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# DBMS Lab Assignment

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## Question

The FreshFarm chain of organic markets has offered to give you a free lifetime supply of fresh produce if you design its database. Given the rising cost of food, you agree. Here's the information you gather:

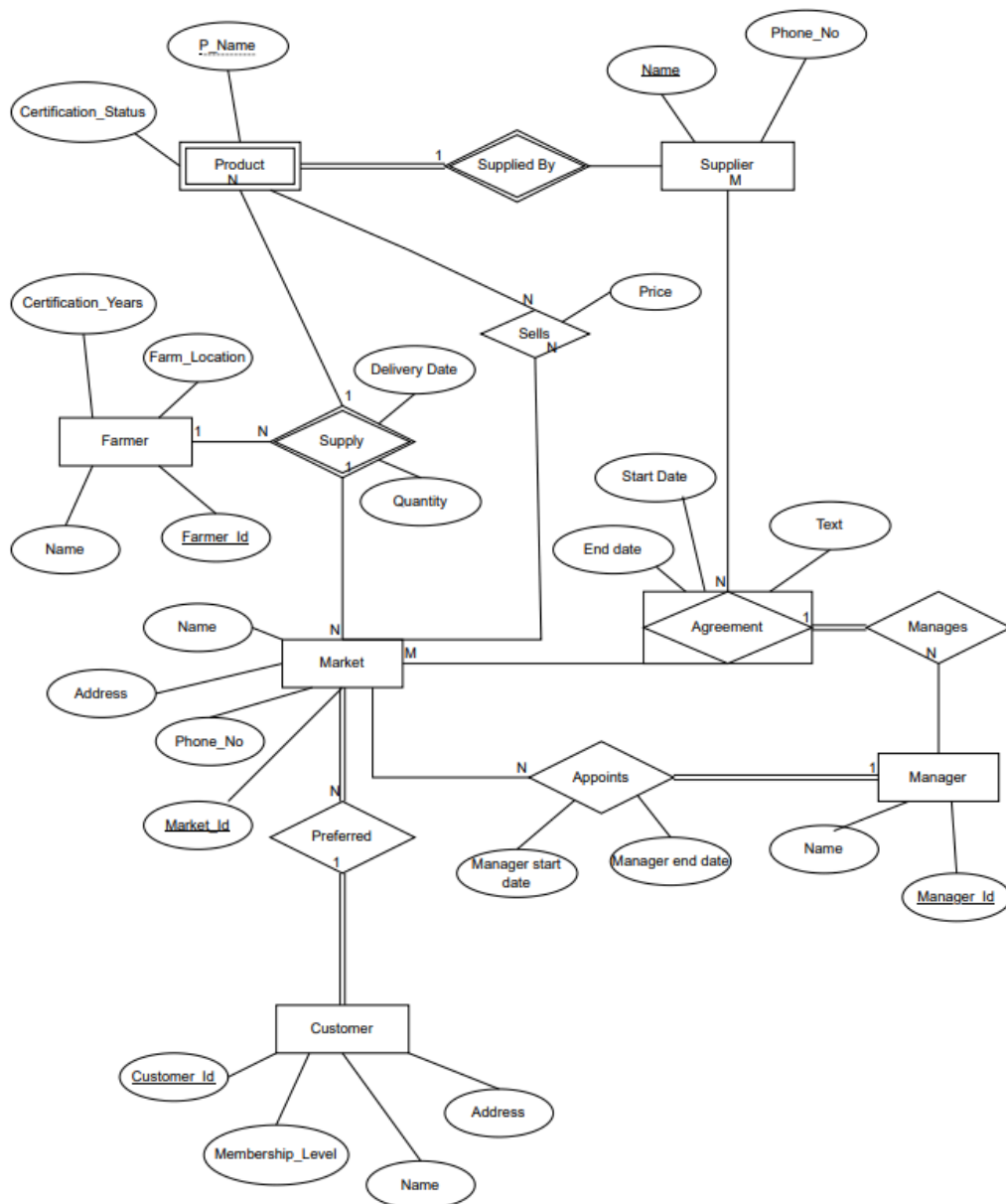
- Customers are identified by a customer ID, and their names, addresses, and membership levels must be recorded.
- Farmers are identified by a farmer ID. For each farmer, their name, farm location, and years of organic certification must be recorded.
- Each supplier is identified by name and has a phone number.
- For each product, the product name and organic certification status must be recorded.
- Each product is supplied by a given supplier, and the product name identifies a product uniquely from among the products of that supplier. If a supplier is deleted, you need not keep track of its products any longer.
- Each market has a name, address, and phone number.
- Every customer has a preferred market. Every market has at least one customer.
- Each market sells several products and has a price for each. A product could be sold at several markets, and the price could vary from one market to another.
- Farmers supply products to markets. A farmer could supply one or more products to several markets, and a market could obtain supplies from several farmers. Each supply has a delivery date and quantity associated with it. You can assume that, if a farmer supplies the same product to the same market more than once, only the last such supply needs to be stored.
- Suppliers have long-term agreements with markets. A supplier can have agreements with several markets, and a market can have agreements with several suppliers. For each agreement, you have to store a start date, an end date, and the text of the agreement.
- Markets appoint a manager for each agreement. There must always be a manager for each agreement, but the manager can change over the lifetime of the agreement.

Draw an ER diagram that captures the preceding information.

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## ER Diagram

Link - [ER.drawio](#)



Explanations and assumptions -

## Entities and Attributes

### 1. Customer

- **Attributes:** CustomerID (Primary Key), Name, Address, MembershipLevel.
- **Primary Key:** CustomerID uniquely identifies each customer.

### 2. Farmer

- **Attributes:** FarmerID (Primary Key), Name, FarmLocation, YearsOfCertification.
- **Primary Key:** FarmerID uniquely identifies each farmer.

### 3. Supplier

- **Attributes:** SupplierName (Primary Key), PhoneNumber.
- **Primary Key:** SupplierName uniquely identifies each supplier.

### 4. Product

- **Attributes:** ProductName, OrganicCertificationStatus, SupplierName (Foreign Key).
- **Primary Key:** Composite key of ProductName and SupplierName to ensure uniqueness of a product within each supplier context.
- **Foreign Key:** SupplierName references Supplier.

### 5. Market

- **Attributes:** MarketID (Primary Key), Name, Address, PhoneNumber.
- **Primary Key:** MarketID uniquely identifies each market.

### 6. Manager

- **Attributes:** ManagerID (Primary Key), Name. - **Added**
- **Primary Key:** ManagerID uniquely identifies each manager.

## Relationships and Cardinalities

### 1. Customer - Preferred Market

- **Relationship:** Preferred
- **Cardinality:** 1  
(One market can be preferred by many customers; each customer has exactly one preferred market).

### 2. Market - Sells - Product

- **Relationship:** Sells
- **Cardinality:** M  
(A market sells multiple products; each product can be sold at multiple markets).
- **Attributes:** Price (specific to each market-product combination).

### 3. Farmer - Supplies - Product - To - Market

- **Relationship:** Supply

- **Cardinality:** M  
(A farmer supplies multiple products to multiple markets; a market receives supplies from multiple farmers).
- **Attributes:** DeliveryDate, Quantity.
- 4. **Supplier - Long-Term Agreement - Market**
  - **Relationship:** Agreement
  - **Cardinality:** M  
(A supplier can have multiple agreements with markets; each market can have agreements with multiple suppliers).
  - **Attributes:** StartDate, EndDate, Text.
- 5. **Manager - Manages - Agreement**
  - **Relationship:** Manages
  - **Cardinality:** 1  
(One manager can manage multiple agreements; each agreement is managed by exactly one manager).
  - **Attributes:** ManagerStartDate, ManagerEndDate - **Added**

## Associative Relationships

1. **Market - Sells - Product**
  - **Associative Entity:** Sells
  - **Attributes:** Price
  - **Explanation:** The Sells relationship is an associative entity that manages the many-to-many relationship between Market and Product, with an additional attribute (Price) to capture the price at which each product is sold at each market.
2. **Farmer - Supplies - Product - To - Market**
  - **Associative Entity:** Supply
  - **Attributes:** DeliveryDate, Quantity
  - **Explanation:** The Supply relationship is an associative entity that represents the many-to-many relationship between Farmer, Product, and Market, with additional attributes to record the details of each supply instance.
3. **Manager - Manages - Agreement**
  - **Associative Entity:** Manages
  - **Attributes:** ManagerStartDate, ManagerEndDate
  - **Explanation:** The Manages relationship is an associative entity that links Manager to Agreement, capturing the time period during which a manager is responsible for the agreement.
4. **Market - appoints - Manager**
  - **Associative Entity:** Appoints

- **Explanation:** The **Appoints** relationship is an associative entity that links **Market** to **Manager**, and there is always one manager for each agreement, but the manager can change over the lifetime of the agreement.

## Weak Entity and Identifying Relationships

### 1. Product (Weak Entity)

- **Identifying Relationship:** **SuppliedBy**
- **Explanation:** **Product** is a weak entity because it does not have a unique identifier on its own. It relies on its **Supplier** to establish its identity. The composite primary key of **ProductName** and **SupplierName** ensures that **Product** is uniquely identified in the context of a specific **Supplier**.
- **Cardinality:** Each **Product** is supplied by exactly one **Supplier**, but a **Supplier** can supply multiple products.
- **Identifying Relationship:** **SuppliedBy** connects **Product** to **Supplier**, indicating that the product's existence and identity are dependent on the supplier.

### 2. Supply

- **Identifying Relationship:** The **Supply** relationship is also an identifying relationship. The primary key of the **Supply** associative entity includes **FarmerID**, **ProductName**, and **MarketID**, which identifies each supply record uniquely in the context of the farmer, product, and market combination.

## Keys Information -

### 1. Customer

- **Primary Key (PK):** **CustomerID**
  - **Reason:** The **CustomerID** is unique to each customer and serves as a unique identifier for customer records.
- **Foreign Key (FK):** **MarketID** (in the **PreferredMarket** relationship)
  - **Reason:** Establishes a connection between the customer and their preferred market.

### 2. Farmer

- **Primary Key (PK):** **FarmerID**
  - **Reason:** The **FarmerID** uniquely identifies each farmer in the database.
- **Foreign Key (FK):** None directly, but involved in composite keys in associative entities.

### 3. Supplier

- **Primary Key (PK):** `SupplierName`
  - **Reason:** The `SupplierName` is unique for each supplier, allowing it to act as a unique identifier.
- **Foreign Key (FK):** None directly, but related through composite keys in relationships.

### 4. Product (Weak Entity)

- **Primary Key (PK):** `ProductName` + `SupplierName` (Composite Key)
  - **Reason:** `ProductName` uniquely identifies a product only within the context of a supplier, making the combination of `ProductName` and `SupplierName` the primary key.
- **Foreign Key (FK):** `SupplierName`
  - **Reason:** Links each product to its supplying entity, which is necessary since the product is a weak entity.

### 5. Market

- **Primary Key (PK):** `MarketID`
  - **Reason:** The `MarketID` uniquely identifies each market.
- **Foreign Key (FK):** None directly, but used in various relationships (e.g., `PreferredMarket`, `Supply`).

### 6. Manager

- **Primary Key (PK):** `ManagerID`
  - **Reason:** The `ManagerID` uniquely identifies each manager.
- **Foreign Key (FK):** None directly, but involved in the `Manages` relationship.

### 7. Supply (Associative Entity)

- **Primary Key (PK):** `FarmerID` + `ProductName` + `MarketID` (Composite Key)
  - **Reason:** The combination of `FarmerID`, `ProductName`, and `MarketID` uniquely identifies each supply record.
- **Foreign Key (FK):** `FarmerID`, `ProductName`, `MarketID`
  - **Reason:** Establishes the relationships between the `Farmer`, `Product`, and `Market` entities.

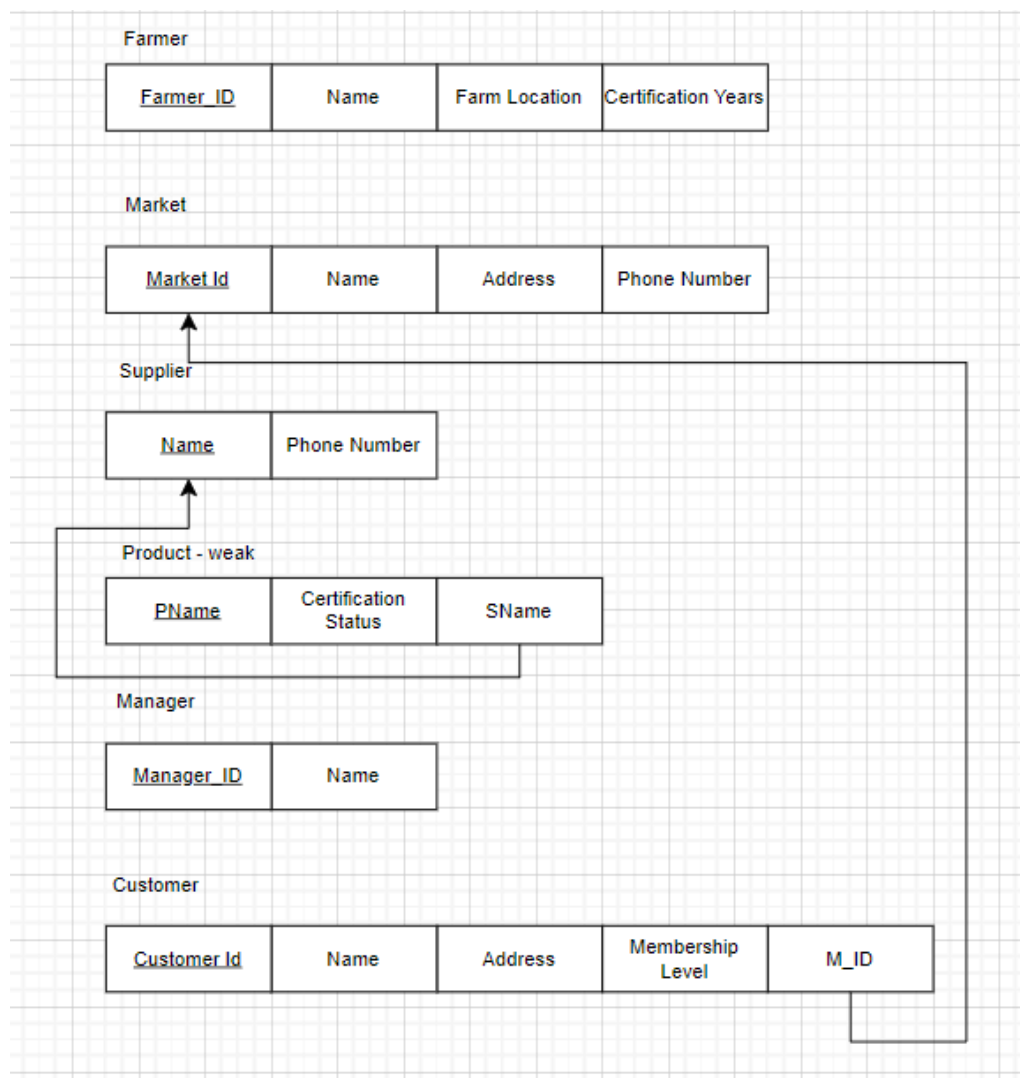
### 8. Manages (Associative Entity)

- **Primary Key (PK):** `ManagerID` + `AgreementID` (Composite Key)

- **Reason:** The combination of **ManagerID** and **AgreementID** uniquely identifies each management assignment.
- **Foreign Key (FK): ManagerID, AgreementID**
  - **Reason:** Establishes the relationship between the **Manager** and the **Agreement** they manage.

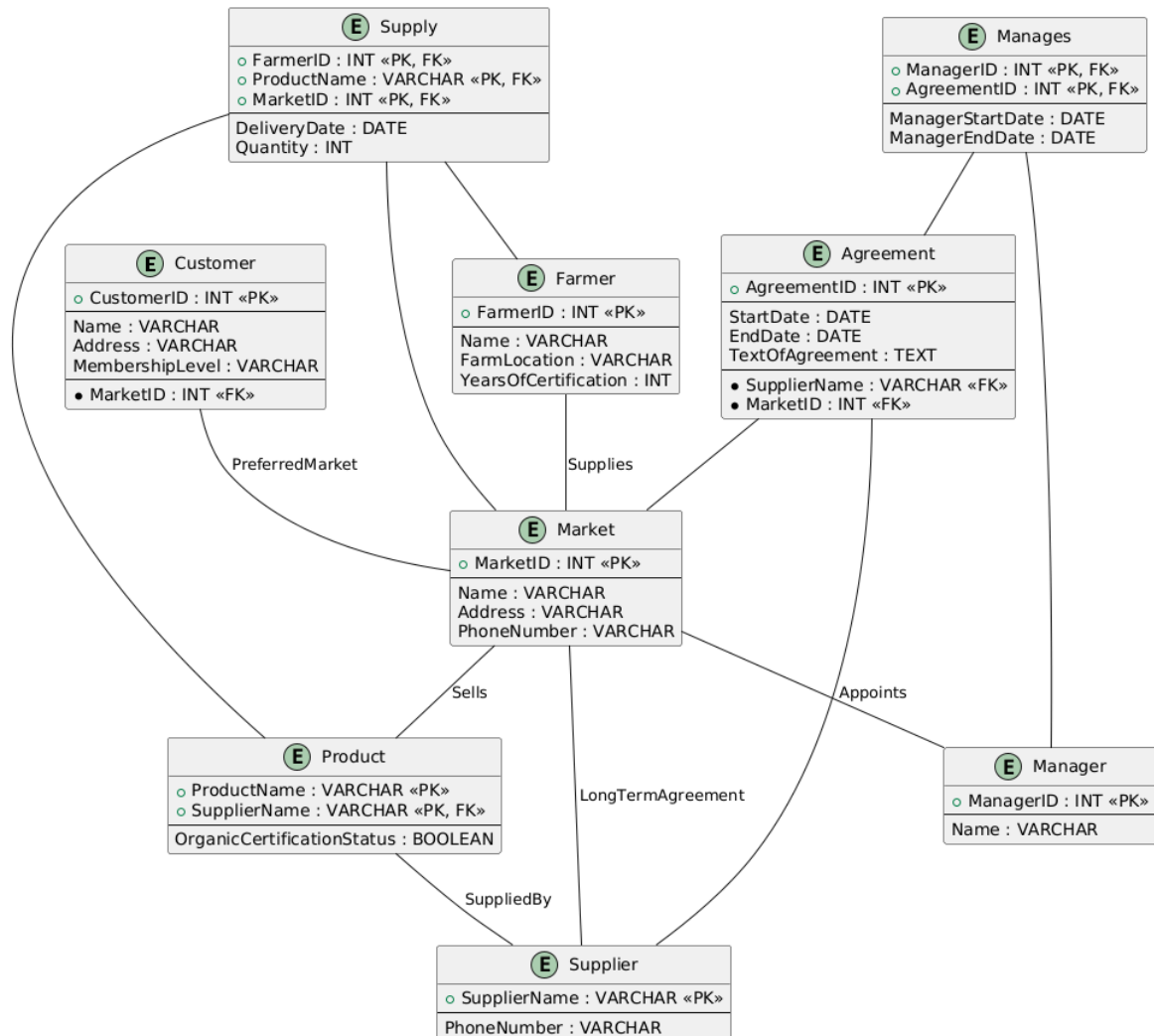
Schema -

Link - [Schema.drawio](#)



Elaborated Diagram -

(Created by Plant UML coding)



## Refined Database Schema -

### Entities and Attributes:

#### 1. Customer

- **customer\_id** (Primary Key)
- **name**
- **address**
- **membership\_level**
- **preferred\_market** (Foreign Key referencing Market)

#### 2. Farmer



- farmer\_id (Primary Key)
  - name
  - farm\_location
  - years\_of\_certification
3. Supplier
- supplier\_name (Primary Key)
  - phone\_number
4. Product
- product\_name (Primary Key)
  - organic\_status
  - supplier\_name (Foreign Key referencing Supplier)
5. Market
- market\_name (Primary Key)
  - address
  - phone\_number
6. Supply
- farmer\_id (Foreign Key referencing Farmer)
  - market\_name (Foreign Key referencing Market)
  - product\_name (Foreign Key referencing Product)
  - delivery\_date
  - quantity
  - (Primary Key: Composite Key on farmer\_id, market\_name, product\_name, and delivery\_date)
7. Agreement
- agreement\_id (Primary Key)
  - supplier\_name (Foreign Key referencing Supplier)
  - market\_name (Foreign Key referencing Market)
  - start\_date
  - end\_date
  - agreement\_text
  - manager\_id
8. Sells
- market\_name (Foreign Key referencing Market)
  - product\_name (Foreign Key referencing Product)
  - price
  - (Primary Key: Composite Key on market\_name and product\_name)
9. Manages\_Agreement
- manager\_id
  - agreement\_id (Foreign Key referencing Agreement)
  - (Primary Key: Composite Key on manager\_id and agreement\_id)

## Creating and adding data and the tables -

### Customer

customer_id	name	address	membership_level	preferred_market
1	Alice Brown	123 Elm St, Springfield	Gold	Organic Market NY
2	Bob White	456 Oak St, Greenfield	Silver	FreshFarm SF
3	Charlie Black	789 Pine St, Riverdale	Gold	FreshFarm LA
4	David Green	321 Maple St, Springfield	Bronze	FreshFarm LA
5	Eve Blue	654 Cedar St, Greenfield	Gold	Organic Market NY

### Farmer

farmer_id	name	farm_location	years_of_certification
101	John Doe	Valley Farms, NY	5
102	Jane Smith	Green Acres, CA	7

103	Emily Johnson	Blue Ridge Farm, TX	3
104	George White	Riverland, WA	4
105	Emma Brown	Sunset Farms, AZ	6

## Supplier

supplier_name	phone_number
Green Suppliers	123-456-7890
Nature's Best	234-567-8901
Organic Harvest	345-678-9012
Farm Fresh	456-789-0123
Pure Organics	567-890-1234

## Product

product_name	organic_status	supplier_name
Organic Apples	TRUE	Green Suppliers
Fresh Lettuce	TRUE	Nature's Best

Organic Milk	TRUE	Organic Harvest
Fresh Carrots	TRUE	Farm Fresh
Organic Eggs	TRUE	Pure Organics

## Market

market_name	address	phone_number
Organic Market NY	123 Broadway, New York	555-1234
FreshFarm SF	456 Market St, San Francisco	555-5678
FreshFarm LA	789 Sunset Blvd, Los Angeles	555-9012
Urban Fresh NY	789 Broadway, New York	555-3456
Fresh Harvest NY	202 Fifth Ave, New York	555-4567
City Greens NY	303 Sixth Ave, New York	555-5678
Metro Foods NY	404 Seventh Ave, New York	555-6789
WholeFoods NY	101 Park Ave, New York	555-2345
Natural Foods SF	202 Mission St, San Francisco	555-6789

## Supply

farmer_id	market_name	product_name	delivery_date	quantity
101	Organic Market NY	Organic Apples	2023-08-01	500
101	FreshFarm LA	Organic Apples	2023-08-12	600
102	FreshFarm SF	Fresh Lettuce	2023-08-05	300
102	WholeFoods NY	Fresh Lettuce	2023-08-15	200
103	FreshFarm LA	Organic Milk	2023-08-10	200
103	Natural Foods SF	Organic Milk	2023-08-20	400
104	FreshFarm SF	Fresh Carrots	2023-08-25	250
104	Organic Market NY	Fresh Carrots	2023-08-30	150
105	Organic Market NY	Organic Eggs	2023-09-01	100
105	WholeFoods NY	Organic Eggs	2023-09-05	120
101	WholeFoods NY	Organic Apples	2023-09-10	400
102	Natural Foods SF	Fresh Lettuce	2023-09-12	350
103	Organic Market NY	Organic Milk	2023-09-15	300

104	WholeFoods NY	Organic Apples	2023-09-10	400
104	Natural Foods SF	Fresh Lettuce	2023-09-12	350
105	Organic Market NY	Organic Milk	2023-09-15	300
105	Natural Foods SF	Organic Apples	2023-09-18	450

## Agreement

agreement_id	supplier_name	market_name	start_date	end_date	agreement_text	manager_id
1	Green Suppliers	Organic Market NY	2023-01-01	2023-12-31	Supply agreement for apples	201
2	Nature's Best	FreshFarm SF	2023-02-01	2023-12-31	Supply agreement for lettuce	202
3	Organic Harvest	FreshFarm LA	2023-03-01	2023-12-31	Supply agreement for milk	203
4	Farm Fresh	WholeFoods NY	2023-04-01	2023-12-31	Supply agreement for carrots	204
5	Pure Organics	Natural Foods SF	2023-05-01	2023-12-31	Supply agreement for eggs	205

6	Green Suppliers	Organic Market NY	2023-06-01	2023-12-31	Supply agreement for carrots	204
7	Nature's Best	Organic Market NY	2023-07-01	2023-12-31	Supply agreement for lettuce	205
8	Organic Harvest	Organic Market NY	2023-08-01	2023-12-31	Supply agreement for milk	206
10	Green Suppliers	WholeFood s NY	2023-06-01	2023-12-31	Agreement for vegetables	207
11	Nature's Best	WholeFood s NY	2023-07-01	2023-12-31	Agreement for organic produce	208
12	Organic Harvest	WholeFood s NY	2023-08-01	2023-12-31	Agreement for dairy products	209
9	Green Suppliers	Urban Fresh NY	2023-07-01	2023-12-31	Agreement for apples and vegetables	206
16	Nature's Best	Fresh Harvest NY	2023-08-01	2023-12-31	Agreement for fresh lettuce and vegetables	207
17	Organic Harvest	City Greens NY	2023-09-01	2023-12-31	Agreement for organic milk and eggs	208

18	Farm Fresh	Metro Foods NY	2023-10-01	2023-12-31	Agreement for fresh carrots and produce	209
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## Sells

market_name	product_name	price
Organic Market NY	Organic Apples	3.50
FreshFarm SF	Fresh Lettuce	2.00
FreshFarm LA	Organic Milk	4.00
FreshFarm LA	Organic Apples	3.60
WholeFoods NY	Fresh Lettuce	2.10
Natural Foods SF	Organic Milk	4.20
Organic Market NY	Organic Eggs	3.00
WholeFoods NY	Organic Eggs	3.10
FreshFarm SF	Fresh Carrots	2.50
Organic Market NY	Fresh Carrots	2.40

## Manages\_Agreement



manager_id	agreement_id
201	1
202	2
203	3
204	4
205	5
206	6
207	7
208	8
209	9

## Queries and Outputs -

1. **Query 1 - Write a SQL query to retrieve the names and phone numbers of all suppliers.**

### **Code -**

```
SELECT supplier_name, phone_number  
FROM Supplier;
```

### **Output -**

supplier_name	phone_number
Farm Fresh	456-789-0123
Green Suppliers	123-456-7890
Nature's Best	234-567-8901
Organic Harvest	345-678-9012
Pure Organics	567-890-1234

2. **Query 2 - Write a SQL query to display the names of farmers who have supplied products to at least 3 different markets.**

**Code -**

```
SELECT f.name
FROM Farmer f
JOIN Supply s ON f.farmer_id = s.farmer_id
GROUP BY f.name
HAVING COUNT(DISTINCT s.market_name) >= 3;
```

**Output -**

name
Emily Johnson
Emma Brown
George White
Jane Smith
John Doe

3. **Query 3 - Write a SQL query to find the names of markets that have agreements with all suppliers in a specific city, along with the agreement details.**

**Code -**

```

SELECT m.market_name AS MarketName,
       GROUP_CONCAT(DISTINCT a.agreement_id ORDER BY a.agreement_id) AS
AgreementIDs,
       MIN(a.start_date) AS StartDate,
       MAX(a.end_date) AS EndDate
FROM Market m
JOIN Agreement a ON m.market_name = a.market_name
WHERE m.address LIKE '%New York%'
GROUP BY m.market_name;

```

**Output -**

MarketName	AgreementIDs	StartDate	EndDate
City Greens NY	17	2023-09-01	2023-12-31
Fresh Harvest NY	16	2023-08-01	2023-12-31
Metro Foods NY	18	2023-10-01	2023-12-31
Organic Market NY	1,6,7,8	2023-01-01	2023-12-31
Urban Fresh NY	9	2023-07-01	2023-12-31
WholeFoods NY	4,10,11,12	2023-04-01	2023-12-31

4. **Query 4 - Write a SQL query to display the names of customers and the markets where they have purchased at least 5 different products.**

**Code -**

```

SELECT
    c.name AS CustomerName,
    m.market_name AS MarketName
FROM
    Customer c
JOIN

```

```

Purchase p ON c.customer_id = p.customer_id
JOIN
Market m ON p.market_name = m.market_name
GROUP BY
c.name, m.market_name
HAVING
COUNT(DISTINCT p.product_name) >= 5;

```

#### Output -

CustomerName	MarketName
Alice Brown	Organic Market NY
Bob White	FreshFarm SF
Charlie Black	FreshFarm LA
David Green	FreshFarm LA
Eve Blue	Organic Market NY
Eve Blue	WholeFoods NY

5. **Query 5- Write a SQL query to list the names of farmers and the products they supply to more than one market, along with the market names and delivery dates.**

#### Code -

```

SELECT f.name AS farmer_name,
       s.product_name,
       s.market_name,
       s.delivery_date
FROM Supply s
JOIN Farmer f ON s.farmer_id = f.farmer_id
WHERE s.product_name IN (
    SELECT product_name

```

```

FROM Supply
GROUP BY product_name
HAVING COUNT(DISTINCT market_name) > 1
)
ORDER BY f.name, s.product_name, s.delivery_date;

```

### Output -

farmer_name	product_name	market_name	delivery_date
Emily Johnson	Organic Milk	FreshFarm LA	2023-08-10
Emily Johnson	Organic Milk	Natural Foods SF	2023-08-20
Emily Johnson	Organic Milk	Organic Market NY	2023-09-15
Emma Brown	Organic Apples	Natural Foods SF	2023-09-18
Emma Brown	Organic Eggs	Organic Market NY	2023-09-01
Emma Brown	Organic Eggs	WholeFoods NY	2023-09-05
Emma Brown	Organic Milk	Organic Market NY	2023-09-15
George White	Fresh Carrots	FreshFarm SF	2023-08-25
George White	Fresh Carrots	Organic Market NY	2023-08-30
George White	Fresh Lettuce	Natural Foods SF	2023-09-12
George White	Organic Apples	WholeFoods NY	2023-09-10
Jane Smith	Fresh Lettuce	FreshFarm SF	2023-08-05
Jane Smith	Fresh Lettuce	WholeFoods NY	2023-08-15
Jane Smith	Fresh Lettuce	Natural Foods SF	2023-09-12
John Doe	Organic Apples	Organic Market NY	2023-08-01
John Doe	Organic Apples	FreshFarm LA	2023-08-12
John Doe	Organic Apples	WholeFoods NY	2023-09-10
John Doe	Organic Apples	Natural Foods SF	2023-09-18