

# **Farmer Supply Chain Using Blockchain**

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**Abstract:** *Agriculture is one of the most vital sectors of the global economy, yet the agricultural supply chain suffers from inefficiencies, lack of transparency, and fraud, which reduce profits for farmers and affect consumers. Traditional systems involve multiple intermediaries, making product origin difficult to verify and data prone to manipulation. This paper proposes a **blockchain-based agricultural supply chain system** using a **C# desktop application**. By recording every transaction in an immutable ledger, the system ensures **transparency, security, and traceability** from farm to consumer. This approach minimizes middlemen, prevents data tampering, and builds trust among all stakeholders. The proposed system also enables **product verification** for consumers and fair compensation for farmers.*

**Keywords:** Blockchain, Ledger, Supply chain, Farming, Logistics

## **I. INTRODUCTION**

Agriculture remains a backbone for many economies, particularly in developing countries. Despite its importance, the current agricultural supply chain faces several challenges:

- Lack of transparency: Farmers often do not know how much their products will sell for or how intermediaries affect pricing.
- Difficulty in verifying product origin: Consumers cannot trace products back to the farmer, leading to trust issues.
- Data manipulation risks: Centralized databases can be altered, resulting in inaccurate records.
- Dependency on middlemen: Many intermediaries reduce the share of profit that reaches the farmer.

Blockchain technology, a decentralized and immutable ledger system, offers a solution. Every transaction is recorded in a block and linked to previous blocks using cryptographic hashing. This makes the data tamper-proof and traceable. A C# desktop application provides a user-friendly interface for farmers, distributors, retailers, and consumers to interact with the blockchain.

## **II. LITRATURE SURVEY**

### **Blockchain in Agriculture:**

Studies indicate blockchain improves transparency and reduces fraud in agri-food supply chains. Tian (2016) proposed a traceability system using RFID and blockchain to verify product authenticity.

### **Smart Contracts for Transactions:**

Smart contracts automate agreements between farmers and buyers. They ensure that payments are executed automatically when predefined conditions are met, reducing manual errors and disputes.

### **Existing Digital Supply Chain Systems:**

Many supply chain systems rely on centralized databases, which can be manipulated. Blockchain eliminates this risk by distributing the ledger across all stakeholders.

### **Desktop Applications in Agriculture:**

Desktop applications developed in C# provide an offline or low-bandwidth interface, ideal for rural areas with limited internet access.



**III. PROBLEM STATEMENT**

To create a transparent, secure, and efficient agricultural supply chain that reduces intermediaries, prevents data manipulation, ensures traceability, and enables fair profits for farmers.

**Module Interaction Diagram:**

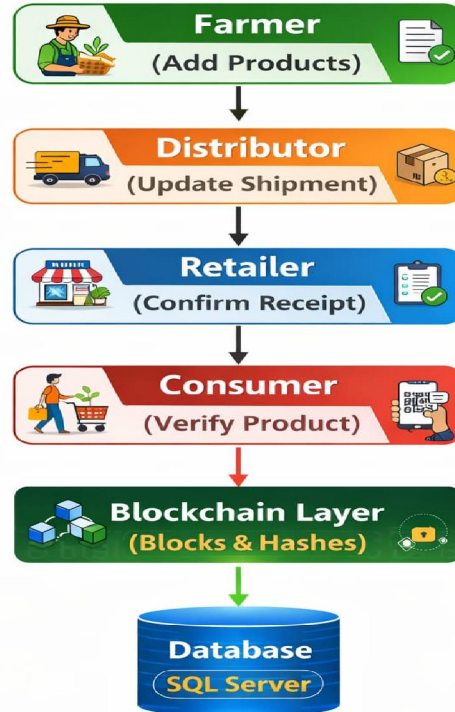


Fig.1

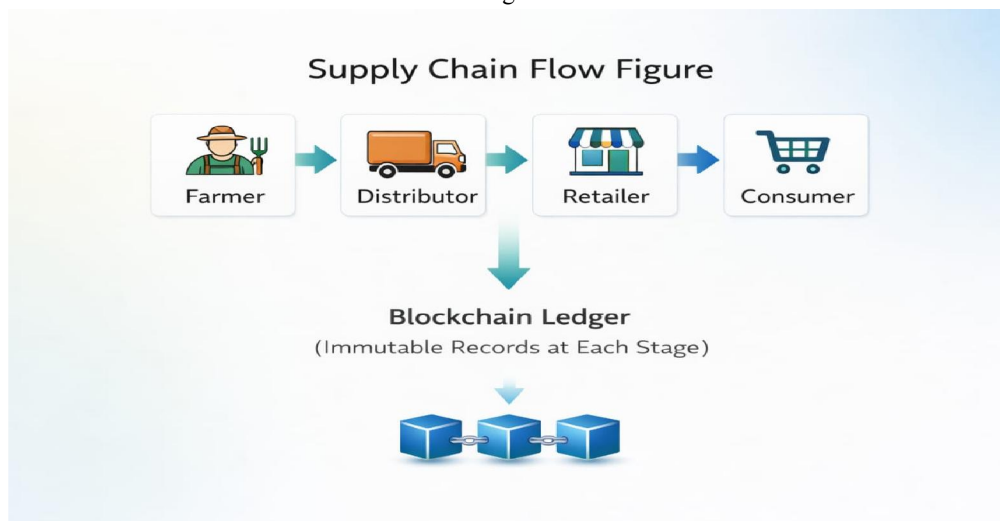


Fig.2



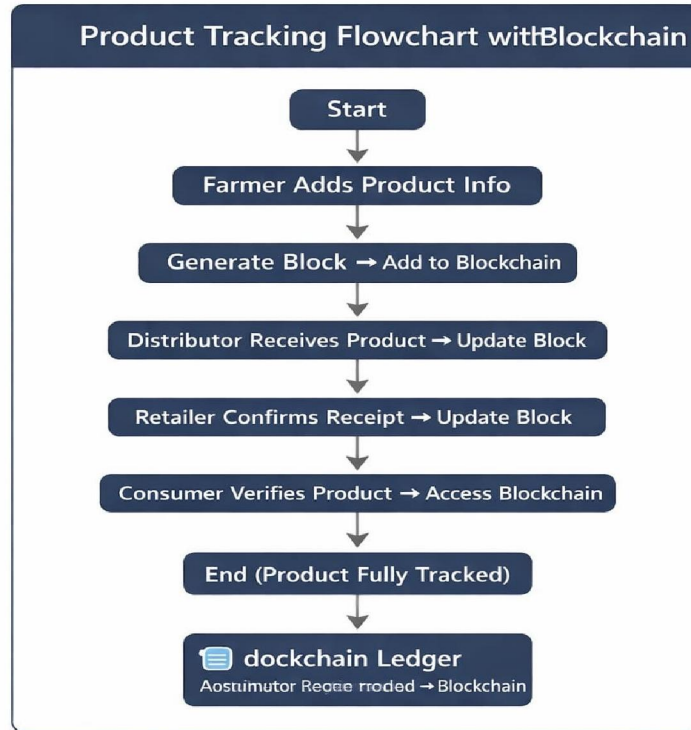


Fig.3








Blockchain Architecture Table	
Component	Description
 Block ID	• Unique identifier for each block
 Product ID	• Crop / product being tracked
 Transaction Details	• Stage of supply chain (Farmer → Distributor → Distributor → Retailer)
 Timestamp	• Date & time of transaction
 Previous Hash	• Hash of the previous block (links blockchain)
 Current Hash	• SHA-256 hash of current block data
 Blockchain Ledger	• Immutable records stored in blockchain

Fig.4



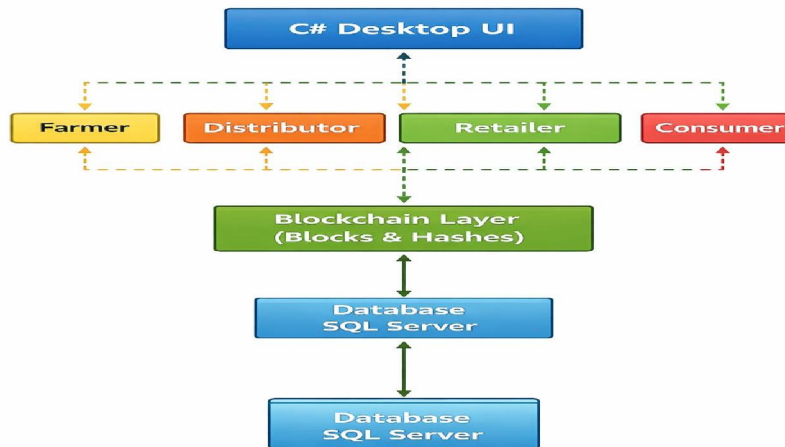


Fig.5

#### IV. BLOCKCHAIN-BASED FARM SUPPLY CHAIN

##### A. Architecture of the System

The proposed system consists of the following modules:

##### Farmer Module:

Register crops and add details (type, quantity, harvest date).

Upload products into the blockchain ledger.

##### Distributor Module:

Update shipment status.

Record transactions when products move to warehouses or retailers.

##### Retailer Module:

Confirm receipt of products.

Maintain inventory records on the blockchain.

##### Consumer Module:

Verify product origin and authenticity.

Scan product ID to see complete transaction history.

##### Blockchain Layer:

Each transaction creates a block containing:

Product ID

Farmer details

Transaction details

Timestamp

Previous hash

Current hash

##### Database Layer:

Stores supplementary information (farmer profile, crop details) for faster access.

##### B. Working Principle

A farmer adds crop information, generating a blockchain transaction.



Distributors and retailers update the blockchain at every stage of the supply chain.  
Consumers can verify the full history of a product.  
Each block links to the previous block using cryptographic hashing, making tampering nearly impossible.

## V. PROPOSED METHODOLOGY

### **System Development:**

Build a C# desktop application with separate dashboards for farmers, distributors, retailers, and consumers.

### **Blockchain Implementation:**

Implement SHA-256 hashing to generate unique block identifiers.

Each new block stores product transaction data, linked to the previous block.

### **Database Integration:**

Use SQL Server or SQLite to store non-critical data such as farmer profiles and product metadata.

### **Product Tracking:**

Monitor products from farm to consumer.

Each update creates a new block, ensuring transparency.

### **Simulation and Testing:**

Simulate a real supply chain scenario to test system efficiency and blockchain integrity.

## VI. EXPECTED OUTCOMES

Improved transparency: Every transaction is recorded and traceable.

Enhanced security: Immutable blockchain prevents fraud and manipulation.

Fair pricing: Reduced intermediaries increase profits for farmers.

Consumer trust: Verification of product origin ensures reliability.

## VII. FUTURE ENHANCEMENTS

IoT Integration: Sensors can monitor crop quality and automatically update blockchain records.

Mobile Application: Provide farmers with easy access to the system from rural areas.

Smart Contracts: Automate payments and agreements between stakeholders.

Government Integration: Link the system with agriculture departments for subsidies and regulations.

## VIII. CONCLUSION

Blockchain technology provides a reliable and transparent solution for agricultural supply chains. By integrating blockchain with a C# desktop application, farmers, distributors, retailers, and consumers can interact securely and efficiently. The proposed system ensures traceability, fairness, and trust while reducing dependency on intermediaries. This approach has the potential to revolutionize the agriculture sector and improve profits for farmers.

## REFERENCES

- [1]. Tian, F. (2016). *An agri-food supply chain traceability system for China based on RFID & blockchain technology*. 13th International Conference on Service Systems and Service Management (ICSSSM).
- [2]. Rejeb, A., Keogh, J.G., & Rejeb, K. (2020). *Blockchain in the Agri-Food sector: Applications, challenges, and opportunities*. Journal of Cleaner Production.
- [3]. Zhang, X., & Zhu, Q. (2019). *Blockchain technology for supply chains—A must or maybe?* International Journal of Production Economics.

