', 25.0, 60, 0.5),

('Colaba', 28.5, 70, 2.0),

('MG Road', 27.2, 65, 1.0),

('Esplanade', 30.0, 75, 1.5),

('Parrys Corner', 29.8, 68, 0.8),

('Hauz Khas', 26.5, 72, 0.2),

('Noida', 32.0, 78, 3.0),

('Janakpuri', 27.7, 74, 0.5),

('Pune City', 28.0, 68, 0.2),

('Abids', 30.5, 76, 1.0),

('Lal Darwaja', 31.2, 78, 2.5),

('Vasant Vihar', 26.0, 62, 0.0),

('T. Nagar', 29.8, 72, 1.2),

('Rohini', 27.3, 70, 0.3),

('Kothrud', 28.7, 73, 0.7);

3.Crops Table:

INSERT INTO Crop (crop, season, duration, water_requirement, soil_type, fertilizer_required)

VALUES

('Rice', 'Kharif', 150, 'High', 'Loamy Soil', 'Nitrogen'),

('Wheat', 'Rabi', 120, 'Moderate', 'Sandy Soil', 'Nitrogen'),

('Maize', 'Kharif', 100, 'Moderate', 'Clay Soil', 'Nitrogen'),

('Cotton', 'Kharif', 180, 'High', 'Sandy Soil', 'Nitrogen'),

('Sugarcane', 'Rabi', 360, 'Very High', 'Loamy Soil', 'Nitrogen'),

('Barley', 'Rabi', 90, 'Moderate', 'Sandy Soil', 'Nitrogen'),

('Sunflower', 'Kharif', 100, 'Moderate', 'Clay Soil', 'Nitrogen'),

('Pulses (Lentil)', 'Rabi', 120, 'Moderate', 'Loamy Soil', 'Nitrogen'),

('Soybean', 'Kharif', 120, 'Moderate', 'Sandy Soil', 'Nitrogen'),

('Potato', 'Rabi', 120, 'High', 'Loamy Soil', 'Nitrogen'),

('Groundnut', 'Kharif', 140, 'Moderate', 'Sandy Soil', 'Nitrogen'),

('Tomatoes', 'All-year', 90, 'Moderate', 'Clay Soil', 'Nitrogen'),

('Cabbage', 'All-year', 120, 'Moderate', 'Loamy Soil', 'Nitrogen'),

('Banana', 'All-year', 360, 'Very High', 'Sandy Soil', 'Nitrogen'),

('Grapes', 'All-year', 150, 'Moderate', 'Clay Soil', 'Nitrogen');

4.Price Table:

```
INSERT INTO Price (crop, selling_price, profit)
VALUES
 ('Rice', 7.00, 2.00),
 ('Wheat', 6.50, 2.00),
 ('Maize', 5.20, 1.40),
 ('Cotton', 11.00, 3.00),
 ('Sugarcane', 3.50, 1.00),
 ('Barley', 7.00, 1.80),
 ('Sunflower', 9.00, 2.50),
 ('Pulses (Lentil)', 10.00, 3.00),
 ('Soybean', 8.00, 2.20),
 ('Potato', 9.50, 3.50),
 ('Groundnut', 7.00, 2.20),
 ('Tomatoes', 4.00, 1.50),
 ('Cabbage', 5.50, 1.70),
 ('Banana', 15.00, 5.00),
 ('Grapes', 13.50, 4.50);
```

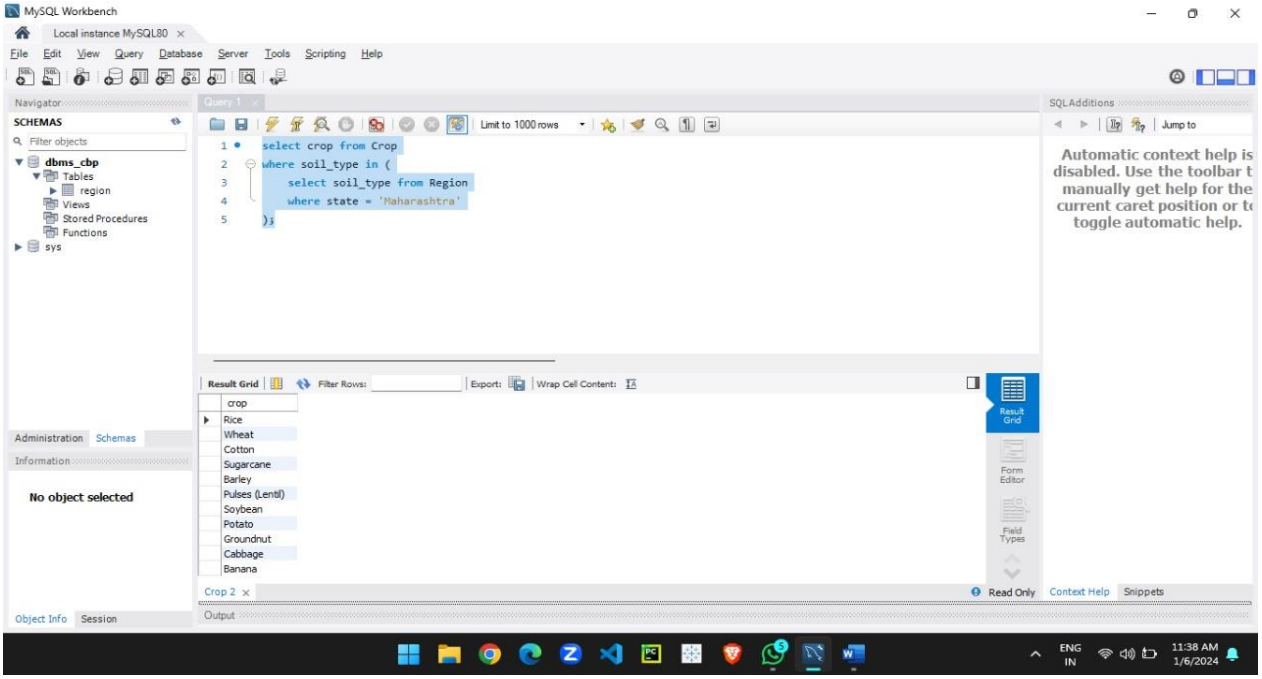
5.Pesticides Table:

```
INSERT INTO Pesticides (pesticide_id, crop_name, name, effectiveness, cost_per_acre)
VALUES
 (1, 'Rice', 'InsectAway', 'High', 500.00),
 (2, 'Wheat', 'FungoGuard', 'Moderate', 350.00),
 (3, 'Maize', 'WeedMaster', 'High', 200.00),
 (4, 'Cotton', 'AphidControl', 'High', 450.00),
 (5, 'Sugarcane', 'NematodeGuard', 'Moderate', 300.00),
 (6, 'Barley', 'RustShield', 'High', 400.00),
 (7, 'Pulses (Lentil)', 'LeafSpot Terminator', 'Moderate', 300.00),
 (8, 'Sunflower', 'MosquitoRepellent', 'Low', 150.00),
 (9, 'Soybean', 'Herbex', 'High', 350.00),
 (10, 'Potato', 'WhiteflyEliminator', 'High', 250.00);
```

Queries:

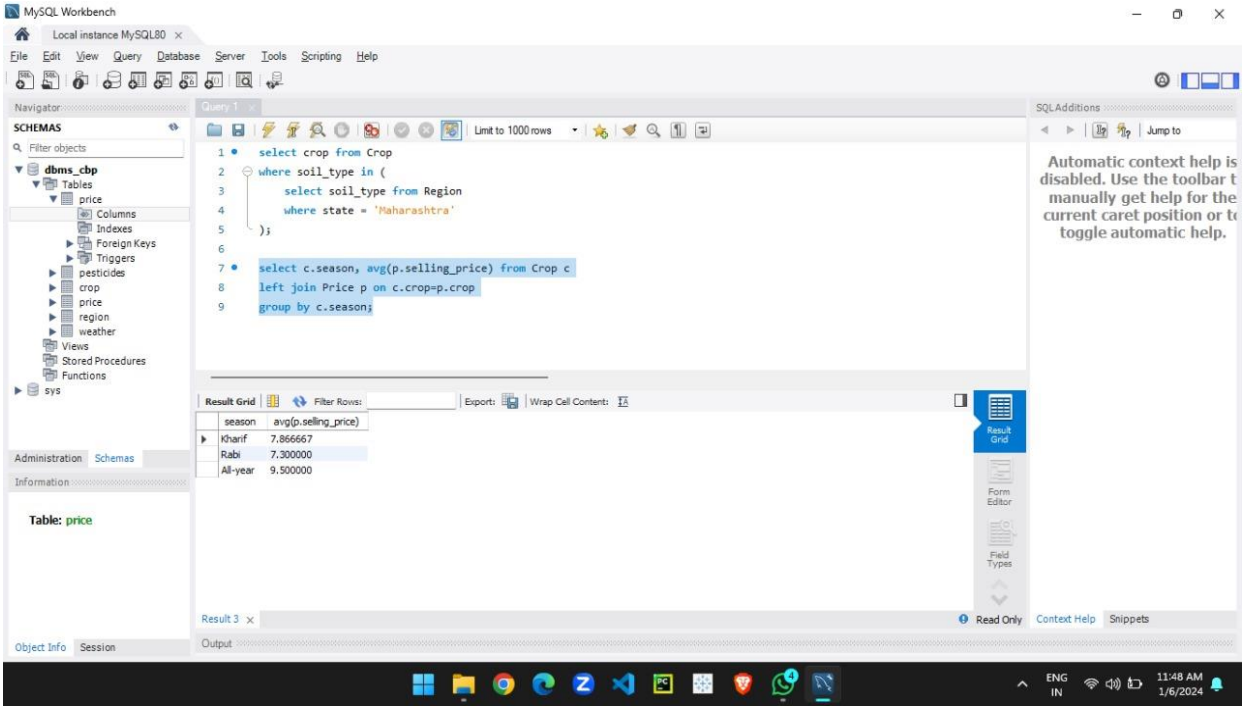
1. **Which crops are suitable to grow in the land of Maharashtra?**

```
select crop from Crop
where soil_type in (
        select soil_type from Region
    where state = 'Maharashtra');
```



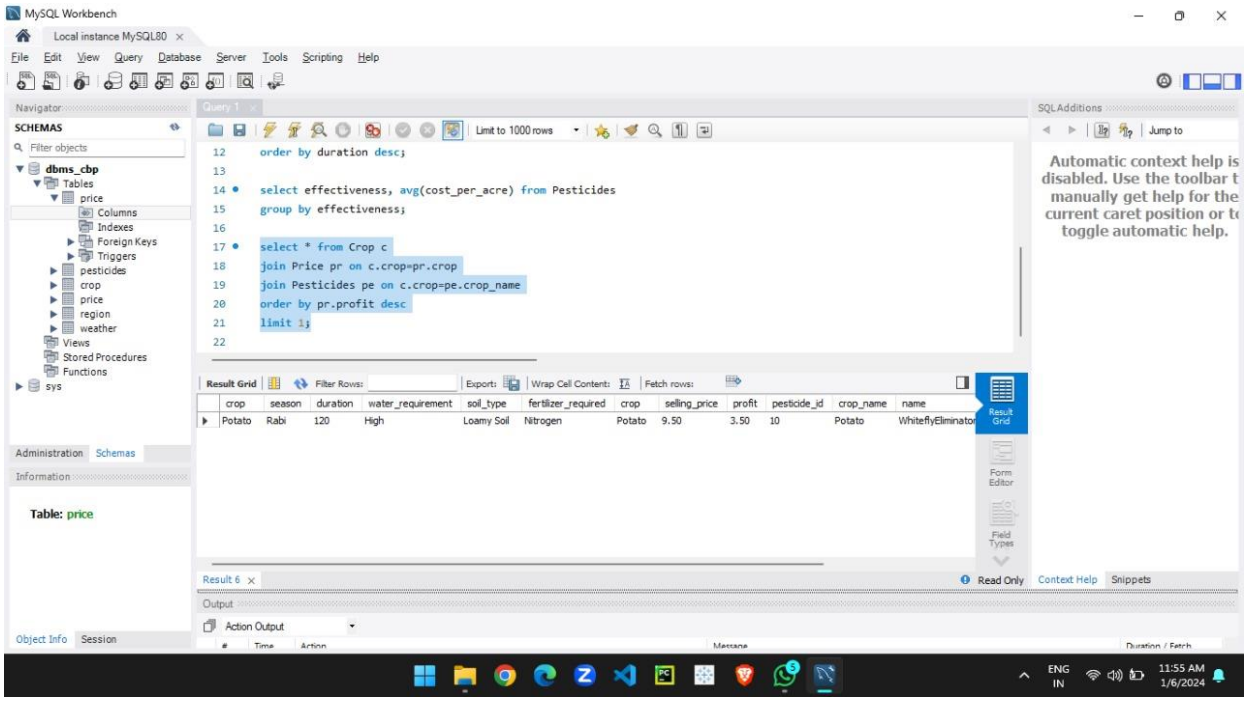
2. **What is the average selling price of crops based on the season they grow?**

```
select c.season, avg(p.selling_price) from Crop c
left join Price p on c.crop=p.crop
group by c.season;
```



3.List out the Pesticide and crop details which gives highest Profit

```
select * from Crop c
join Price pr on c.crop=pr.crop
join Pesticide pe on c.crop=pe.crop
order by pr.profit desc
limit 1;
```

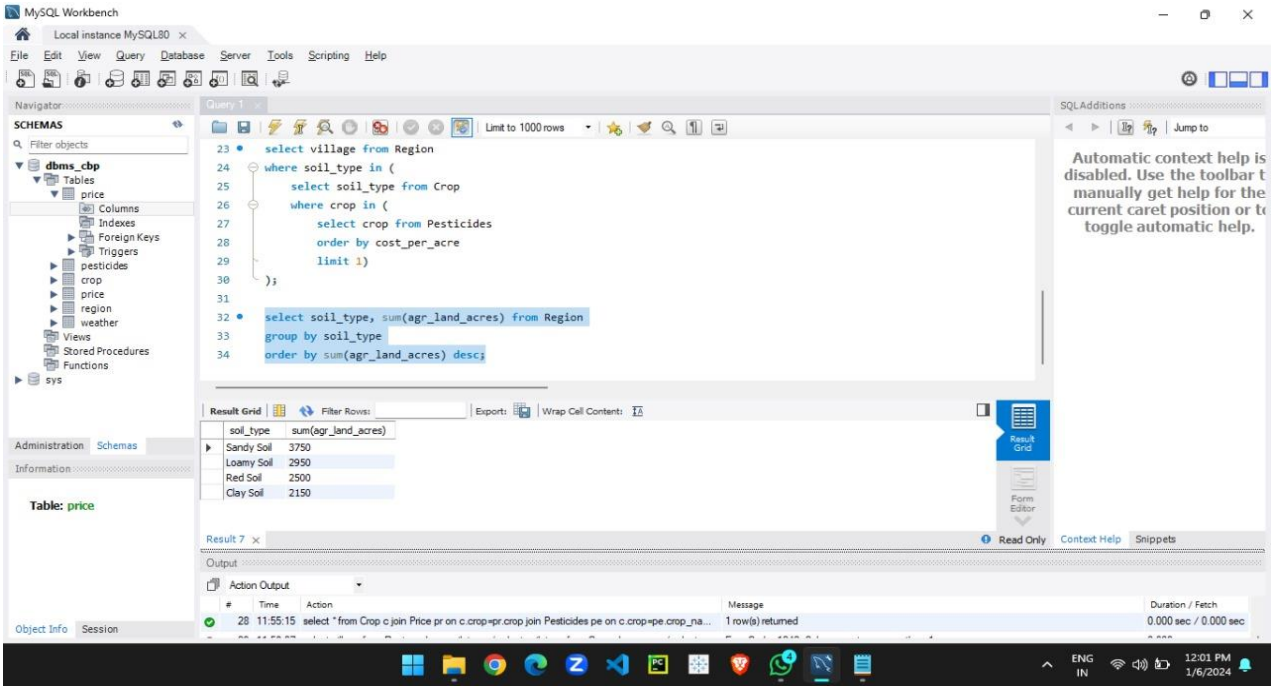


4.List out the village , Avg Temp , Avg humidity,, Precipitation details which one takes the lowest cost per acre?

```
select village from Region
where soil_type=(
select soil_type from Crop
where crop=(
select crop from Pesticide
order by cost_per_acre
limit 1)
);
```

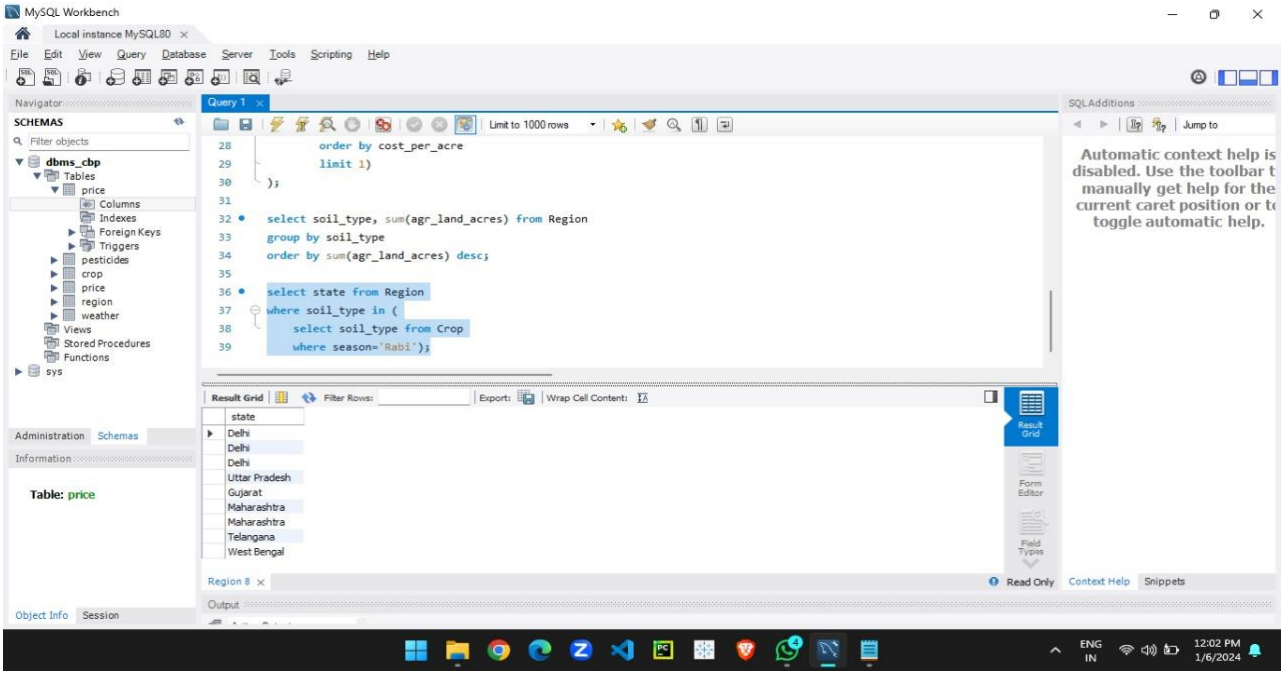
5.How much acres of agricultural land is there for each of soil type?

```
select soil_type, sum(agr_land_acres) from Region
group by soil_type
order by sum(agr_land_acres) desc;
```



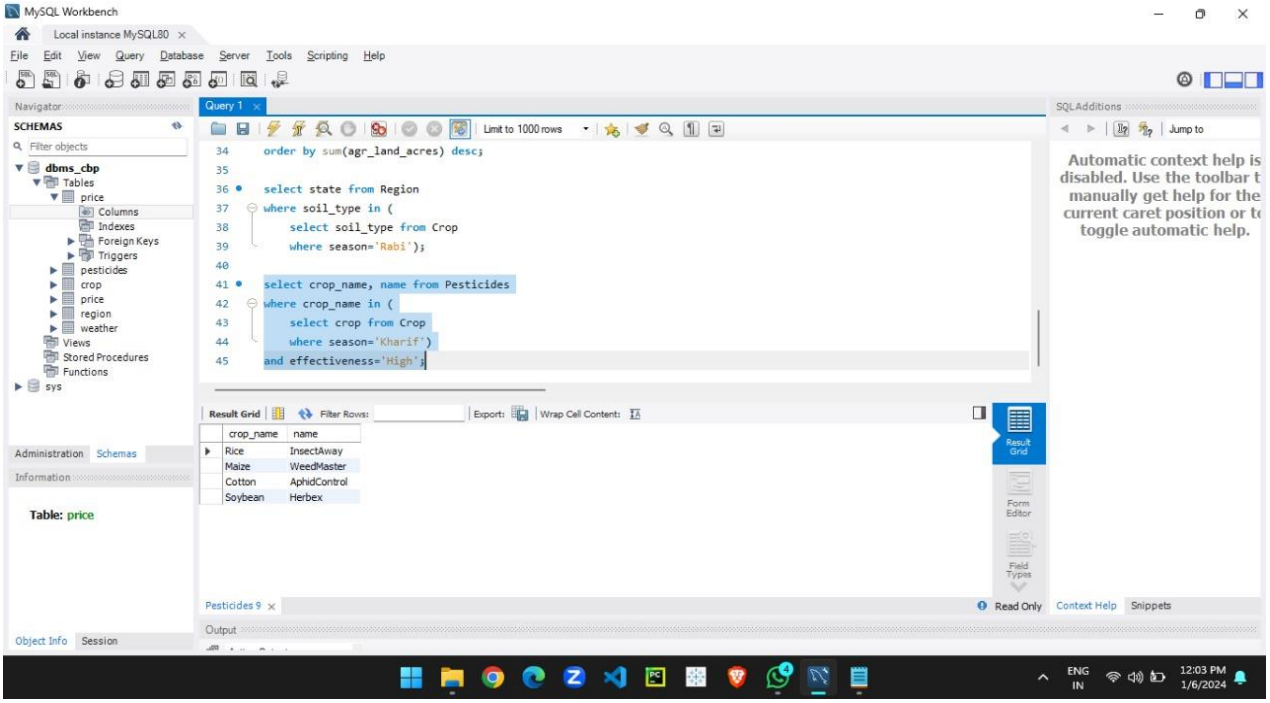
6. Name the states which crops are grown in rabi?

```
select state from Region
where soil_type=(
select soil_type from Crop
where season='Rabi');
```



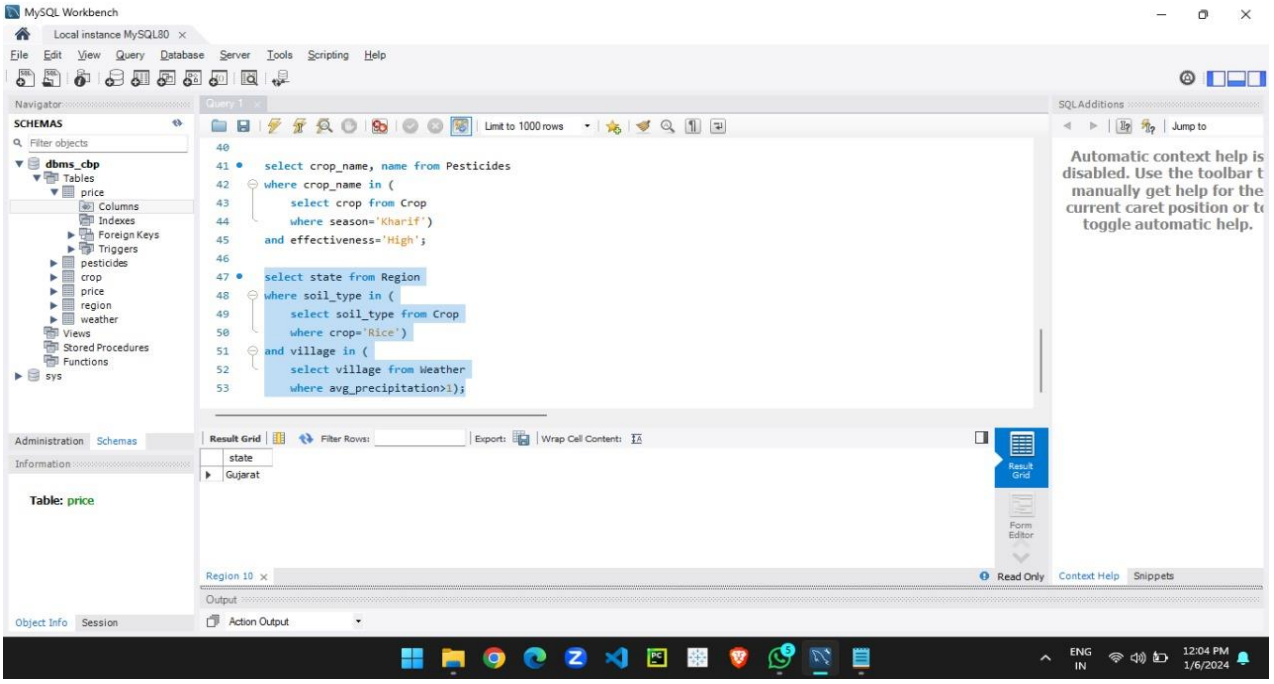
7.list the pesticides used for the kharif crops which are very effective?

```
select crop_name, name from Pesticide
where crop_name=(
select crop from Crop
where season='Kharif')
and effectiveness='High';
```



8.In which states can rice be grown

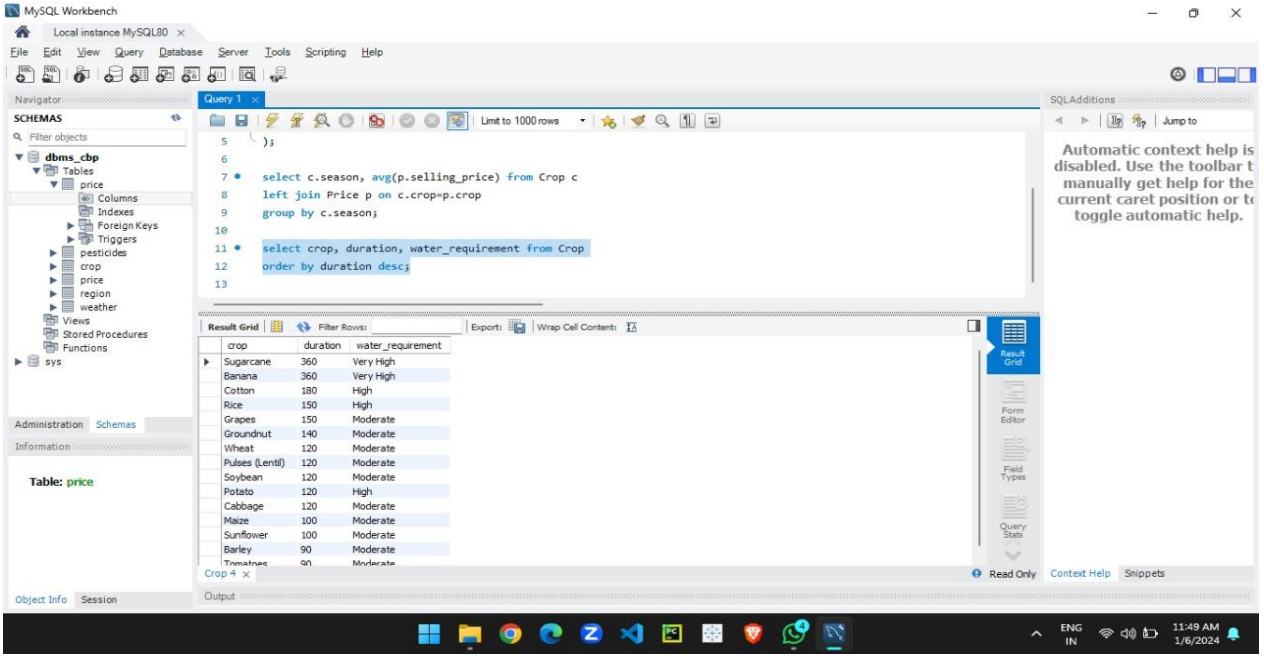
```
select state from Region
where soil_type=(
select soil_type from Crop
where crop='Rice')
and village=(
select village from Weather
where avgPrecipitation>1);
```



9.Sort the crops based on duration of harvest.

select crop, duration, water_requirement from Crop

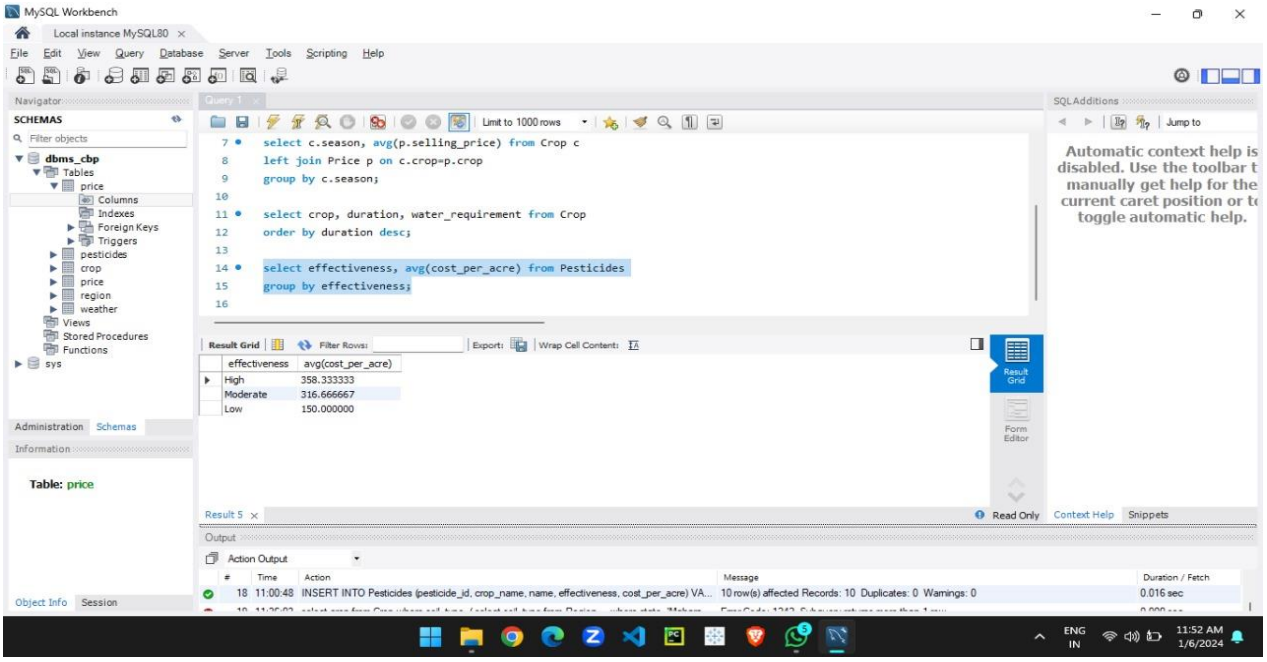
order by duration desc;



10.What is the average cost of pesticides in each effective range

select name, effectiveness, avg(cost_per_acre) from Pesticide

group by effectiveness;



CONCLUSION

In conclusion, our agricultural management system offers a comprehensive solution for farmers and stakeholders in the agricultural sector. The database schema captures essential information about regions, weather conditions, crops, pricing, and pesticides, facilitating efficient decision-making processes for sustainable and profitable farming.

The Region table provides a foundation by detailing crucial aspects such as pincode, village, district, state, soil type, and agricultural land acres. The Weather table complements this by recording weather data, enabling farmers to make informed decisions based on average temperature, humidity, and precipitation specific to their village.

Crop details, including crop name, season, duration, soil type, water requirements, and fertilizer needs, are stored in the Crop table. This information aids farmers in selecting suitable crops based on their region's characteristics. The Price table tracks the financial aspects, capturing initial cost prices, selling prices, and profit margins for each crop.

REFERENCES

- https://data.world/oecd/crop-production
- https://www.kaggle.com/datasets/thammuio/all-agriculture-related-datasets-for-india

SOURCE CODE

https://github.com/Meghana-Thumu/DBMS-CBP