Farm Product Tracking Using Blockchain

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Abstract— This project explores how we can secure farm-trader transactions by using the blockchain and providing a new supply chain platform that simultaneously handles multiple actors in the supply chain. It provides a new, well-defined data-based system that ensures data security and enables tracking features for the end user. We are trying to replace a traditional supply chain system with a new, advanced blockchain-based platform that ensures data integrity, privacy, and secure data access.

Keyword- Supply chain, Transaction, Blockchain, Integrity.

1. INTRODUCTION

Farm products are generally traded in local markets, and their details are not maintained properly. The whole process is offline and trader-centric, which also benefits a trader. All information is also stored at the vendor's end, and no central platform authority can verify it. So there is a very high chance of data manipulation in traditional systems. Traditional farmers just sell their products to traders, and then all details are stored at the trader's end without any verification. In this system, if the end-user wants details about a product, there is a chance that manipulated data is provided by the trader.

There are various advantages to our proposed architecture because it maintains data, and blockchain assures data tempering. so authenticated data is maintained in the supply chain from start to end. In the current scenario, the cost of maintaining data is very high because of the paperwork and its maintainability. There is a chance of tampering and corruption, and sometimes it is responsible for product price increments.
Platform is a full blockchain-based solution to traditional supply chain problems. We try to provide a single platform to farmers, traders, and consumers. This will help solv a basic data storage problem. We provide a single decentralized database to all. Platforms are generally built in regional languages, so they are easily used by any user. We want to build a platform that solves traditional supply chain problems and also makes the supply chain process easy, fast, and secure using blockchain technologies.

2. LITERATURE REVIEW

Smart contracts and blockchain technology have the potential to completely transform several industries, including supply chain management and logistics in the agricultural industry.

The literature study summarizes findings from seminal publications examining various aspects of supply chain applications of smart contracts and blockchain technology to begin we first outline four stages of blockchain adoption and highlight the necessity for matching social changes and regulatory adjustments. They then we on to examine the use of blockchain technology and smart contracts in supply chain management and logistics [1]. Although blockchain is praised for improving trust and transparency among supply chain actors, issues like scalability and information privacy still exist. To increase transparency, accountability, and auditability in supply chain processes, the paper promotes the integration of IoT devices and smart contracts, using empirical evidence to support blockchain-based systems.

Moving on to the management of the agricultural supply chain, we go into more detail on how important blockchain technology and smart contracts are to improving operational efficiency, traceability, and transparency, especially in developing nations like India

where issues with intermediary dependency are common [2]. Blockchain is recognized as a way to streamline direct transactions, cut expenses, and enhance supply chain traceability. The study suggests a test framework to improve agricultural supply chain traceability by utilizing smart contracts and Ethereum's blockchain.

In keeping with the research, we concentrate on contract production and the deployment of the Blockchain-Enabled Integrated Market Platform (BeIMP) [3], highlighting the platform's importance in policing contracts between farms and businesses, especially in Asian nations where small-scale farmers encounter difficulties gaining access to markets. BeIMP's capacity to transform contract farming methods is shown by its ability to provide safe and transparent transactions.

Finally, we examine how blockchain technologies such as Hyperledger, Ethereum, Corda, and Polygon can enhance agricultural traceability. With innovations like real-time tracking and industry-specific solutions like tea quality control, blockchain enables quick issue discovery, recalls, and quality upgrades. The suggested blockchain solution increases revenue and trust by ensuring authenticity and transparency.

3.How does blockchain work.

A blockchain is a decentralized and distributed ledger technology that allows transactions to be recorded in a secure and immutable manner.

A blockchain network consists of multiple nodes (computers) spread across the globe. These nodes work together to maintain the blockchain. When a transaction occurs, such as the transfer of digital assets like cryptocurrency or recording data, it is broadcast to the network.

The nodes on the network verify the validity of the transaction using consensus mechanisms, such as Proof of Work (PoW), Proof of Stake (PoS), or other consensus algorithms. The verification process ensures that the transaction is legitimate and conforms to the rules of the network. Verified transactions are grouped into blocks. Each block contains a certain number of transactions, along with a timestamp and a reference to the previous block, forming a chain of blocks - the blockchain.
Each block is secured using cryptographic hash functions. This ensures the integrity of the data within the block and makes it nearly impossible to alter or tamper with the information stored in previous blocks.

Once a block is created, it is added to the blockchain through a consensus mechanism agreed upon by the network. This process may vary depending on the blockchain protocol being used. Once a block is added to the blockchain, it becomes a permanent part of the ledger. This immutability ensures that the data recorded on the blockchain cannot be altered or deleted, providing a transparent and tamper-proof record of transactions. Every node on the network maintains a copy of the entire blockchain. This distributed nature ensures that no single entity has control over the data, making the blockchain resistant to censorship and single points of failure.

Depending on the blockchain protocol, nodes may receive rewards, such as cryptocurrency, for their contributions to the network, such as validating transactions or mining new blocks. A blockchain operates as a transparent, secure, and decentralized system for recording transactions and maintaining a tamper-proof ledger of digital assets or information.

4. PROPOSED SYSTEM

From the moment an order is placed until it is completed and the final payment is made, the supply chain tracking project follows a carefully designed technical flow [5]. Smart contracts control this transaction, starting from the moment manufacturers place an order and making sure all relevant information is safely stored on the blockchain. Then, when the manufacturer agrees to ship, smart contracts carefully monitor every stage, from dealing with suppliers to clearing customs, all the while preserving transparency and immutability.

When the manufacturer confirms that the shipment procedure is finished, the shipment company ends its involvement, and smart contracts help to finalize the shipment details. The manufacturer notifies customs and regulatory agencies at this point, requesting approval for the shipment, subject to the fulfilment of previous actions documented on the blockchain. When authorization is granted, smart contracts help with shipping processing, guaranteeing legal compliance and starting the latter phases of the transaction.

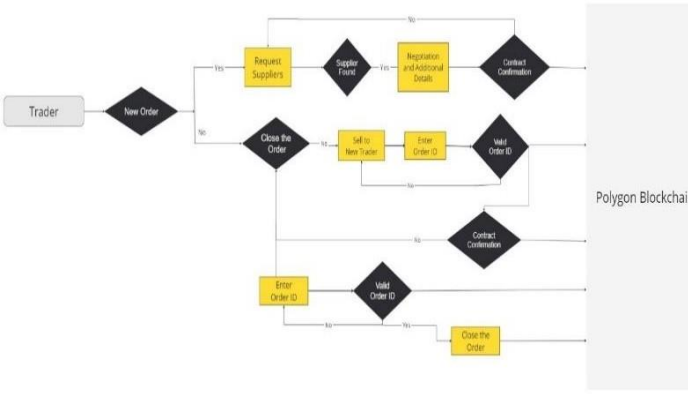

Fig. 1.1. Farmer System.

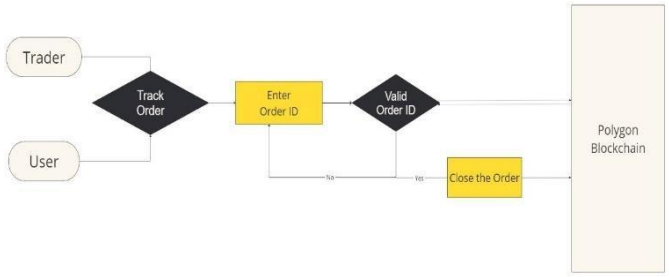

Fig. 1.2 Trader System.

As the features of blockchain like immutability, decentralized, encrypted data is collinear with the need of improvement in the existing system of storing health care documents, we can use it perfectly for the new proposed system which can give the user assurance that the documents are safe enough.

The paper signifies that there are two main entities present as patient and the doctor. The patient and doctor both can register on the platform as patient and doctor category with their own metamask wallet. Then the patients can store their documents on platform easily just by uploading the documents manually. Also the patient can see the different doctors which are registered on the platform and can give access to the specific doctor easily by taking their metamask wallet id. And the doctors can see on their side who has given the access to the documents and can easily check the previous documents of the patient and can give proper advise to the patient. If the patient feels like now there is no need of access to specific person or doctor he can easily remove the access of that person.

By implementing this system we can easily store the documents on non tamperable system and also provide paperless treatments or paperless visit to the doctor.

4. METHODOLOGY

The foundation of Agrichain's methodology is a methodical process that guarantees the smooth integration of blockchain technology for safe data management and traceability with ReactJS for frontend development. The approach consists of multiple crucial phases, starting with user classification and ending with blockchain-driven data processing, all meant to improve openness and productivity in the farming supply chain.

[4.1] User Categorization: Farmers, traders, and consumers are the three divisions that Agrichain divides its users into at the beginning of the program. This classification makes it easier to modify features and functionalities to fit the unique requirements and roles of different user segments. Farmers now have the option to publish their goods, traders can browse and engage with listed products, and consumers can access features such as traceability and transparent product information.

[4.2] Frontend Development with ReactJS: The JavaScript library ReactJS, which is well-known for its adaptability, scalability, and user-friendly interface, powers Agrichain's frontend development. ReactJS is utilized by Agrichain to provide a streamlined and user-friendly experience on several platforms and devices. Agrichain guarantees accessibility and user-friendliness for users at every point of the supply chain with interactive elements and responsive design.

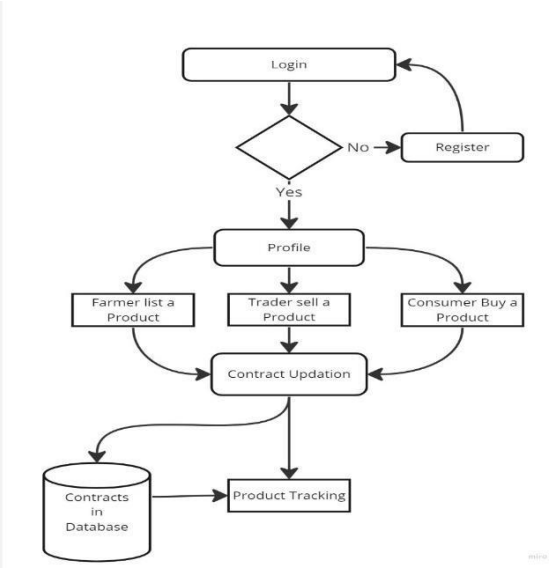

Fig 2 .1: Methodology .

[4.3] Blockchain Integration: Using blockchain technology to create a safe and unchangeable ledger of

product data is the cornerstone of Agrichain's methodology. Every product that is listed starts a new blockchain block that contains important data, like product description, farmer credentials, and transaction history. Agrichain guarantees data integrity and tamper-proof records throughout the product lifecycle by utilizing the decentralized architecture of blockchain technology and cryptographic security mechanisms.

[4.4] Single Block Data Management: Agrichain maintains a single block of data for every product that is listed, combining all pertinent details into a single, verified record. The blockchain block dynamically reflects changes made by farmers updating product details and traders accepting requests, giving a thorough picture of the food's journey from conception to consumption. With the use of the distinct blockchain ID, customers can easily obtain product information, reducing data redundancy and streamlining the tracking process.

Agrichain's methodology harmonizes frontend development with ReactJS and blockchain integration to deliver a user-centric platform that fosters transparency, trust, and traceability within the agricultural supply chain. By adhering to best practices in user interface design and blockchain implementation, Agrichain sets a precedent for innovation in agri-tech solutions, paving the way for a more resilient and sustainable food ecosystem.

6. RESULTS AND DISCUSSIONS

Successfully create a platform based on blockchain that provides a single medium for farmers, traders, and consumers. Because of our architecture, we can track any product at any point in the supply chain. Data is secure and tamper-proof, and the main target of empowering farmers is achieved by providing security and assurance to them. Your platform is simple and completely farmer-centric, so we created a platform that is easily used by farmers.

7. CONCLUSION

In conclusion, the implementation of Blockchain marks a significant advancement in the farm product supply chain. Also, we trying to give a single platform to farmers and traders so it maintains consistency and security throughout the process. We make sure of Data Security, Data Integrity, and tamper-proof data. Also using our platform may control corruption and the price of products it will give profit to farmers. so I conclude at the end that our suggested way of supply chain in farm products will give new direction to supply chain management and provide benefits to farmers in many ways.

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