

Coffee Supply Chain Project Documentation

1. Introduction

The Coffee Supply Chain project is a blockchain-powered platform built on the Internet Computer (ICP) to ensure transparency, traceability, and efficiency in the coffee supply chain. This decentralized system enables farmers, roasters, retailers, and consumers to track coffee beans from farm to cup.

2. Problem Statement

The traditional coffee supply chain faces several inefficiencies and challenges:

- **Lack of Transparency:** Consumers and stakeholders lack visibility into the origins and journey of coffee beans.
- **Supply Chain Fraud:** Misrepresentation of coffee origins and certifications is prevalent.
- **Delayed Payments:** Farmers often experience payment delays due to intermediaries.
- **High Operational Costs:** Manual tracking and logistics increase costs for stakeholders.
- **Quality Concerns:** Difficulty in verifying the quality and authenticity of coffee beans.
- **Limited Access to Markets:** Smallholder farmers struggle to access international markets and receive fair pricing.

3. Value Proposition

This project aims to address these challenges by leveraging blockchain technology to offer:

- **End-to-End Traceability:** Track coffee beans from farms to consumers with immutable records.
- **Smart Payments:** Automate payments between stakeholders, reducing delays.
- **Supply Chain Integrity:** Ensure authenticity of coffee origins and certifications.
- **Marketplace for Auctions:** Enable direct trade between farmers and buyers.
- **Operational Efficiency:** Reduce manual processes through automation.
- **Enhanced Consumer Confidence:** Provide customers with verifiable data about their coffee's origin and quality.

4. Core Functionalities

a) Coffee Farm Management

- Register coffee batches with location, certifications, and timestamps.
- Track the journey of coffee beans through different processing stages.

b) Coffee Bean Processing

- Record roasting and processing details for traceability.
- Enable quality verification through certification records.

c) Smart Payments

- Automate payments between farmers, processors, and retailers.
- Ensure instant and secure transactions using smart contracts.

d) Retailer & Consumer Access

- Allow retailers to verify the authenticity and origin of coffee batches.
- Provide consumers with traceability insights via a QR code scanning system.

e) Auction Tracking System

- Enable real-time coffee batch auctions.
- Facilitate direct trade between farmers and buyers.
- Ensure transparent bidding processes.

5. Technology Stack

- **Blockchain Framework:** Internet Computer Protocol (ICP)
- **Smart Contracts:** Motoko
- **Frontend:** React.js
- **Database:** Stable storage on ICP canisters
- **Payment Integration:** Blockchain-based transactions

6. Conclusion

The Coffee Supply Chain project aims to revolutionize the coffee industry by integrating blockchain for transparency, fair trade, and efficiency. By leveraging decentralized technology, we empower farmers, businesses, and consumers with verifiable data, ensuring a fair and sustainable coffee supply chain.

