NATIONAL INSTITUTE OF TECHNOLOGY WARANGAL

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DBMS PROJECT ON AGRICULTURAL DATABASE

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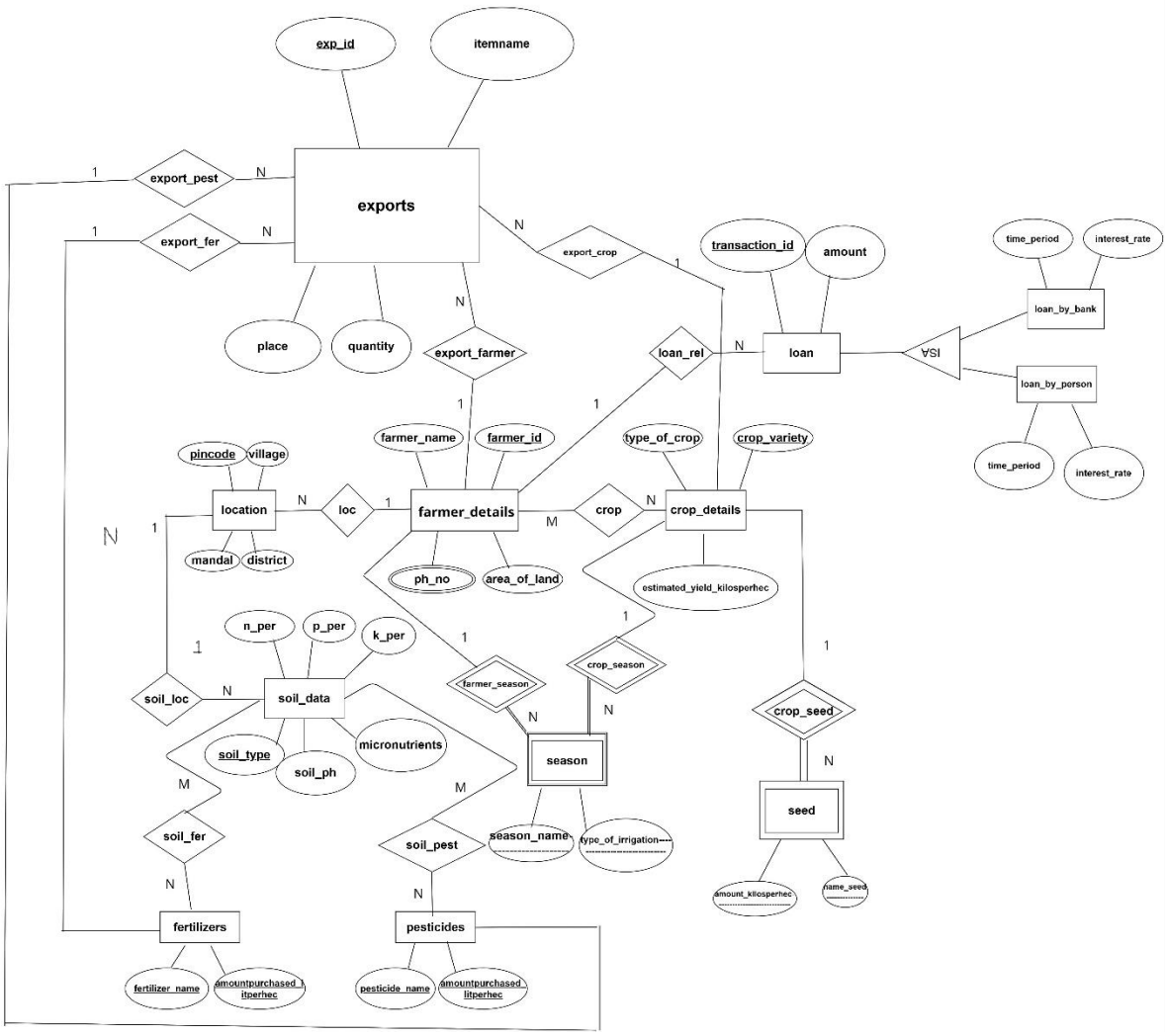
Problem Statement:

We are creating a database which manages the data related to Agriculture. Agriculture is broadest economic sector in India. Agriculture is dependent on many climate and economic factors. Some of the factors on which agriculture is dependent are soil, climate, cultivation, irrigation, fertilizers, temperature, rainfall, harvesting, pesticide, etc. The Agricultural Database contains all data about a farmer such as the amount of land he possesses, the type of soil and the details such as soil pH, amount of micronutrients and percentages of Nitrogen, Potassium and Phosphorous, the type of crop and crop variety he produces in which season, the type of irrigation used, the amount of fertilizers and pesticides used per hectare, the quantity of an item exported to a place, the amount of money/capital taken as a loan, the interest rate, the time period , etc.

ER DIAGRAM:



ASSUMPTIONS:

1.A Farmer can grow many crops and a crop can be grown by many farmers.

2.A Farmer can take many loans but a loan can be taken by only one farmer.

3.A farmer can have land at many locations but land at a location can only be possessed by only one farmer.

4.A crop can be grown by many seeds but one seed can grow only one type of crop.

5.One kind of soil can be found in many locations but one location can have only one kind of soil.

6.one kind of soil can use many kinds of fertilizers and one kind of fertilizers can be used on many kinds of soil.

7. one kind of soil can use many kinds of pesticides and one kind of pesticides can be used on many kinds of soil.

8.A crop can be grown in many seasons but in one season only one crop can be grown in a specific season.

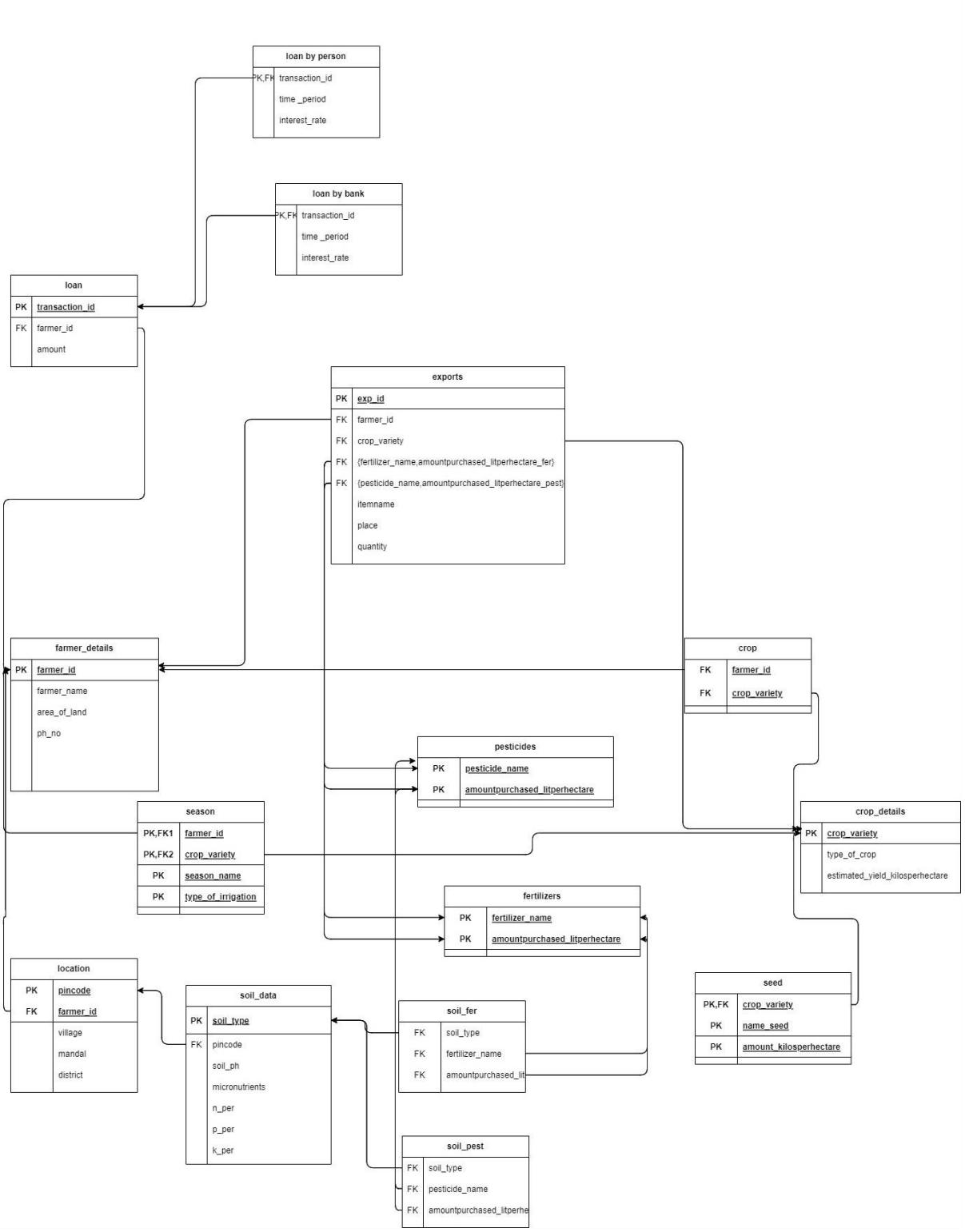
9.one fertilizer may be present in many exports but one export can only contain one fertilizer.

10.one pesticide may be present in many exports but one export can only contain one pesticide.

11.one crop may be present in many exports but one export can contain one crop.

12.one farmer can send many exports but one export should only be sent by one farmer.

RELATIONAL SCHEMA:



TABLES:

1.farmer_details(farmer_id,farmer_name,area_of_land,ph_no)

2.crop_details (crop_variety, type_of_crop,estimated_yield_kilosperhectare)

3.crop(farmer_id,crop_variety)

4.soil_data (**soil_type** , pincode,soil_ph ,n_per ,p_per, k_per ,micronutrients)

5.location(pincode, village,mandal, district)

6.season(farmer_id,crop_variety,name,type_of_irrigation)

7.seed(crop_variety,seed_name,amountpurchased_kilosperhec)

8.fertilizers(fertilizer_name,amountpurchased_litperhectare)

9.pesticides(pesticide_name,amountpurchased_litperhec)

10.exports

(exp_id,farmer_id,crop_variety,fertilizer_name,amountpurchased_litperhec_fer,pesticide_name,amountpurchased_litperhectare_pest,itemname,place,quantity)

11.loan(transaction_id ,amount)

12.loan_by_bank(transaction_id ,interest_rate ,time_period)

13.loan_by_person(transaction_id ,interest_rate,time_period)

14.soil_fer(soil_type ,fertilizer_name ,amountpurchased_litperhec)

15.soil_pest(soil_type, pesticide_name , amountpurchased_litperhec)

FUNCTIONAL DEPENDENCIES:

1. **farmer_details**:
   farmer_id->farmer_name
   farmer_id->area_of_land
   farmer_id->ph_no

Therefore,as all attributes depend on farmer_id, the primary key is farmer_id.

2. **location:**

   pincode->village

   pincode->mandal

   pincode->district

primary key:pincode

3. **soil_data:**

   soil_type->soil_ph

   soil_type->micronutrients

   soil_type->n_per

   soil_type->p_per

   soil_type->k_per

   Primary key: soil_type

4. **fertilizers:**

{fertilizer_name,amountpurchased_litperhec}->{ fertilizer_name,amountpurchased_litperhec}

Primary key:{ fertilizer_name,amountpurchased_litperhec}

5. **pesticides:**

{pesticide_name,amountpurchased_litperhec}->{ pesticide_name,amountpurchased_litperhec}

Primary key:{pesticide_name,amountpurchased_litperhec}

6. **crop_details:**

   crop_variety->type_of_crop

   crop_variety->estimated_yield_kilosperhec

   Primary key:crop_variety

7. **loan:**

   transaction_id->amount

Primary key:transaction_id

8. **loan_by_person:**

transaction_id->time_period

transaction_id->interest_rate

9. **loan_by_bank:**

transaction_id->time_period

transaction_id->interest_rate

10. **seed:**

{crop_variety,name_seed,amount_kilosperhec}->{crop_variety,name_seed,amount_kilosperhec}

Primary key: {crop_variety,name_seed,amount_kilosperhec}

11. **season**:
    {farmer_id,crop_variety,season_name,type_of_irrigation}->{farmer_id,crop_variety,season_name,type_of_irrigation}
    Primary key:
    {farmer_id,crop_variety,season_name,type_of_irrigation}
12. **exports**:
    exp_id->itemname
    exp_id->place
    exp_id->quantity
    primary key: exp_id

NORMALIZATIONS:

1.farmer_details:

Primary key:farmer_id

As there are no partial dependencies, the table is in 2NF.

As there are no transitive dependencies, the table is in 3NF.

As left hand side of each functional dependency is a super key, hence the table is in BCNF.

Table: farmer_details

Columns:

farmer_id	int PK
farmer_name	varchar(30)
area_of_land	int
ph_no	int

2.location:

Primary key: pincode

As there are no partial dependencies, the table is in 2NF.

As there are no transitive dependencies, the table is in 3NF.

As left hand side of each functional dependency is a super key, hence the table is in BCNF.

Table: location

Columns:

pincode	int PK
farmer_id	int
village	varchar(30)
mandal	varchar(30)
district	varchar(30)

3.soil_data:

Primary key: soil_type

As there are no partial dependencies, the table is in 2NF.

As there are no transitive dependencies, the table is in 3NF.

As left hand side of each functional dependency is a super key, hence the table is in BCNF.

Table: soil_data

Columns:

soil_type	varchar(30) PK
pincode	int
soil_ph	int
n_per	int
p_per	int
k_per	int
micronutrients	int

4.fertilizers:

Primary key: :{ fertilizer_name,amountpurchased_litperhec}

As there are no partial dependencies, the table is in 2NF.

As there are no transitive dependencies, the table is in 3NF.

As left hand side of each functional dependency is a super key, hence the table is in BCNF.

Table: fertilizers

Columns:

fertilizer_name	varchar(30) PK
amountpurchased_litperhec	int PK

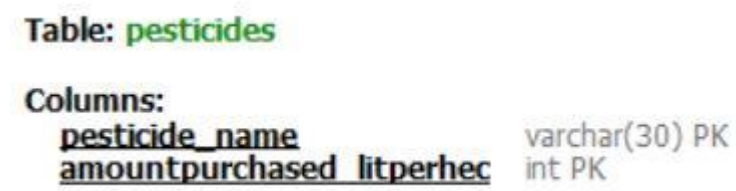
5.pesticides:

Primary key: :{pesticide_name,amountpurchased_litperhec}

As there are no partial dependencies, the table is in 2NF.

As there are no transitive dependencies, the table is in 3NF.

As left hand side of each functional dependency is a super key, hence the table is in BCNF.



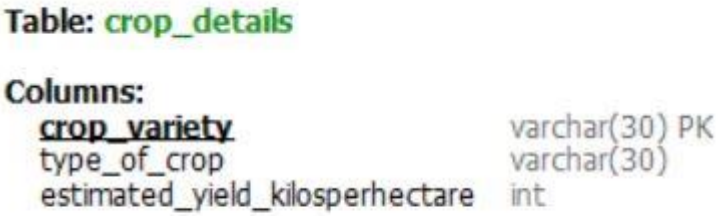
6.crop_details:

Primary key: crop_variety

As there are no partial dependencies, the table is in 2NF.

As there are no transitive dependencies, the table is in 3NF.

As left hand side of each functional dependency is a super key, hence the table is in BCNF.



7.loan:

Primary key: transaction_id

As there are no partial dependencies, the table is in 2NF.

As there are no transitive dependencies, the table is in 3NF.

As left hand side of each functional dependency is a super key, hence the table is in BCNF.

Table: loan

Columns:

transaction_id	int PK
amount	int
farmer_id	int

8.loan_by_bank:

Primary key: transaction_id

As there are no partial dependencies, the table is in 2NF.

As there are no transitive dependencies, the table is in 3NF.

As left hand side of each functional dependency is a super key, hence the table is in BCNF.

Table: loan_by_bank

Columns:

transaction_id	int PK
interest_rate	int
time_period	int

9.loan_by_person:

Primary key: transaction_id

As there are no partial dependencies, the table is in 2NF.

As there are no transitive dependencies, the table is in 3NF.

As left hand side of each functional dependency is a super key, hence the table is in BCNF.

Table: loan_by_person

Columns:

transaction_id	int PK
interest_rate	int
time_period	int

10.seed:

Primary key: {crop_variety,name_seed,amount_kilosperhec}

As there are no partial dependencies, the table is in 2NF.

As there are no transitive dependencies, the table is in 3NF.

As left hand side of each functional dependency is a super key, hence the table is in BCNF.

Table: seed

Columns:

crop_variety	varchar(30) PK
name_seed	varchar(30) PK
amount_kilosperhec	int PK

11.season:

Primary key:
{farmer_id,crop_variety,season_name,type_of_irrigation}

As there are no partial dependencies, the table is in 2NF.

As there are no transitive dependencies, the table is in 3NF.

As left hand side of each functional dependency is a super key, hence the table is in BCNF.

Table: season

Columns:

farmer_id	int PK
crop_variety	varchar(30) PK
season_name	varchar(30) PK
type_of_irrigation	varchar(30) PK

12.exports:

Primary key: exp_id

As there are no partial dependencies, the table is in 2NF.

As there are no transitive dependencies, the table is in 3NF.

As left hand side of each functional dependency is a super key, hence the table is in BCNF.

Table: exports

Columns:

exp_id	int PK
farmer_id	int
crop_variety	varchar(30)
fertilizer_name	varchar(30)
amountpurchased_litperhec_fer	int
pesticide_name	varchar(30)
amountpurchased_litperhec_pest	int
itemname	varchar(30)
place	varchar(30)
quantity	varchar(30)

TABLE INSERTIONS:

```
create table farmer_details
(
farmer_id int,
farmer_name varchar(30),
```

```
area_of_land int,
ph_no int,
primary key(farmer_id)
);
insert into farmer_details values (6780,'Venkat',7,87638901);
insert into farmer_details values (2539,'Srinivas',9,67923510);
insert into farmer_details values (7631,'Ramu',3,91638271);
insert into farmer_details values (4563,'Laxman',10,74109532);
insert into farmer_details values (9841,'Pratap',4,81560091);
insert into farmer_details values (1452,'Akash',6,88991725);
insert into farmer_details values (5382,'Subbu',12,71829722);
insert into farmer_details values (7639,'Phani',2,90001827);
select * from farmer_details;

create table location
(
  pincode int,
  farmer_id int,
  village varchar(30),
  mandal varchar(30),
  district varchar(30),
  primary key(pincode),
  foreign key(farmer_id) references farmer_details(farmer_id)
);
```

```
insert into location values
(100231,6780,'Lakkavaram','Huzurnagar','Suryapet');

insert into location values
(342103,7631,'Annaram','Tripuraram','Nalgonda');

insert into location values
(562891,7639,'Raghunadhapalem','Tirumalapalem','Khammem');

insert into location values
(539291,5382,'Lingampally','Chilpur','Jangaon');

insert into location values
(429183,4563,'Rudraram','Yellareddy','Kamareddy');

insert into location values
(579392,9841,'Paidipalli','Velgatoor','Jagitial');

insert into location values
(478291,1452,'Chintarevula','Dharur','Gadwal');

insert into location values
(578246,2539,'Mailaram','Gannervaram','Karimnagar');

select * from location;


create table crop_details

(

crop_variety varchar(30),

type_of_crop varchar(30),

estimated_yield_kilosperhectare int,

primary key(crop_variety)

);

insert into crop_details values('R101','Rice',25);
```

```
insert into crop_details values('M402','Rice',20);
insert into crop_details values('D527','Basmati Rice',15);
insert into crop_details values('W321','Wheat',30);
insert into crop_details values('B323','Barley',20);
insert into crop_details values('R302','Rice',15);
insert into crop_details values('M322','Maize',25);
insert into crop_details values('S324','Sorghum',23);
insert into crop_details values('M327','Millet',15);
insert into crop_details values('C358','Cotton',40);
select * from crop_details;

create table crop
(
farmer_id int,
crop_variety varchar(30),
foreign key(farmer_id) references farmer_details(farmer_id),
foreign key(crop_variety) references crop_details(crop_variety)
);
insert into crop values(7631,'R101');
insert into crop values(6780,'M402');
insert into crop values(2539,'D527');
insert into crop values(4563,'W321');
insert into crop values(4563,'B323');
insert into crop values(9841,'R302');
```

```
insert into crop values(1452,'M322');
insert into crop values(5382,'S324');
insert into crop values(7639,'M327');
insert into crop values(4563,'C358');
insert into crop values(5382,'W321');
select * from crop;

create table loan
(
transaction_id int,
amount int,
farmer_id int,
primary key(transaction_id),
foreign key(farmer_id) references farmer_details(farmer_id)
);
insert into loan values(372812,10000,6780);
insert into loan values(891023,20000,2539);
insert into loan values(718309,15000,7631);
insert into loan values(182911,25000,4563);
insert into loan values(982043,5500,9841);
insert into loan values(671957,7000,1452);
insert into loan values(558923,9000,5382);
insert into loan values(820192,20000,7639);
select * from loan;
```

```
create table loan_by_bank
(
transaction_id int,
interest_rate int,
time_period int,
primary key(transaction_id),
foreign key (transaction_id) references loan(transaction_id)
);
insert into loan_by_bank values(372812,5,3);
insert into loan_by_bank values(820192,4,6);
insert into loan_by_bank values(891023,8,10);
insert into loan_by_bank values(182911,5,8);
insert into loan_by_bank values(671957,3,2);
select * from loan_by_bank;

create table loan_by_person
(
transaction_id int,
interest_rate int,
time_period int,
primary key(transaction_id),
foreign key (transaction_id) references loan(transaction_id)
);
```

```
insert into loan_by_person values(558923,2,2);
insert into loan_by_person values(718309,5,6);
insert into loan_by_person values(982043,2,1);
select * from loan_by_person;

create table soil_data
(
soil_type varchar(30),
pincode int,
soil_ph int,
n_per int,
p_per int,
k_per int,
micronutrients int,
primary key(soil_type),
foreign key(pincode) references location(pincode)
);
insert into soil_data values('Red Soil',100231,8,3,5,4,20);
insert into soil_data values('Clay',429183,7,6,3,9,35);
insert into soil_data values('Sand',539291,6,6,6,7,22);
insert into soil_data values('Black Soil',578246,8,4,5,7,18);
insert into soil_data values('Silty soil',478291,9,5,8,7,24);
insert into soil_data values('Loamy Soil',342103,6,3,4,2,12);
insert into soil_data values('Alluvial Soil',579392,7,6,12,9,34);
```

```
insert into soil_data values('Laterite Soil',562891,8,5,7,10,28);
select * from soil_data;

create table fertilizers
(
fertilizer_name varchar(30),
amountpurchased_litperhec int,
primary key(fertilizer_name,amountpurchased_litperhec)
);
insert into fertilizers values('Nitrogenous fertilizer',3);
insert into fertilizers values('Phosphorous fertilizer',4);
insert into fertilizers values('Potassium fertilizer',2);
insert into fertilizers values('Zinc fertilizer',4);
insert into fertilizers values('Magnesium fertilizer',1);
insert into fertilizers values('Boron fertilizer',2);
insert into fertilizers values('Sulfer fertilizer',1);
insert into fertilizers values('Calcium fertilizer',2);
select * from fertilizers;

create table soil_fer
(
soil_type varchar(30),
fertilizer_name varchar(30),
amountpurchased_litperhec int,
```

```
foreign key(soil_type) references soil_data(soil_type),
foreign key(fertilizer_name,amountpurchased_litperhec) references
fertilizers(fertilizer_name,amountpurchased_litperhec)
);
insert into soil_fer values('Black Soil','Magnesium fertilizer',1);
insert into soil_fer values('Alluvial Soil','Nitrogenous fertilizer',3);
insert into soil_fer values('Laterite Soil','Sulfer fertilizer',1);
insert into soil_fer values('Clay','Potassium fertilizer',2);
insert into soil_fer values('Red Soil','Calcium fertilizer',2);
insert into soil_fer values('Sand','Boron fertilizer',2);
insert into soil_fer values('Silty soil','Phosphorous fertilizer',4);
insert into soil_fer values('Loamy Soil','Zinc fertilizer',4);
select * from soil_fer;

create table pesticides
(
pesticide_name varchar(30),
amountpurchased_litperhec int,
primary key(pesticide_name,amountpurchased_litperhec)
);
insert into pesticides values('Public health pesticide',20);
insert into pesticides values('Miticide',21);
insert into pesticides values('Fungicide',19);
insert into pesticides values('Insecticide',17);
```

```
insert into pesticides values('Store pest inscticide',8);
insert into pesticides values('Rodenticide',13);
insert into pesticides values('Herbicide',28);
insert into pesticides values('Ethion',17);
select * from pesticides;

create table soil_pest
(
soil_type varchar(30),
pesticide_name varchar(30),
amountpurchased_litperhec int,
foreign key(soil_type) references soil_data(soil_type),
foreign key(pesticide_name,amountpurchased_litperhec) references
pesticides(pesticide_name,amountpurchased_litperhec)
);
insert into soil_pest values('Black Soil','Insecticide',17);
insert into soil_pest values('Alluvial Soil','Store pest inscticide',8);
insert into soil_pest values('Laterite Soil','Public health pesticide',20);
insert into soil_pest values('Clay','Ethion',17);
insert into soil_pest values('Red Soil','Herbicide',28);
insert into soil_pest values('Sand','Fungicide',19);
insert into soil_pest values('Silty soil','Rodenticide',13);
insert into soil_pest values('Loamy Soil','Public health pesticide',20);
select * from soil_pest;
```

```
create table seed
(
crop_variety varchar(30),
name_seed varchar(30),
amount_kilosperhec int,
primary key(crop_variety,name_seed,amount_kilosperhec),
foreign key(crop_variety) references crop_details(crop_variety)
);
insert into seed values('R101','Rice 1',12);
insert into seed values('M402','Rice 2',10);
insert into seed values('D527','Basmati 1',15);
insert into seed values('W321','Wheat 1',20);
insert into seed values('B323','Barley 1',10 );
insert into seed values('R302','Rice 3',16);
insert into seed values('M322','Maize 1',14);
insert into seed values('S324','Sorghum 1',18);
insert into seed values('M327','Millet 1',12);
insert into seed values('C358','Cotton 1',8);
select * from seed;

create table season (
farmer_id int,
crop_variety varchar(30),
```

```
season_name varchar(30),
type_of_irrigation varchar(30),
primary
key(farmer_id,crop_variety,season_name,type_of_irrigation),
foreign key(crop_variety) references crop_details(crop_variety),
foreign key(farmer_id) references farmer_details(farmer_id)
);
insert into season values(9841,'R101','Summer','Sprinkler');
insert into season values(1452,'M402','Winter','Manual');
insert into season values(6780,'D527','Rainy','Pump System');
insert into season values(5382,'W321','Winter','Drip');
insert into season values(4563,'B323','Summer','Drip');
insert into season values(2539,'R302','Rainy','Drip');
insert into season values(7639,'M322','Rainy','Pump System');
insert into season values(4563,'S324','Summer','Drip');
insert into season values(2539,'M327','Winter','Center Pivot');
insert into season values(7631,'C358','Summer','Sprinkler');
select * from season;

create table exports
(
exp_id int,
farmer_id int,
crop_variety varchar(30),
```

```
fertilizer_name varchar(30),
amountpurchased_litperhec_fer int,
pesticide_name varchar(30),
amountpurchased_litperhec_pest int,
itemname varchar(30),
place varchar(30),
quantity varchar(30),
primary key(exp_id),
foreign key(farmer_id) references farmer_details(farmer_id),
foreign key(crop_variety) references crop_details(crop_variety),
foreign key(fertilizer_name,amountpurchased_litperhec_fer)
references fertilizers(fertilizer_name,amountpurchased_litperhec),
foreign key(pesticide_name,amountpurchased_litperhec_pest)
references pesticides(pesticide_name,amountpurchased_litperhec)
);
insert into exports values(24622,6780,'R101','Nitrogenous
fertilizer',3,'Public health pesticide',20,'Rice','USA','10 kgs');
insert into exports values(45366,2539,'M402','Phosphorous
fertilizer',4,'Miticide',21,'Rice','UK','15 kgs');
insert into exports values(12535,7631,'D527','Potassium
fertilizer',2,'Fungicide',19,'Basmati Rice','Australia','20 kgs');
insert into exports values(75422,4563,'W321','Zinc
fertilizer',4,'Insecticide',17,'Wheat','USA','25 kgs');
insert into exports values(98492,9841,'B323','Magnesium
fertilizer',1,'Store pest inscticide',8,'Barley','UK','30 kgs');
```

```
insert into exports values(74933,1452,'R302','Boron
fertilizer',2,'Rodenticide',13,'Rice','Austalia','25 kgs');

insert into exports values(29592,5382,'M322','Sulfer
fertilizer',1,'Herbicide',28,'Maize','Africa','20 kgs');

insert into exports values(75952,7639,'S324','Calcium
fertilizer',2,'Ethion',17,'Sorghum','China','18 kgs');

insert into exports values(27840,9841,'M327','Zinc
fertilizer',4,'Miticide',21,'Millet','Russia','25 kgs');

insert into exports values(66381,2539,'C358','Magnesium
fertilizer',1,'Insecticide',17,'Cotton','Italy','30 kgs');

select * from exports;
```