NORMALIZATION OF THE DATABASE

1. FIRST NORMAL FORM (1NF)

A table is in 1NF if:

All values are **atomic** (no repeating groups)

Each field contains only **one value**

All records are **unique**

All your tables satisfy 1NF because:

FARMERS has single-valued fields (name, phone_number, location)

CROPS contains one crop per row

WEATHER_DATA stores only one set of measurements per record

CROP_REQUIREMENTS contains only one set of min/max ranges per record

ADVISORIES stores one advisory per row

Example (Good 1NF):

farmer_id	farmer_name	phone_number	location
1	John Karemera	078835…	Gasabo

No repeated values or multi-valued attributes.

2. SECOND NORMAL FORM (2NF)

A table is in 2NF if:

It is already in 1NF

Every non-key attribute fully depends on the whole primary key

Since all your tables use **single-column primary keys**, not composite keys, they **automatically satisfy 2NF**.

No partial dependencies exist.

Examples:

In FARMERS, farmer_name depends fully on farmer_id

In CROPS, crop_name depends fully on crop_id

In WEATHER_DATA, temperature depends only on weather_id

In CROP_REQUIREMENTS, min_temp depends on req_id

In ADVISORIES, advisory_message depends fully on advisory_id

Thus, **all tables are in 2NF by design**.

3. THIRD NORMAL FORM (3NF)

A table is in 3NF if:

It is already in 2NF

No transitive dependencies (non-key attribute depending on another non-key attribute)

Let's check each table:

FARMERS Table (3NF)

No attribute depends on another attribute.

farmer_name does NOT depend on phone_number

location does NOT depend on farmer_name

So FARMERS is in **3NF**.

CROPS Table (3NF)

No non-key attribute determines another.

crop_name does not determine season

season does not determine crop_name

So CROPS is in **3NF**.

WEATHER_DATA Table (3NF)

All fields depend on weather_id only.

- temperature, rainfall, humidity only depend on weather_id
- location does not determine humidity
- reading_date does not determine temperature

So WEATHER_DATA is in **3NF**.

CROP_REQUIREMENTS Table (3NF)

All weather requirement fields depend on req_id, not each other.

- min_temp does not determine max_temp
- max_rainfall does not determine min_rainfall

So it is also **3NF**.

ADVISORIES Table (3NF)

Check for transitive dependency:

- advisory_message depends only on advisory_id
- farmer_id, crop_id, weather_id are foreign keys
- No attribute depends on another non-key attribute

So ADVISORIES is in **3NF**.