আন্তর্জাতিক ইসলামী বিশ্ববিদ্যালয় চট্টগ্রাম
الجامعة الإسلامية العالمية شيتاغونغ
International Islamic University Chittagong

Department of Computer Science and Engineering

PROJECT REPORT

PROJECT TITLE

FARMIGO - EMPOWERING URBAN FARMS WITH SMART OPTIMIZATION

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Approval of the Teacher

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Md. Warid Bin Azad

Adjunct Lecturer,

Department of CSE, IIUC.

1. INTRODUCTION

Our Project **FARMIGO** aims to develop a comprehensive database management system for urban farmers, designed to optimize land use, improve crop cultivation management, and facilitate fair-market transactions. The system will empower farmers to manage land parcels, crop production, resource allocation, and sales, addressing critical challenges in urban farming such as underutilized farmland, resource optimization, and access to fair markets.

2. LITERATURE RIVIEW

Existing works and URL	Findings	Observations
AGRIEDGE *https://www.agriedge.com*	Offers farm management tools, crop planning, and resource optimization.	Lacks specialized focus on urban farming and land leasing options.
FARMLOGS *https://www.farmlogs.com*	Provides crop tracking, weather analytics, and resource management.	More focused on traditional farming; limited fair-market transaction facilitation.
AGRIVI *https://www.agrivi.com*	Comprehensive farm management with analytics, resource tracking, and crop production insights.	Features are generic and not tailored for urban land optimization.
TARANIS *https://www.taranis.ag*	Provides crop monitoring using AI and satellite imagery for precise decision-making.	Too complex and expensive for small-scale urban farming solutions.

Key Notes for Farmigo:

- Your system's urban farming niche makes it stand out from competitors.
- Many platforms prioritize large-scale farming or precision agriculture, lacking affordable options for small-scale urban farmers.
- Address gaps like land leasing, fair-market transactions, and ease of use to attract urban farming communities.

3. AIMS AND OBJECTIVES

- **Land and Resource Management**
  Enable farmers to efficiently manage land parcels, track leases, monitor land utilization, and allocate resources effectively for crop cultivation.

- **Fair and Transparent Market Transactions**
  Develop a marketplace for farmers to connect with buyers, enabling direct sales with detailed records of transactions, sale amounts, and buyer details.

- **Loan and Financial Assistance**
  Integrate loan management features to help farmers track loans, repayment schedules, and interest rates, ensuring financial support is efficiently utilized.

4. QUERIES AND OUTPUT

1) All tables with related fields:

	FarmerID	Name	Contact	Email
1	1	Rafiq Ahmed	01745678901	rafiq.ahmed@example.com
2	2	Sabrina Khatun	01756789012	sabrina.khatun@example.com
3	3	Kamal Hossain	01767890123	kamal.hossain@example.com
4	4	Lima Begum	01778901234	lima.begum@example.com
5	5	Shafiul Islam	01789012345	shafiul.islam@example.com

	LandlordID	Name	Contact
1	1	Fatema Bibi	01867890123
2	2	Jamal Uddin	01878901234
3	3	Khadija Kh...	01889012345
4	4	Mokbul Ho...	01890123456
5	5	Nasima Ak...	01801234567

	LandID	LandlordID	FarmerID	Location	Size	IsLeased	LeaseAmount	StartDate	EndDate
1	1	3	4	Rajshahi	12.00	1	15000.00	2024-01-01	2024-12-31
2	2	4	5	Khulna	18.50	0	NULL	NULL	NULL
3	3	5	1	Rangpur	22.00	1	20000.00	2024-02-01	2024-11-30
4	4	2	3	Mymen...	14.00	1	13000.00	2024-03-01	2024-12-31
5	5	3	2	Jessore	16.50	0	NULL	NULL	NULL

	CropID	FarmerID	LandID	CropName	Quantity	ProductionCost
1	1	4	4	Potatoes	20	70.00
2	2	5	5	Onions	25	105.00
3	3	1	3	Wheat	10	40.00
4	4	2	4	Sugarca...	22	55.00
5	5	3	2	Chili	8	90.00

	ResourceID	FarmerID	ResourceName	Quantity	Cost
1	1	4	Irrigation Water	5000	1200.00
2	2	5	Compost Fertilizer	300	1800.00
3	3	1	Tractor Rental	2	7000.00
4	4	2	Harvesting Tools	15	1500.00
5	5	3	Organic Pesticide	250	900.00

	BuyerID	Name	Contact
1	1	Rahima Khatun	01890123456
2	2	Harun Rashid	01801234567
3	3	Sonia Begum	01812345678
4	4	Kabir Hossain	01823456789
5	5	Shamim Reza	01834567890

	SaleID	BuyerID	CropID	QuantitySold	SaleAmount	SaleDate
1	1	3	3	7	50.00	2024-12-03
2	2	4	4	20	80.00	2024-12-04
3	3	5	5	8	100.00	2024-12-05
4	4	1	1	17	75.00	2024-12-06
5	5	2	2	24	120.00	2024-12-07

	WeatherID	LandID	Date	Temperature	Rainfall	Humidity
1	1	3	2024-12-03	25.00	8.00	70.00
2	2	4	2024-12-04	27.50	0.00	55.00
3	3	5	2024-12-05	30.00	3.00	60.00
4	4	2	2024-12-06	28.00	7.00	68.00
5	5	1	2024-12-07	24.50	4.00	72.00

	HealthID	CropID	HealthStatus	InspectionDate	Notes
1	1	3	Healthy	2024-12-03	No issues detected
2	2	4	Moderate	2024-12-04	Minor yellowing of leaves
3	3	5	Diseased	2024-12-05	Fungal infection found
4	4	1	Healthy	2024-12-06	Optimal growth
5	5	2	Stressed	2024-12-07	Water shortage observ...

	LoanID	FarmerID	LoanAmount	InterestRate	LoanDate	RepaymentDueDate	IsRepaid
1	1	3	6000.00	5.50	2024-03-01	2025-03-01	0
2	2	4	7000.00	4.80	2024-04-01	2025-04-01	0
3	3	5	9000.00	5.20	2024-05-01	2025-05-01	0
4	4	1	4000.00	4.00	2024-06-01	2025-06-01	0
5	5	2	10000.00	5.00	2024-07-01	2025-07-01	0

2) Land and Crop Details: Locations, Crop Names, Quantities, and Production Costs

```sql
SELECT
    Land.Location AS LandLocation,
    Crop.CropName AS CropName,
    Crop.Quantity AS CropQuantity,
    Crop.ProductionCost AS CropProductionCost
FROM Land
INNER JOIN Crop ON Land.LandID = Crop.LandID;
```

	LandLocation	CropName	CropQuantity	CropProductionCost
1	Mymensingh	Potatoes	20	70.00
2	Jessore	Onions	25	105.00
3	Rangpur	Wheat	10	40.00
4	Mymensingh	Sugarca...	22	55.00
5	Khulna	Chili	8	90.00

3) Leased Land Details with Farmers, Landlords, and Crop Information

```sql
SELECT
    Farmer.Name AS FarmerName,
    Farmer.Contact AS FarmerContact,
    Land.Location AS LandLocation,
    Land.Size AS LandSize,
    Land.IsLeased,
    Landlord.Name AS LandlordName,
    Landlord.Contact AS LandlordContact,
    Crop.CropName AS CropName,
    Crop.Quantity AS CropQuantity,
    Crop.ProductionCost AS CropProductionCost
FROM Land
INNER JOIN Farmer ON Land.FarmerID = Farmer.FarmerID
INNER JOIN Landlord ON Land.LandlordID = Landlord.LandlordID
INNER JOIN Crop ON Land.LandID = Crop.LandID
WHERE Land.IsLeased = 1;
```

	FarmerName	FarmerContact	LandLocation	LandSize	IsLeased
1	Kamal Hossain	01767890123	Mymensingh	14.00	1
2	Rafiq Ahmed	01745678901	Rangpur	22.00	1
3	Kamal Hossain	01767890123	Mymensingh	14.00	1

LandlordName	LandlordContact	CropName	CropQuantity	CropProductionCost
Jamal Uddin	01878901234	Potatoes	20	70.00
Nasima Akter	01801234567	Wheat	10	40.00
Jamal Uddin	01878901234	Sugarcane	22	55.00

4) Crop Yield Classification: High Yield vs Low Yield Categories

```sql
-- **CASE Statement**
SELECT CropName,
       CASE
           WHEN Quantity > 10 THEN 'High Yield'
           ELSE 'Low Yield'
       END AS YieldCategory
FROM Crop;
```

	CropName	YieldCategory
1	Potatoes	High Yield
2	Onions	High Yield
3	Wheat	Low Yield
4	Sugarcane	High Yield
5	Chili	Low Yield

5) Aggregated Farm Data: Costs, Sales, Farmers, and Quantities Overview

```sql
SELECT
    MIN(Crop.ProductionCost) AS MinCost,
    MAX(Sale.SaleAmount) AS MaxSale,
    COUNT(DISTINCT Farmer.FarmerID) AS TotalFarmers,
    SUM(Sale.QuantitySold) AS TotalQuantity,
    AVG(Sale.SaleAmount) AS AverageSale
FROM Farmer
JOIN Crop ON Farmer.FarmerID = Crop.FarmerID
JOIN Sale ON Crop.CropID = Sale.CropID;
```

	MinCost	MaxSale	TotalFarmers	TotalQuantity	AverageSale
1	40.00	120.00	5	76	85.000000

6)Updating and Deleting Data

```
--Update and Delete Query
UPDATE Crop SET Quantity = 20, ProductionCost = 70  WHERE CropID = 1;
UPDATE Crop SET Quantity = 25, ProductionCost = 105 WHERE CropID = 2;
UPDATE Crop SET Quantity = 10, ProductionCost = 40 WHERE CropID = 3;
UPDATE Crop SET Quantity = 22, ProductionCost = 55 WHERE CropID = 4;
UPDATE Crop SET Quantity = 8, ProductionCost = 90 WHERE CropID = 5;
DELETE FROM Crop WHERE CropID = 7;
```

	CropID	FarmerID	LandID	CropName	Quantity	ProductionCost
1	1	4	4	Potatoes	1200	4500.00
2	2	5	5	Onions	900	3000.00
3	3	1	3	Wheat	1100	5500.00
4	4	2	4	Sugarcane	1500	7000.00
5	5	3	2	Chili	600	3200.00
6	7	3	2	Garlic	800	4200.00

	CropID	FarmerID	LandID	CropName	Quantity	ProductionCost
1	1	4	4	Potatoes	20	70.00
2	2	5	5	Onions	25	105.00
3	3	1	3	Wheat	10	40.00
4	4	2	4	Sugarcane	22	55.00
5	5	3	2	Chili	8	90.00

7) Farmer Crop Production, Sales, and Profit Analysis

```
SELECT
    Crop.FarmerID,
    Crop.CropName,
    SUM(Crop.Quantity) AS ProducedKg,
    SUM(Sale.QuantitySold) AS SoldKg,
    SUM(Crop.Quantity - Sale.QuantitySold) AS RemainingKg,
    SUM(Sale.QuantitySold * Crop.ProductionCost) AS TotalCost,
    SUM(Sale.QuantitySold * Sale.SaleAmount) AS TotalSale,
    SUM((Sale.QuantitySold * Sale.SaleAmount) -
    (Sale.QuantitySold * Crop.ProductionCost)) AS Profit
FROM Crop
INNER JOIN Sale ON Crop.CropID = Sale.CropID
GROUP BY Crop.FarmerID, Crop.CropName
ORDER BY FarmerID
```

	FarmerID	CropName	ProducedKg	SoldKg	RemainingKg	TotalCost	TotalSale	Profit
1	1	Wheat	10	7	3	280.00	350.00	70.00
2	2	Sugarcane	22	20	2	1100.00	1600.00	500.00
3	3	Chili	8	8	0	720.00	800.00	80.00
4	4	Potatoes	20	17	3	1190.00	1275.00	85.00
5	5	Onions	25	24	1	2520.00	2880.00	360.00

8) Retrieve All Buyers with Names Starting with 'Shamim'

```
-- **LIKE Operator**
SELECT * FROM Buyer WHERE Name LIKE 'Shamim%';
```

	BuyerID	Name	Contact
1	5	Shamim Reza	01834567890

9) Retrieve Crop Details with Health Status and Associated Weather Data

```
SELECT Crop.CropName, CropHealth.HealthStatus,
WeatherData.Temperature, WeatherData.Rainfall, WeatherData.Humidity
FROM Crop
INNER JOIN CropHealth ON Crop.CropID = CropHealth.CropID
INNER JOIN Land ON Crop.LandID = Land.LandID
INNER JOIN WeatherData ON Land.LandID = WeatherData.LandID
```

	CropName	HealthStatus	Temperature	Rainfall	Humidity
1	Potatoes	Healthy	27.50	0.00	55.00
2	Onions	Stressed	30.00	3.00	60.00
3	Wheat	Healthy	25.00	8.00	70.00
4	Sugarcane	Moderate	27.50	0.00	55.00
5	Chili	Diseased	28.00	7.00	68.00

10) Retrieve Land Locations with Weather Data for Low Rainfall or Low Humidity

```
SELECT Land.Location, WeatherData.Date, WeatherData.Temperature,
WeatherData.Rainfall, WeatherData.Humidity FROM Land
INNER JOIN WeatherData ON Land.LandID = WeatherData.LandID
WHERE WeatherData.Rainfall < 10.0 OR WeatherData.Humidity < 50.0;
```

	Location	Date	Temperature	Rainfall	Humidity
1	Rangpur	2024-12-03	25.00	8.00	70.00
2	Mymensingh	2024-12-04	27.50	0.00	55.00
3	Jessore	2024-12-05	30.00	3.00	60.00
4	Khulna	2024-12-06	28.00	7.00	68.00
5	Rajshahi	2024-12-07	24.50	4.00	72.00

11) Crops by Quantity and Available Large Lands

```
SELECT * FROM Crop ORDER BY Quantity DESC;-- **ORDER BY Query**
SELECT * FROM Land WHERE Size > 1.5 AND IsLeased = 0;-- **Conditional Query**
```

	CropID	FarmerID	LandID	CropName	Quantity	ProductionCost
1	2	5	5	Onions	25	105.00
2	4	2	4	Sugarcane	22	55.00
3	1	4	4	Potatoes	20	70.00
4	3	1	3	Wheat	10	40.00
5	5	3	2	Chili	8	90.00

	LandID	LandlordID	FarmerID	Location	Size	IsLeased
1	2	4	5	Khulna	18.50	0
2	5	3	2	Jessore	16.50	0

12)Unique Land Locations and Farmers with Land

```
SELECT DISTINCT Location FROM Land;-- **DISTINCT**
SELECT FarmerID FROM Farmer WHERE EXISTS -- **EXISTS Query**
(SELECT * FROM Land WHERE Farmer.FarmerID = Land.LandlordID);
```

	Location
1	Jessore
2	Khulna
3	Mymensingh
4	Rajshahi
5	Rangpur

	FarmerID
1	2
2	3
3	4
4	5

13) Outstanding Loans for Farmers

```
SELECT Farmer.Name AS FarmerName, Loan.LoanAmount,
Loan.InterestRate, Loan.RepaymentDueDate FROM Farmer
INNER JOIN Loan ON Farmer.FarmerID = Loan.FarmerID
WHERE Loan.IsRepaid = 0;
```

	FarmerName	LoanAmount	InterestRate	RepaymentDueDate
1	Kamal Hossain	6000.00	5.50	2025-03-01
2	Lima Begum	7000.00	4.80	2025-04-01
3	Shafiul Islam	9000.00	5.20	2025-05-01
4	Rafiq Ahmed	4000.00	4.00	2025-06-01
5	Sabrina Khatun	10000.00	5.00	2025-07-01

14) Farmers and Buyers Contact Information

```
--Union
SELECT Name, Contact,
'Farmer' AS Role FROM Farmer
UNION SELECT Name, Contact,
'Buyer' AS Role FROM Buyer;
```

	Name	Contact	Role
1	Harun Rashid	01801234567	Buyer
2	Kabir Hossain	01823456789	Buyer
3	Kamal Hossain	01767890123	Farmer
4	Lima Begum	01778901234	Farmer
5	Rafiq Ahmed	01745678901	Farmer
6	Rahima Khatun	01890123456	Buyer
7	Sabrina Khatun	01756789012	Farmer
8	Shafiul Islam	01789012345	Farmer
9	Shamim Reza	01834567890	Buyer
10	Sonia Begum	01812345678	Buyer

15) Farmers with Loan

```sql
-- Count function
SELECT Farmer.Name AS FarmerName,
Farmer.Contact As FarmerContact,
COUNT(Loan.LoanID) AS LoanCount
FROM Farmer
INNER JOIN Loan ON Farmer.FarmerID = Loan.FarmerID
GROUP BY Farmer.Name, Farmer.Contact
HAVING COUNT(Loan.LoanID) > 0;
```

	FarmerName	FarmerContact	LoanCount
1	Rafiq Ahmed	01745678901	1
2	Sabrina Khatun	01756789012	1
3	Kamal Hossain	01767890123	1
4	Lima Begum	01778901234	1
5	Shafiul Islam	01789012345	1

16) Land Locations and Associated Crop Names

```sql
-- **LEFT JOIN**
SELECT Land.Location,
Crop.CropName FROM Land
LEFT JOIN Crop ON
Land.LandID = Crop.LandID;
```

	Location	CropName
1	Rajshahi	NULL
2	Khulna	Chili
3	Rangpur	Wheat
4	Mymensingh	Potatoes
5	Mymensingh	Sugarcane
6	Jessore	Onions

17) Buyer Names and Associated Sale Amounts

```sql
-- **RIGHT JOIN**
SELECT Sale.SaleAmount,
Buyer.Name AS BuyerName FROM
Sale RIGHT JOIN Buyer ON
Sale.BuyerID = Buyer.BuyerID;
```

	SaleAmount	BuyerName
1	75.00	Rahima Khatun
2	120.00	Harun Rashid
3	50.00	Sonia Begum
4	80.00	Kabir Hossain
5	100.00	Shamim Reza

18) Farmers with Total Production Cost Greater Than 40

```sql
-- **HAVING Clause**
SELECT FarmerID, SUM(ProductionCost)
AS TotalCost FROM Crop GROUP BY FarmerID
HAVING SUM(ProductionCost) > 40;
```

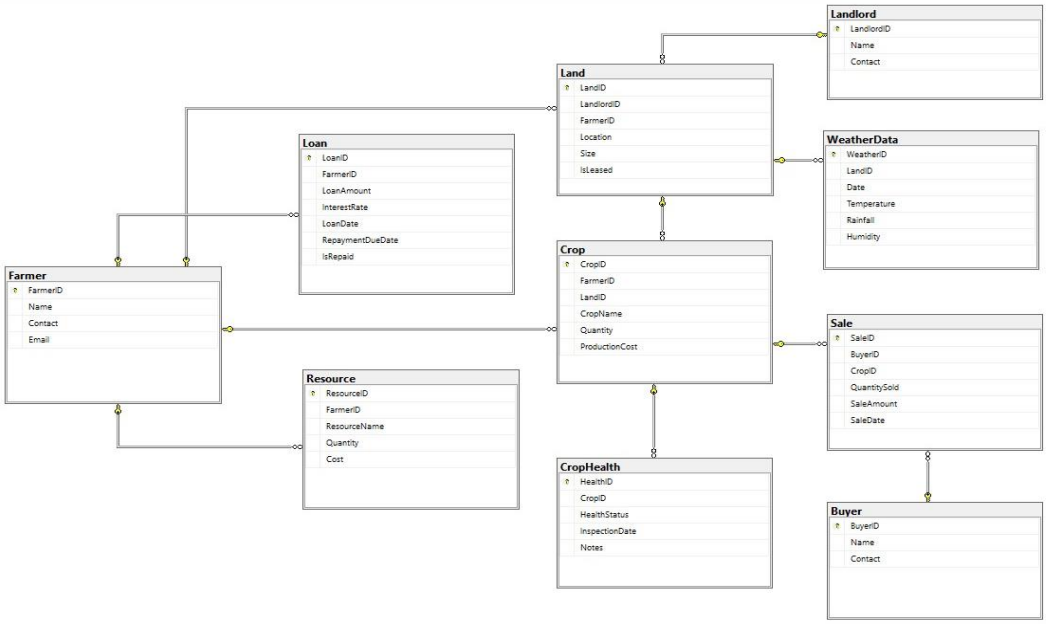
	FarmerID	TotalCost
1	2	55.00
2	3	90.00
3	4	70.00
4	5	105.00

19) Health Status of Crops for a Farmer

```sql
SELECT Farmer.Name AS FarmerName, Crop.CropName,
CropHealth.HealthStatus, CropHealth.Notes FROM Farmer
INNER JOIN Crop ON Farmer.FarmerID = Crop.FarmerID
INNER JOIN CropHealth ON Crop.CropID = CropHealth.CropID;
```

	FarmerName	CropName	HealthStatus	Notes
1	Rafiq Ahmed	Wheat	Healthy	No issues detected
2	Sabrina Khatun	Sugarcane	Moderate	Minor yellowing of leaves
3	Kamal Hossain	Chili	Diseased	Fungal infection found
4	Lima Begum	Potatoes	Healthy	Optimal growth
5	Shafiul Islam	Onions	Stressed	Water shortage observed

5. DATABASE DIAGRAM



6. CONCLUSION

The *Farmigo* project effectively demonstrates how a well-designed database can optimize urban farming operations. By integrating modules for land management, crop tracking, resource allocation, and sales monitoring, the system enhances data-driven decision-making for farmers and stakeholders. The streamlined structure and efficient queries ensure seamless management, enabling farmers to improve productivity and resource utilization.

References:

FAO Urban Agriculture: *https://www.fao.org/urban-agriculture*

W3School SQL: *https://www.w3schools.com/sql/default.asp*

ChatGPT*: https://chatgpt.com/*

Taranis*:* https://www.taranis.ag