

**VIVEKANAND EDUCATION SOCIETY'S INSTITUTE OF
TECHNOLOGY**

Department of Computer Engineering



Mini Project Report on

**Blockchain-based Solutions for Tracking Food
Supply Chain**

Under the subject: Blockchain(Minors)

Year: B.E. Semester : VII

Submitted by

Sanskruti Nawander(38)

Under the guidance of

Lab Teacher

Mrs. Lifna C S

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Chapter 1: Introduction

The food supply chain is basically everything that happens to your food from the moment it's harvested until it reaches you. The problem is this chain is long, messy, and honestly shady sometimes. Farmers → middlemen → distributors → storage → retailers → consumers... and at any point, someone could tamper with the product, mislabel it, or store it improperly.

The result?

- Food fraud (fake / diluted products)
- Spoilage due to bad storage
- Zero traceability when contamination happens

This is where **Blockchain** steps in like the responsible elder sibling. Blockchain stores data in a distributed, tamper-proof ledger. Meaning once data is recorded, you can't secretly change it. So every step of the food journey gets **transparent, trackable, and verifiable**.

Goal of the Project:

To design a blockchain-based system that tracks food products across the supply chain, ensuring authenticity, reducing fraud, and improving consumer trust.

Chapter 2: Literature Survey

| Author / Year | Key Idea | Limitation |
|----------------------|---|---|
| Tian (2016) | Used RFID + blockchain for farm-to-table traceability. | RFID was costly & limited adoption. |
| Kamble et al. (2019) | Surveyed blockchain's potential to enhance food supply trust. | Mostly theoretical, lacking implementation. |

| | | |
|----------------------------|---|--|
| IBM Food Trust (2020) | Real industry blockchain network used by Walmart. | Requires enterprise onboarding. |
| Kouhizadeh & Sarkis (2021) | Showing blockchain reduces fraud in the supply chain. | Implementation challenges in developing countries. |

Gap Identified:

Most solutions are either enterprise-level and expensive, or only partially implemented. Needs a **simple, cost-effective, scalable** system for real supply chains.

Chapter 3: Requirements

3.1 Functional Requirements

- Record product details at each supply chain stage.
- Allow authorized stakeholders (farmer, distributor, etc.) to upload data.
- Let consumers verify product history.

3.2 Non-Functional Requirements

- Security → Data can't be altered once added.
- Transparency → Everyone sees history.
- Scalability → Should handle many products.
- Low latency → Fast data verification.

3.3 Hardware / Software

- **Hardware:** Laptop / PC
- **Software:**
 - Blockchain Network (Ethereum / Hyperledger / Polygon testnet)
 - Web Interface / Mobile App
 - Database for metadata (optional)
 - Languages: JavaScript, Node.js / Python

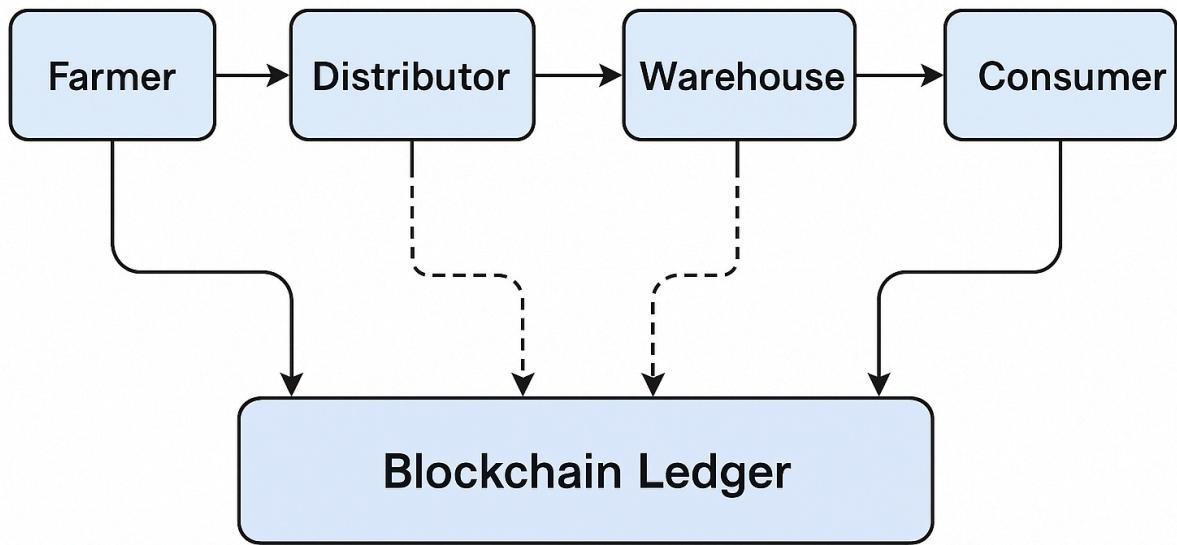
Chapter 4: Proposed Design

System Flow

Farmer → Distributor → Warehouse → Retailer → Consumer

Every stage updates product data on blockchain.

Block Diagram



Each node logs:

- Timestamp
- Product batch ID
- Quality info
- Location

Chapter 5: Implementation



Home Page

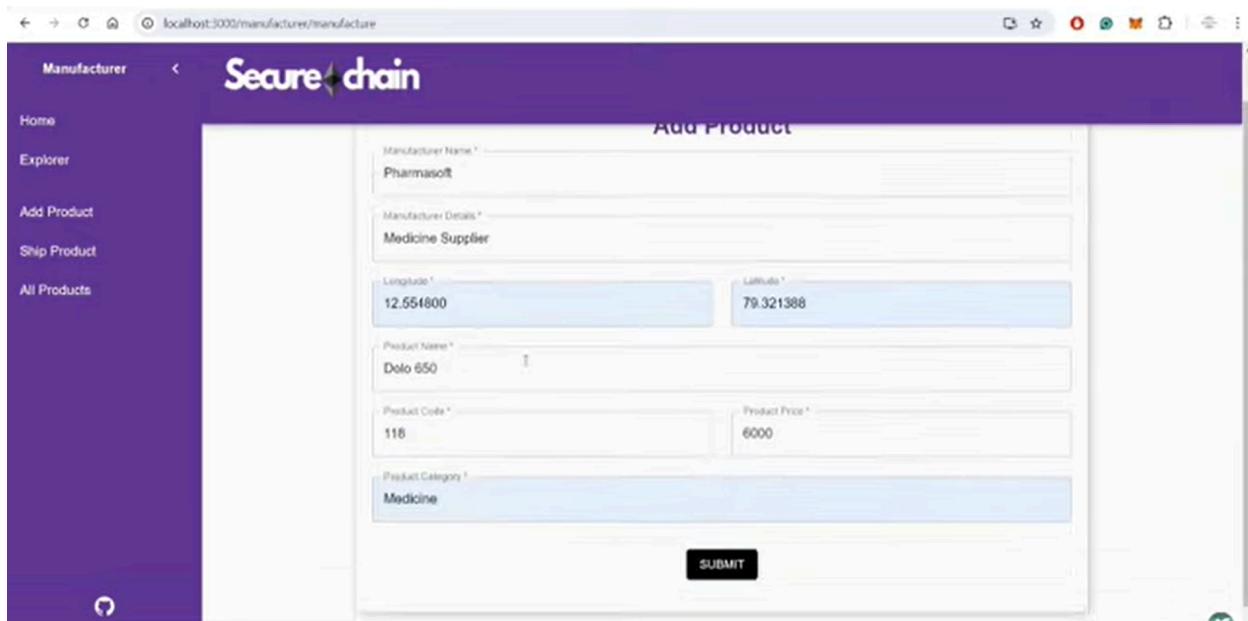
Displays a welcoming dashboard interface allowing users to navigate the platform. Designed to introduce the supply-chain transparency concept clearly.

A screenshot of the 'Securechain' interface showing the 'Add Roles' page. The left sidebar has 'Home' and 'Explorer' buttons. The main area has input fields for 'Enter Manufacturer Address' (containing '0x780C2BFc42a73F0BB7F960347FFBd79e3294faDF'), 'Enter Third Party Address', 'Enter Delivery Hub Address', and 'Enter Customer Address'. To the right, there's a wallet summary for 'Account 10' with 99.949 ETH, and a transaction history section titled 'Activity' showing three failed transactions: 'Add Man...', 'Ship By Th...', and 'Ship By Th...'. Below this is a 'Local Accounts' section listing two addresses: '0x780C2BFc42a73F0BB7F960347FFBd79e3294faDF' and '0x6cbEC229154DD77e3cB3525729acda811c1BDE17'.

Add Roles Page

This interface allows the admin to assign blockchain roles (Manufacturer, Third Party, Delivery Hub, Customer) using wallet addresses.

Each role is linked to a MetaMask account, ensuring only verified participants can interact in the supply chain.



The screenshot shows a web browser window with the URL `localhost:3003/manufacturer/manufacturer`. The page title is "SecureChain". On the left, there's a sidebar with links: Home, Explorer, Add Product, Ship Product, and All Products. The main content area is titled "ADD PRODUCT". It contains several input fields:

- Manufacturer Name *: Pharmasoft
- Manufacturer Details *: Medicine Supplier
- Longitude *: 12.554800
- Latitude *: 79.321388
- Product Name *: Dolo 650
- Product Code *: 118
- Product Price *: 6000
- Product Category ?: Medicine

At the bottom right is a "SUBMIT" button.

Add Product – Manufacturer Dashboard

This screen allows the manufacturer to register a new product with details such as name, type, price, and production location (latitude & longitude).

Once submitted, the product entry is permanently stored on the blockchain, forming the first traceable record in the supply chain.

The screenshot shows the SecureChain web application's product search feature. At the top, there is a purple header bar with the title "SecureChain". Below it, a sidebar on the left has "Home" and "Explorer" buttons. The main content area features a search bar with the placeholder "Enter Product Universal ID" and a magnifying glass icon. To the right of the search bar is a map showing a specific location in Kolkata, India, with various landmarks labeled like "Kharagpur", "Maheshkhali", and "Khulna". On the left side of the map, there is a detailed product card for a product with Universal ID 4. The card includes the following information:

| | |
|----------------------------|--|
| Universal ID : | 4 |
| SKU : | 4 |
| Owner : | 0x780C2BFc42a73F0BB7F960347FFBd79e3294faDF |
| Manufacturer : | 0x780C2BFc42a73F0BB7F960347FFBd79e3294faDF |
| Name of Manufacturer : | Pharmasoft |
| Details of Manufacturer : | Medicine Supplier |
| Longitude of Manufacture : | 12.554800 |
| Latitude of Manufacture : | 79.321388 |
| Manufactured date : | 1722331948 |

Below the card is a "MORE DETAILS" button. At the bottom of the page, there is a "Product History" section with a table header row containing columns for "Universal ID", "Manufacturer", "Date", "Product Name", "Price", "Owner", "Last Action", "Details", and "Receipt".

Search & Explore Product Journey

This page allows users to search any product using its unique blockchain ID and instantly retrieve verified details like manufacturer, origin, time, and current owner. A live map visualization is displayed alongside, showing the exact geolocation where the product was created, helping ensure transparency and trust in the product's journey.

The screenshot shows the SecureChain web application's product details interface. At the top, there is a purple header bar with the title "SecureChain". Below it, a sidebar on the left has "Home" and "Explorer" buttons. The main content area features a large modal window titled "Details" for a product with Universal ID 3. The modal displays the following product information:

| | |
|---------------------------|---|
| Universal ID: | 3 |
| SKU: | 3 |
| Owner: | 0x6cbECf29154d077e3c83525729acda811c1BDE17 |
| Manufacturer: | 0x780C2BFc42a73F0BB7F960347FFBd79e3294faDF |
| Name of Manufacturer: | Pharmasoft |
| Manufactured date: | Tue Jul 30 2024 14:57:20 GMT+0530 (India Standard Time) |
| Details of Manufacturer: | Pharmasoft |
| Longitude of Manufacture: | 12.554800 |
| Latitude of Manufacture: | 79.321388 |
| Product Name: | Vaccine 650 |
| Product Code: | 117 |
| Product Price: | 5000 |

At the bottom of the modal, there is a timestamp: "Tue Jul 30 2024 14:57:20 GMT+0530 (India Standard Time)". To the right of the modal, there is a smaller panel showing a map of the same location as the previous screenshot. Below the modal, there is a table with columns for "Last Action", "Details", and "Receipt". The table rows include "Manufactured", "Bought by Third Party", and "Shipped From Manufacturer", each with "DETAILS" and "RECEIPT" buttons.

Product Full Details Popup

This popup displays the complete blockchain-verified record of the selected product, including:

- Its unique universal ID and SKU
- Current owner and manufacturer address
- Manufacturing timestamp and exact geo-coordinates
- Full product specs such as name, category, and price

Chapter 6: Result Analysis

(Here you will insert pictures of your UI, Ganache screenshots, smart contract deployment, QR codes, etc.)

Example Photo Captions:

- *Figure 1: Smart contract deployed on test network*
- *Figure 2: Product batch creation interface*
- *Figure 3: QR code scanning verification page*

Showcase that:

- Every stage shows a timestamp.
- Data cannot be edited.
- Consumer sees complete traceability.

Chapter 7: Conclusion

Blockchain brings transparency and trust to the food supply chain. By recording every transaction in a tamper-proof ledger, it prevents fraud, reduces wastage, and reassures consumers about product authenticity. The proposed system is scalable and can be integrated with IoT sensors later for automation.

Future Scope:

- Integrate temperature/humidity IoT tracking.
- Add AI-based spoilage prediction.
- Government-scale deployment for agriculture.

References

1. Tian, F. "An information system for food safety based on HACCP, RFID and blockchain." 2016.
2. Kamble, S.S., Gunasekaran, A., Sharma, R. "Modeling blockchain adoption in supply chain." 2019.

3. IBM Food Trust Documentation. 2020.
4. Kouhizadeh, M., & Sarkis, J. "Blockchain practices, benefits and challenges." 2021.