**2.2.3. Conceptual Data Modeling of the new system**

This is data storing for our new system. Our project aims to empower farmers and enhance transparency in the export process through a digital platform. It focuses on providing detailed farmer profiles, transparent pricing tools, and real-time tracking, fostering direct connections. Additionally, our platform aims to facilitate exporters' access to diverse products, build trust through a rating system, and promote global marketing with a focus on sustainability and community initiatives. The overall objective is to contribute to the sustainable growth and global recognition of Ethiopian coffee and selit.

1. **Identifying main Entities:**

1. **Farmer:**

Role:

* Represents individuals or entities engaged in agriculture.
* Utilizes the platform to showcase cultivation practices and products.

1. **Exporter:**

Role:

* Engages in transactions with farmers for exporting agricultural products.
* Utilizes the platform for product discovery and negotiation.

1. **Product:**

Role:

* Represents the agricultural products available on the platform.
* Categorized based on region, flavor profiles, and processing methods.

1. **Transaction:**

Role:

* Captures the details of the transactions between farmers and exporters.
* Includes negotiation details and pricing information.

1. **Shipment:**

Role:

* Represents the physical movement of products from farmers to exporters.
* Provides real-time tracking information.

1. **Agent:**

Role:

* Represents individuals or entities assisting farmers in on boarding to the platform.
* Facilitates communication between farmers and the platform.

1. **Identifying Relationship between Entities:**

* Farmer and Exporter:

Relationship: Many-to-Many

Explanation: A farmer can **engage in** transactions with multiple exporters, and an exporter can **transact** with multiple farmers. This relationship signifies ongoing communication, negotiation, and collaboration between farmers and exporters regarding various aspects of products, including details about cultivation practices, quality standards, and pricing. It reflects a continuous and interactive engagement that goes beyond the formalities of individual transactions, promoting a deeper level of understanding and cooperation between the two parties.

* Agent and Farmer:

Relationship: Many-to-Many

Explanation: An agent can **assist** multiple farmers, and at the same time, a farmer can **seek assistance** from multiple agents. This Many-to-Many relationship signifies a flexible arrangement where agents can provide support to various farmers, and farmers can engage with different agents for assistance, fostering collaboration and diversified interactions within the platform.

* Transaction and Farmer:

Relationship: Many-to-One

Explanation: Multiple transactions can **involve** a single farmer, but each transaction is **associated with** a specific farmer. This relationship captures the history of transactions for each farmer.

* Farmer and Product:

Relationship: One-to-Many

Farmers should **have** one product, but each product could be **associated with** a many farmer.

* Exporter and Transaction:

Relationship: One-to-Many

Exporters can **engage in** multiple transactions, but each transaction **involves** a specific exporter.

* Product and Exporter:

Relationship: Many-to-Many

Explanation: An exporter can **handle** multiple products, and a product can be **handled by** multiple exporters. This relationship enables flexibility for exporters to deal with a diverse range of products.

* Exporter and Shipment:

Relationship: One-to-Many

Explanation: An exporter may **have** multiple shipments, but each shipment is **associated with** a specific exporter. This relationship allows exporters to manage and track multiple shipments.

* Product and Transaction:

Relationship: Many-to-Many

A product can be **involved in** multiple transactions, and a transaction can **include** multiple products.

* Transaction and Shipment:

Relationship: One-to-One

Each transaction is **associated with** a single shipment, capturing the movement of products.

1. **Identifying Attributes for each Entities:**
2. Farmer:

Farmer ID

Farmer Name

Contact Information

Biometrics

Verification Document

Account Status

Data of registration

Location

Financial support status

Grants Received

1. Exporter:

Exporter ID

Exporter Name

Contact Information

Verification Document

Account Status

Data of registration

Location

Product Detail

Transportation preference

Account Balance

1. Product:

Product ID

Quality

Quantity

Region

Desired Price

Date availability

1. Transaction:

Transaction ID

Amount

Purpose

Date

SenderID

ReceiverID

1. Shipment:

Shipment ID

Transporter Name

Departure date

Arrival date

Delivery status

Shipping cost

Service fee

Car Number

Product ID

1. Agent:

Agent ID

Agent Name

Address

Contact information

Location

Role

Degree Document

Experience

Agent fee collected.

Date of registration

Account Status

**2.2.3.1 Identifying Entity Type and Attribute**

**Attribute Data Types**

1. **Farmer**:
   * Farmer ID: Integer
   * Farmer Name: NVARCHAR
   * Contact Information: NVARCHAR
   * Biometrics: NVARCHAR
   * Verification Document: NVARCHAR
   * Account Status: NVARCHAR
   * Data of registration: DATE
   * Location: NVARCHAR
   * Financial support status: NVARCHAR
   * Grants Received: Integer
2. **Exporter**:
   * Exporter ID: Integer
   * Exporter Name: NVARCHAR
   * Contact Information: NVARCHAR
   * Verification Document: NVARCHAR
   * Account Status: NVARCHAR
   * Data of registration: DATE
   * Location: NVARCHAR
   * Product Detail: NVARCHAR
   * Transportation preference: NVARCHAR
   * Account Balance: MONEY
3. **Product**:
   * Product ID: Integer
   * Quality: NVARCHAR
   * Quantity: Integer
   * Region: NVARCHAR
   * Desired Price: MONEY
   * Date availability: DATE
4. **Transaction**:
   * Transaction ID: Integer
   * Amount: MONEY
   * Purpose: NVARCHAR
   * Date: DATE
   * SenderID: Integer
   * ReceiverID: Integer
5. **Shipment**:
   * Shipment ID: Integer
   * Transporter Name: NVARCHAR
   * Departure date: DATE
   * Arrival date: DATE
   * Delivery status: NVARCHAR
   * Shipping cost: MONEY
   * Service fee: MONEY
   * Car Number: NVARCHAR
   * Product ID: Integer
6. **Agent**:
   * Agent ID: Integer
   * Agent Name: NVARCHAR
   * Address: NVARCHAR
   * Contact information: NVARCHAR
   * Location: NVARCHAR
   * Role: NVARCHAR
   * Degree Document: NVARCHAR
   * Experience: NVARCHAR
   * Agent fee collected: MONEY.
   * Date of registration: DATE
   * Account Status: NVARCHAR

**KEYS**

The primary key is a column or a combination of columns that uniquely identifies each row in a table. The foreign key is a column or a combination of columns that refers to the primary key of another table. In the given entities, the primary keys and foreign keys are as follows:

* **Farmer**: The primary key is Farmer ID. There are no foreign keys.
* **Exporter**: The primary key is Exporter ID. There are no foreign keys.
* **Product**: The primary key is Product ID. ExporterID and FarmerID are foreign keys.
* **Transaction**: The primary key is Transaction ID. The foreign keys are SenderID and ReceiverID, which refer to the Farmer ID and Exporter ID in the Farmer and Exporter tables, respectively.
* **Shipment**: The primary keys are Shipment ID and ProductID . The foreign keys are ExporterID, AgentID and, FarmerID.
* **Agent**: The primary key is Agent ID. There are no foreign keys.

**ENTITY TYPES**

1. **Strong Entity**: A strong entity has a primary key and its existence is not dependent on any other entity. **Farmer, Exporter, Product, Transaction** and **Agent** are Strong Entities.
2. **Weak Entity**: A weak entity is an entity that cannot be uniquely identified by its own attributes alone. It needs to rely on a foreign key in conjunction with its own attributes to form a primary key. In our case **Shipment** is Weak Entity.
3. **Associative Entity**: An associative entity is used to relate two or more entities in a many-to-many relationship. In the conceptual data model five many to many relationships are identified. Based on the identification, there would be five associative entities.

* Agent-exporter
* Farmer-Agent
* Farmer-exporter
* Product-Transaction
* Exporter-Product

**Relationship Degree and Names between Entities**

* 1. **Farmer and Exporter:**

Name of Relationship:

* A farmer can **engage in** transactions exporters.
* An exporter can **transact** with farmers.

Degree: Binary

* 1. **Transaction and Farmer:**

Name of Relationship:

* An agent can **assist** farmers.
* A farmer can **seek assistance** from multiple agents.

Degree: Binary

* 1. **Transaction and Farmer:**

Name of Relationship:

* Transactions **involve** a farmer.
* Transaction is associated with a specific farmer.

Degree: Binary

* 1. **Farmer and Product:**

Name of Relationship:

* Farmers should **have** a product,
* product could be **associated with** a farmer.

Degree: Binary

* 1. **Exporter and Transaction:**

Name of Relationship:

* Exporters can **engage in** transactions.
* Transaction **involves** a specific exporter.

Degree: Binary

* 1. **Product and Exporter:**

Name of Relationship:

* An exporter can **handle** products.
* A product can be **handled by** exporters.

Degree: Binary

* 1. **Exporter and Shipment:**

Name of Relationship:

* An exporter could **have** shipments.
* Shipment is **associated with** a specific exporter.

Degree: Binary

* 1. **Product and Transaction:**

Name of Relationship:

* A product **involved in** transactions.
* A transaction **includes** products.

Degree: Binary

* 1. **Transaction and Shipment:**

Name of Relationship:

* Transaction is **associated with** a shipment.

Degree: Binary

**2.2.3.2 E-R MODELING**

