Table Design – NutriRoot

Users Table

COLUMN	Type	Description
user_id	INT (PK)	Unique user identifier
name	VARCHAR(100)	User name
email	VARCHAR(100)	User email
password	VARCHAR(255)	Encrypted password
role	VARCHAR(20)	User role (Farmer/Admin)
created_at	DATETIME	Account creation time

Soil_Data Table

Column	Type	Description
soil_id	INT (PK)	Unique soil record ID
user_id	INT (FK)	Reference to User
nitrogen	FLOAT	Nitrogen level
phosphorus	posphorus FLOAT	Phosphorus level
potassium	FLOAT	Potassium level
ph	FLOAT	Soil pH value
moisture	FLOAT	Soil moisture (%)
temperature	FLOAT	Soil temperature (°C)
recorded_at	DATETIME	Date & time of reading

Crop Table

Column	Type	Description
crop_id	INT (PK)	Unique crop ID
crop_name	VARCHAR(100)	Crop name
ideal_n	FLOAT	Ideal nitrogen level
ideal_p	FLOAT	Ideal phospho rus level
ideal_k	FLOAT	Ideal potassium level
ideal_ph	FLOAT	Ideal soil pH

Fertilizer Table

Column	Type	Description
fertilizer_id	INT (PK)	Unique fertilizer ID
fertilizer_ name	VARCHAR(100)	Fertilizer name
nutrient_ type	VARCHAR(50)	N / P / K / Mixed
description	TEXT	Fertilizer details

Recommendation Table

Column	Type	Description
recommendation_id	INT (PK)	Recommendation ID
soil_id	INT (FK)	Reference to Soil_Data
crop_id	INT (FK)	Selected crop
fertilizer_id	INT (FK)	Recommended fertilizer
dosage	VARCHAR(100)	Recommended quantity
recommendation_date	DATETIME	Date generated

Alert Table

Column	Type	Description
alert_id	INT (PK)	Alert ID
soil_id	INT (FK)	Soil data reference
parameter	VARCHAR(50)	Parameter name
alert_message	TEXT	Alert description
alert_date	DATETIME	Alert time

Report Table

Column	Type	Description
report_id	INT (PK)	Report ID
user_id	INT (FK)	User reference
recommendation_id	INT (FK)	Recommendation reference
file_path	VARCHAR(255)	PDF file location
generated_at	DATETIME	Report generation time

TABLE NORMALISATION

First Normal Form (1NF)

A table is said to be in **First Normal Form (1NF)** if:

- Each table should have a **primary key**
- No **multi-valued** or **repeating attributes**
- All fields must contain **atomic (single) values**

Application in NutriRoot

- Each table (User, Soil_Data, Crop, Fertilizer, Recommendation, Alert, Report) has a **primary key.**
- Soil parameters (N, P, K, pH, moisture, temperature) are stored as **separate columns.**
- **No repeating groups exist**.

NutriRoot satisfies 1NF

Second Normal Form (2NF)

A table is in **Second Normal Form (2NF)** if:

- It is already in **1NF**
- All non-key attributes should depend on the **entire primary key**.
- There is **no partial dependency**

Application in NutriRoot

- Tables use **single-column primary keys.**
- Crop details are stored only in the **Crop table.**
- Fertilizer details are stored only in the **Fertilizer table**.
- Recommendation table references Soil, Crop, and Fertilizer using **foreign keys.**

NutriRoot satisfies 2NF

Third Normal Form (3NF)

A table is in **Third Normal Form (3NF)** if:

- It is already in **2NF**
- There is **no transitive dependency**
- Non-key attributes must depend **only on the primary key**.

Application in NutriRoot

- User details are stored only in the **User table.**
- Soil parameters are stored only in **Soil_Data.**
- Fertilizer information is not repeated in Recommendation.
- Reports reference recommendations using IDs instead of duplicating data.

NutriRoot satisfies 3NF.