Roll number : 1602-21-737-029

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Project Name : Smart Farming Systematic Approach Data Management System

Project Objective : giving suggestions for performing systematic farming to the farmers

Instructor Name : B. Leelavathy

Assignment : 1

Contents :

Abstract :

The Smart Farming Systematic Approach Data Management System aims to assist farmers by providing suggestions for systematic farming. This project employs the use of data management systems and technologies to analyze various aspects of farming such as soil quality, weather patterns, and crop productivity. By collecting and analyzing this data, the system provides recommendations to farmers on how to optimize their farming practices to improve yields and reduce costs. Through the implementation of this project, farmers can make informed decisions and improve their overall agricultural productivity, ultimately leading to increased profitability and sustainability in the farming industry.

Tables :

1. Farmers table - containing information on the farmers, including their name, contact details, and location.

2. Farms table - containing information on the farms, including the area of the farm, the crops grown, and the soil quality.

3. Weather table - containing information on the weather patterns in the area, including temperature, humidity, and rainfall.

4. Crop table - containing information on the crops, including the crop type, expected yield, and harvest time.

5. Recommendations table - containing recommendations for farmers based on the data analysis performed by the system, including suggestions on crop selection, planting time, and fertilization schedules.

```
SQL> select * from tab;

TNAME                          TABTYPE  CLUSTERID
------------------------------ ------- ----------
CROP                           TABLE
FARMERS                        TABLE
FARMS                          TABLE
RECOMMENDATIONS                TABLE
WEATHER                        TABLE

SQL>
```

Cardinalities and constraints :

1. Farmers table:
    - Mapping : One farmer can have many farms.
    - Participation constraint: Each farm must be associated with a farmer.
    - Key constraint: Farmer ID is the primary key for this table.

2. Farms table:
    - Mapping : One farm belongs to one farmer.
    - Participation constraint: Each farm must have a farmer associated with it.
    - Key constraint: Farm ID is the primary key for this table.

3. Weather table:
    - Mapping : One weather record is associated with one farm.
    - Participation constraint: Each farm must have a weather record associated with it.
    - Key constraint: Weather ID is the primary key for this table.

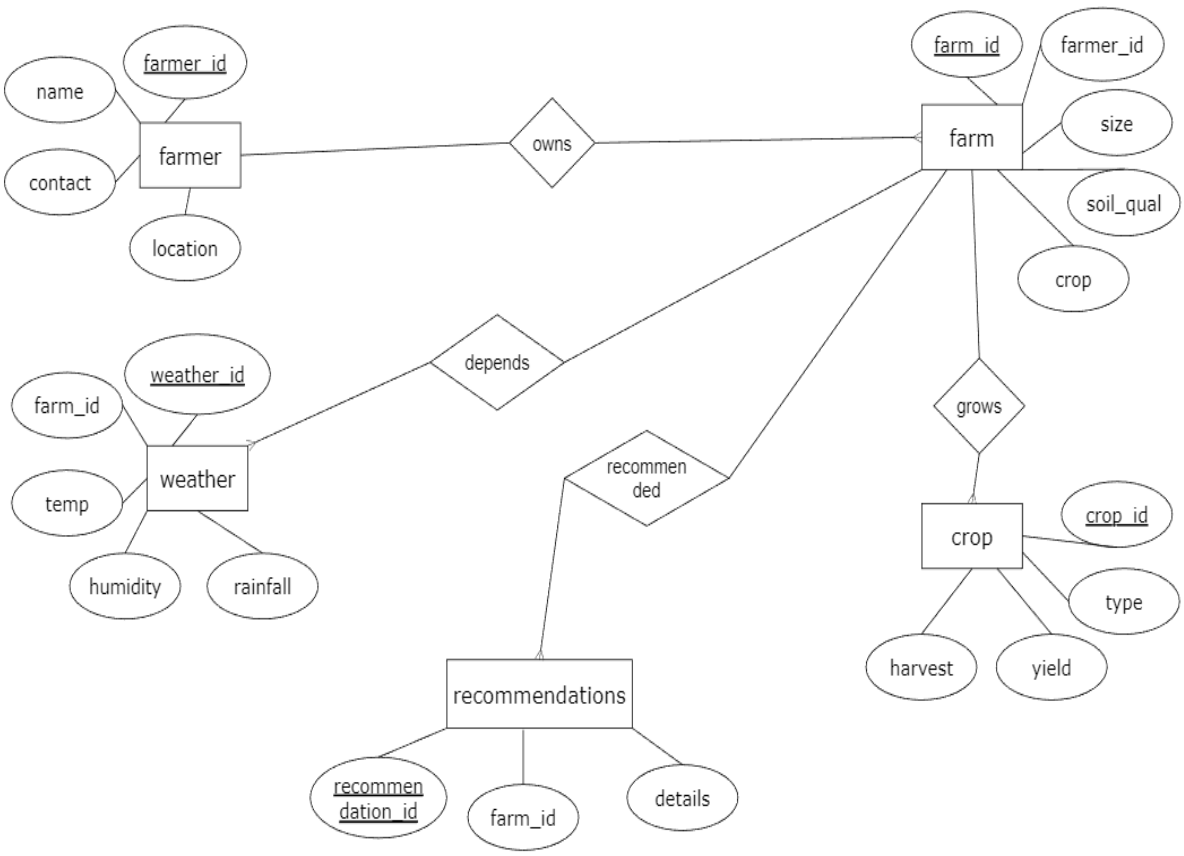
4. Crop table:
    - Mapping : One crop is grown on many farms.
    - Participation constraint: Each farm must have at least one crop associated with it.
    - Key constraint: Crop ID is the primary key for this table.

5. Recommendations table:
    - Mapping : One recommendation is associated with one farm.
    - Participation constraint: Each farm must have at least one recommendation associated with it.
    - Key constraint: Recommendation ID is the primary key for this table.

Additionally, the following key constraints are also present :

- Farmer ID in the Farmers table is a foreign key that references the primary key in the Farms table.
- Farm ID in the Farms table is a foreign key that references the primary key in the Weather table.
- Farm ID in the Farms table is a foreign key that references the primary key in the Crop table.
- Farm ID in the Farms table is a foreign key that references the primary key in the Recommendations table.

ER Diagram :


farmer_id
name
farmer
contact
location
owns
farm_id
farmer_id
farm
size
soil_qual
crop
depends
weather_id
farm_id
weather
temp
humidity
rainfall
recommen
ded
grows
crop_id
crop
type
harvest
yield
recommendations
recommen
dation_id
farm_id
details

DDL Operations :

Farmers :

```
CREATE TABLE Farmers (
  Farmer_ID INT PRIMARY KEY,
  Name VARCHAR(20) NOT NULL,
  Contact VARCHAR(20) NOT NULL,
  Location VARCHAR(20) NOT NULL
);
```

output:
Query OK, 0 rows affected

```
SQL> desc farmers;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 FARMER_ID                                 NOT NULL NUMBER(38)
 NAME                                      NOT NULL VARCHAR2(20)
 CONTACT                                   NOT NULL VARCHAR2(20)
 LOCATION                                  NOT NULL VARCHAR2(20)

SQL>
```

Farms :

```
CREATE TABLE Farms (
  Farm_ID INT PRIMARY KEY,
  Farmer_ID INT NOT NULL,
  Area FLOAT NOT NULL,
  Crop VARCHAR(15) NOT NULL,
  Soil_Qual VARCHAR(20) NOT NULL,
  FOREIGN KEY (Farmer_ID) REFERENCES Farmers(Farmer_ID)
);
```

output:
Query OK, 0 rows affected

```
SQL> desc farms;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 FARM_ID                                   NOT NULL NUMBER(38)
 FARMER_ID                                 NOT NULL NUMBER(38)
 AREA                                      NOT NULL FLOAT(126)
 CROP                                      NOT NULL VARCHAR2(15)
 SOIL_QUAL                                 NOT NULL VARCHAR2(20)

SQL>
```

Weather :

```
CREATE TABLE Weather (
  Weather_ID INT PRIMARY KEY,
  Farm_ID INT NOT NULL,
  Temp FLOAT NOT NULL,
  Humidity FLOAT NOT NULL,
  Rainfall FLOAT NOT NULL,
  FOREIGN KEY (Farm_ID) REFERENCES Farms(Farm_ID)
);
```

output:
Query OK, 0 rows affected

```
SQL> desc weather;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 WEATHER_ID                                NOT NULL NUMBER(38)
 FARM_ID                                   NOT NULL NUMBER(38)
 TEMP                                      NOT NULL FLOAT(126)
 HUMIDITY                                  NOT NULL FLOAT(126)
 RAINFALL                                  NOT NULL FLOAT(126)

SQL>
```

Crop :

```
CREATE TABLE Crop (
  Crop_ID INT PRIMARY KEY,
  Type VARCHAR(20) NOT NULL,
  Yield FLOAT NOT NULL,
  Harvest DATE NOT NULL,
  Farm_ID INT NOT NULL,
  FOREIGN KEY (Farm_ID) REFERENCES Farms(Farm_ID)
);
```

output:
Query OK, 0 rows affected

```
SQL> desc crop;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 CROP_ID                                   NOT NULL NUMBER(38)
 TYPE                                      NOT NULL VARCHAR2(20)
 YIELD                                     NOT NULL FLOAT(126)
 HARVEST                                   NOT NULL DATE
 FARM_ID                                   NOT NULL NUMBER(38)

SQL>
```

Recommendations :

```
CREATE TABLE Recommendations (
  RecommendationID INT PRIMARY KEY,
  Farm_ID INT NOT NULL,
  Details VARCHAR(50) NOT NULL,
  FOREIGN KEY (Farm_ID) REFERENCES Farms(Farm_ID)
);
```

output:
Query OK, 0 rows affected

```
SQL> desc recommendations;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 RECOMMENDATIONID                          NOT NULL NUMBER(38)
 FARM_ID                                   NOT NULL NUMBER(38)
 DETAILS                                   NOT NULL VARCHAR2(50)

SQL>
```

DML Operations (examples) :

Farmers :

INSERT INTO Farmers (Farmer_ID, Name, Contact, Location)
VALUES
(101, 'lekhanag', '123-456-7890', ‘suncity’),
(102, 'bhargav’, '555-555-5555', 'karmanghat'),
(103, ‘bagawan', '555-123-4567', 'narsingi'),
(104, 'sai charan', '888-888-8888', 'narsingi'),
(105, 'varun aditya', '777-777-7777', 'karmanghat');

output:
Query OK, 5 rows affected

```
SQL> select * from farmers;

 FARMER_ID NAME                 CONTACT              LOCATION
---------- -------------------- -------------------- --------------------
       101 lekhanag             8106104497           suncity
       102 bhargav              9392129754           kharmanghat
       103 bagawan              7013540091           narsingi
       104 sai charan           7815918544           narsingi
       105 varun aditya         9110324081           kharmanghat

SQL>
```

Farms :

INSERT INTO Farms (Farm_ID, Farmer_ID, area, Crop, Soil_Qual)
VALUES
(1, 1, 10.0, 'Corn', 'Loamy'),
(2, 1, 5.0, 'Soybeans', 'Sandy'),
(3, 2, 20.0, 'Wheat', 'Clay'),
(4, 3, 15.0, 'Barley', 'Loamy'),
(5, 4, 8.0, 'Potatoes', 'Sandy');

output:
Query OK, 5 rows affected

```
SQL> select * from farms;

   FARM_ID  FARMER_ID       AREA CROP            SOIL_QUAL
---------- ---------- ---------- --------------- --------------------
        11        101        1.2 cotton          black soil (80%)
        22        101        4.7 sugarcane       red soil (60%)
        33        102       1.92 lemon           black soil (50%)
        44        103        2.8 rice            black soil (80%)
        55        104        3.9 weed            dry soil
        66        104        3.7 corn            red soil (10%)
        77        105        2.1 coriander       clay (20%)

7 rows selected.
```

Weather :

INSERT INTO Weather (Weather_ID, Farm_ID, Temp, Humidity, Rainfall)
VALUES
(1, 1, 75.0, 50.0, 0.2),
(2, 2, 85.0, 65.0, 0.0),
(3, 3, 65.0, 70.0, 0.5),
(4, 4, 60.0, 45.0, 0.1),
(5, 5, 70.0, 60.0, 0.3);

output:
Query OK, 5 rows affected

```
SQL> select * from weather;

WEATHER_ID    FARM_ID       TEMP   HUMIDITY   RAINFALL
---------- ---------- ---------- ---------- ----------
      2001         11         29       40.5        130
      2002         22         41         70        150
      2003         33         45         40        100
      2004         44         45         40        100
      2005         55         20         45        150
      2006         66         25         55        125

6 rows selected.
```

Crop :

INSERT INTO Crop (Crop_ID, Type, Yield, Harvest, Farm_ID)
VALUES
(1, 'Corn', 100.0, '2022-10-15', 1),

(2, 'Soybeans', 75.0, '2022-09-30', 2),
(3, 'Wheat', 60.0, '2022-06-01', 3),
(4, 'Barley', 80.0, '2022-07-15', 4),
(5, 'Potatoes', 90.0, '2022-11-01', 5);

output:
Query OK, 5 rows affected

```
SQL> select * from crop;

   CROP_ID TYPE                      YIELD HARVEST      FARM_ID
---------- -------------------- ---------- --------- ----------
       401 cotton                     1000 01-MAR-23         11
       402 lemon                       800 01-SEP-23         33
       403 sugarcane                  2500 01-FEB-23         22
       404 rice                      20000 01-JAN-23         44
       405 corn                        500 01-OCT-23         66

SQL>
```

Recommendations :

INSERT INTO Recommendations (RecommendationID, Farm_ID, Details)
VALUES
(1, 1, 'Apply nitrogen fertilizer'),
(2, 2, 'Rotate crops to prevent disease'),
(3, 3, 'Use cover crops to improve soil quality'),
(4, 4, 'Plant resistant varieties to combat pests'),
(5, 5, 'Increase soil moisture for better yields');

output:
Query OK, 5 rows affected

```
SQL> select * from recommendations;

RECOMMENDATIONID    FARM_ID DETAILS
---------------- ---------- --------------------------------------------------
               1         11 harvest rice in black soil for more yield
               2         22 cotton, wheat are good for red soil
               3         55 wait for rainfall or treat with water
               4         77 cabbage, carrot are good for clay soil

SQL>
```