



BLOCKCHAIN BASED SUPPLY CHAIN TRANSPARENCY FOR AGRICULTURAL PRODUCTION

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Abstract : The agricultural supply chain faces major challenges such as lack of transparency, product adulteration, and inefficient tracking systems. This project proposes a Blockchain-Based Supply Chain Transparency System for agricultural production, enabling secure, decentralized, and tamper-proof tracking of products from farmers to consumers. Each stage of the supply chain, including farming, processing, storage, transportation, and retail, is recorded on a blockchain network. The use of QR codes allows consumers to verify product authenticity and trace its origin instantly. Smart contracts automate transactions, reduce middlemen involvement, and ensure fair pricing for farmers. The system enhances food safety, increases consumer trust, and improves supply chain efficiency. Overall, this solution provides a reliable and transparent agricultural ecosystem.

IndexTerms - Agriculture, Blockchain, QR Code, Smart Contracts, Supply Chain, Traceability, Transparency

I. INTRODUCTION

Agriculture plays a crucial role in the global economy, yet the supply chain remains inefficient and opaque. Consumers often lack information about the origin and quality of food products, while farmers face exploitation due to intermediaries.

Traditional systems rely on manual record-keeping, which leads to errors, fraud, and lack of accountability. In recent years, blockchain technology has emerged as a powerful solution to address these issues.

Blockchain provides a decentralized and immutable ledger that ensures transparency and security. By integrating blockchain into the agricultural supply chain, every transaction and movement of goods can be recorded permanently. This project aims to develop a blockchain-based system that enables real-time tracking of agricultural products, improves trust between stakeholders, and ensures fair pricing for farmers

II. OBJECTIVE

- To provide end-to-end transparency in the agricultural supply chain
- To enable traceability of agricultural products
- To reduce fraud and data manipulation
- To increase consumer trust in food quality
- To ensure fair pricing for farmers
- To improve food safety and contamination tracking
- To automate supply chain processes using smart contracts

III. LITERATURE SURVEY

Recent studies highlight the importance of transparency in supply chain management. Traditional systems lack proper tracking mechanisms, leading to inefficiencies and fraud.

Research on blockchain technology shows its effectiveness in ensuring data security and transparency. According to studies, blockchain-based systems eliminate data tampering and provide real-time tracking capabilities.

Existing agricultural systems fail to integrate advanced technologies, resulting in poor traceability. Blockchain-based solutions have been proposed to address these issues, but large-scale implementation is still limited.

This project builds upon existing research by integrating blockchain with QR code technology to provide an efficient and scalable solution for agricultural supply chains.

IV. METHODOLOGY

The proposed system follows a structured approach:

- Farmers register their products on the platform
- Each product is assigned a unique ID and QR code
- Every stage of the supply chain updates product details
- Data is stored securely on the blockchain
- Consumers scan QR codes to verify product history

The system uses blockchain platforms like Ethereum or Hyperledger, along with smart contracts for automation. Frontend technologies such as React.js and backend technologies like Node.js or Python are used for development.

V. EXISTING SYSTEM

The current agricultural supply chain follows this structure:

Farmer → Local Agent → Wholesaler → Distributor → Retailer → Consumer

Problems:

- Lack of transparency
- Manual record keeping
- No real-time tracking
- High dependency on middlemen
- Difficulty in identifying contamination sources

Disadvantages:

- High chances of fraud and data manipulation
- No product traceability
- Low trust among consumers
- Farmers receive unfair pricing
- Inefficient recall process during contamination

- Lack of automation

VI. PROPOSED SYSTEM

The proposed system introduces a blockchain-based tracking platform where every transaction is recorded securely.

Features:

- Blockchain-based data storage
- QR code-based product tracking
- Smart contract automation
- Real-time updates
- Transparent supply chain

This system eliminates intermediaries, ensures data integrity, and improves efficiency.

VII. MODULE DESCRIPTION

- Farmer Module: Registers crop details and generates QR codes
- Supplier Module: Updates processing and storage details
- Distributor Module: Tracks transportation data
- Retailer Module: Updates product availability
- Consumer Module: Verifies product history using QR code
- Blockchain Module: Stores immutable transaction records
- Smart Contract Module: Automates transactions and validations

VIII. SYSTEM REQUIREMENTS

Hardware Requirements:

- Computer or mobile device
- Minimum 4 GB RAM
- Internet connectivity

Software Requirements:

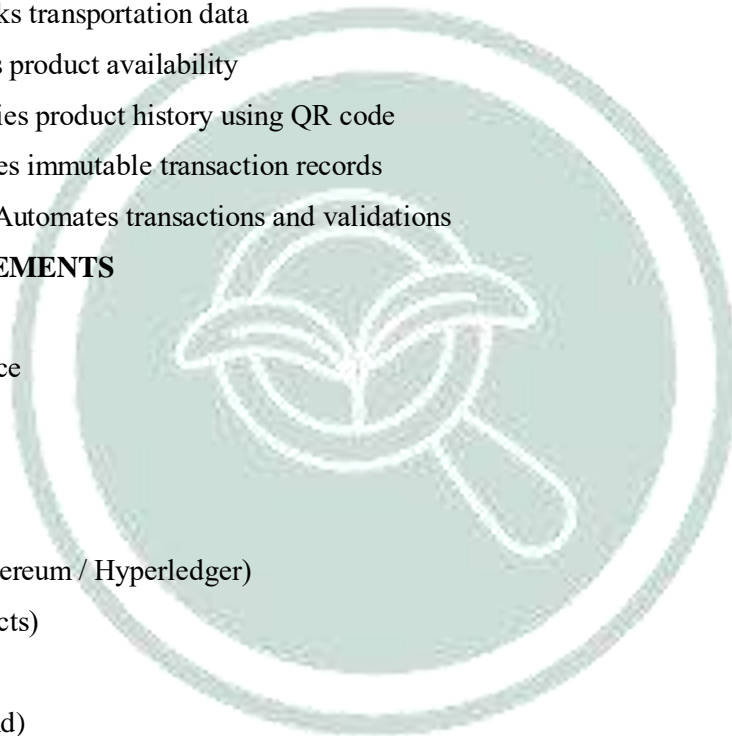
- Blockchain platform (Ethereum / Hyperledger)
- Solidity (for smart contracts)
- React.js (Frontend)
- Node.js / Python (Backend)
- MongoDB (Database)

IX. RESULT

The system successfully demonstrates the following improvements:

- Improved transparency
- Accurate product tracking
- Reduction in fraud
- Increased consumer trust
- Better supply chain management

The AgriChain application was developed with role-based dashboards for Farmers, Distributors, and Consumers. The following figures illustrate the key interfaces of the implemented system.



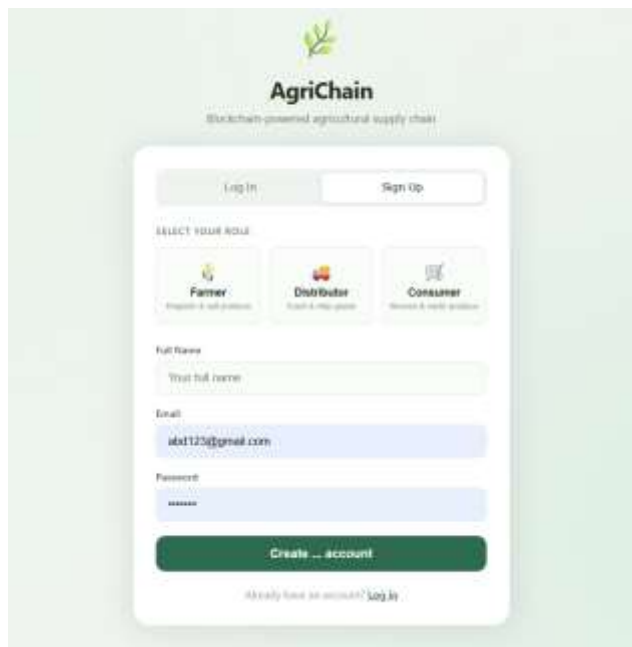


Fig. 1. AgriChain Login Page – Role Selection (Farmer, Distributor, Consumer)

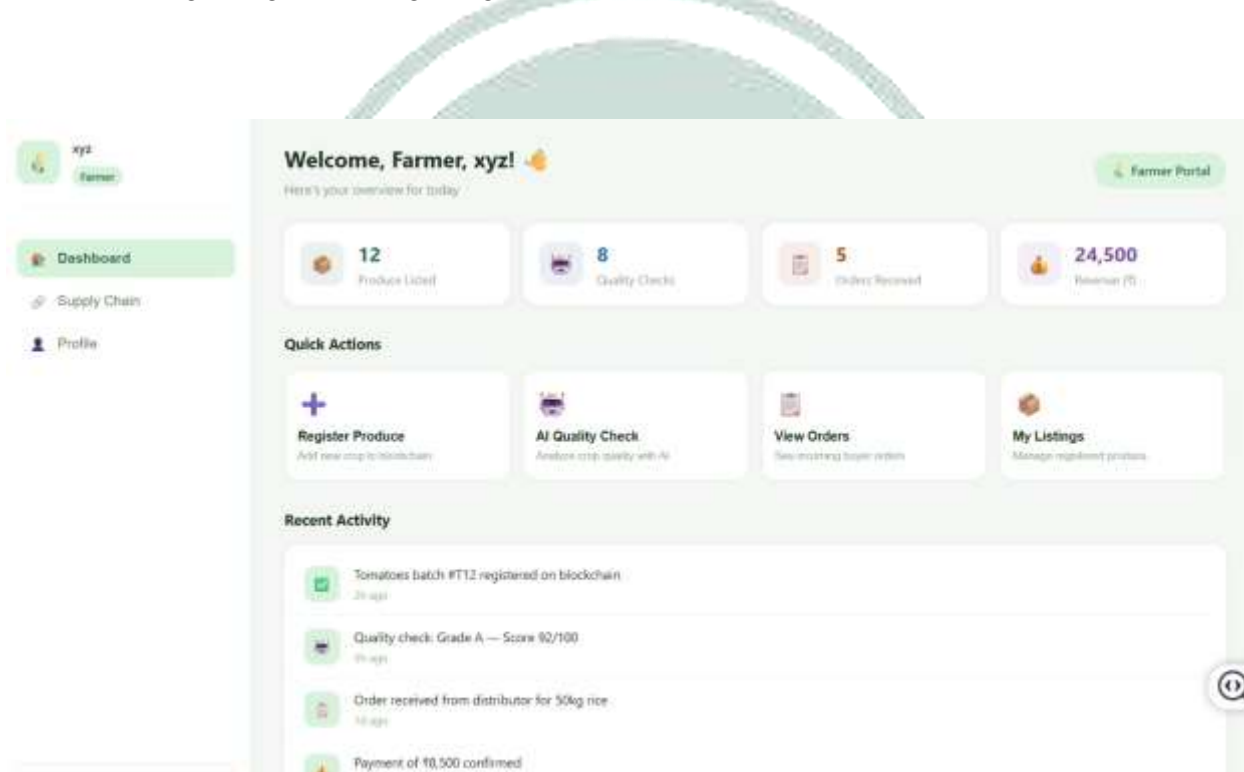


Fig. 2. Farmer Dashboard – Produce Registration and Quality Check Overview

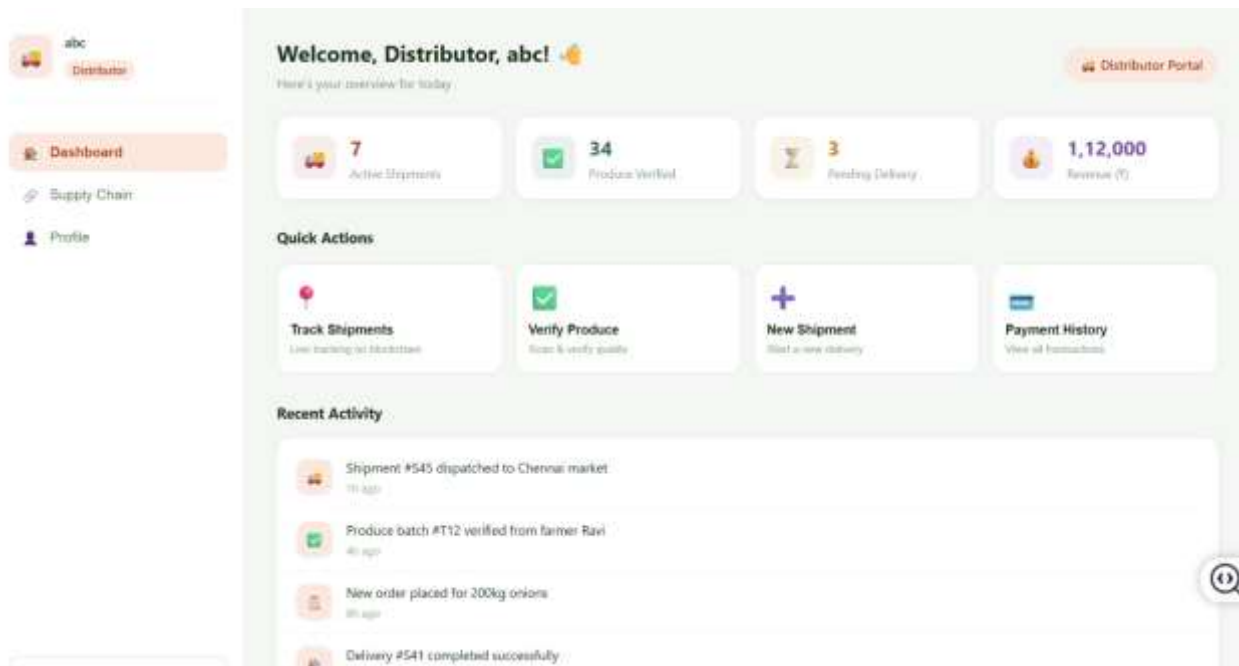


Fig. 3. Distributor Dashboard – Shipment Tracking and Revenue Overview

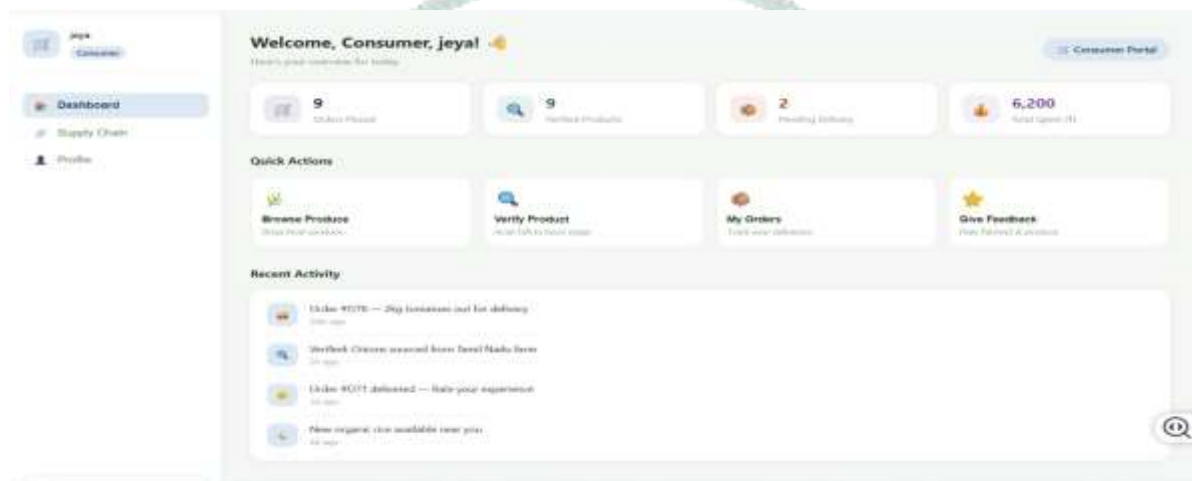


Fig. 4. Consumer Dashboard – Product Browsing and QR Verification Interface

X. CONCLUSION

The Blockchain-Based Supply Chain Transparency System enhances the agricultural ecosystem by ensuring transparency, security, and efficiency. It reduces fraud, improves food safety, and builds trust among consumers. By eliminating intermediaries and automating processes, the system ensures fair pricing for farmers and reliable product tracking. This project demonstrates the potential of blockchain technology in transforming traditional agricultural supply chains.

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