

Agriculture Food Supply Chain Management using Blockchain Technology

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Abstract—Agriculture is the primary source of livelihood for about 58 percent of India's population. Agriculture supply chain is further complicated by fragmented inbound and outbound networks. It consists of multiple agents or intermediaries tapping into the marketing channel to realize a profit and successfully pass on the losses to the producer. Agricultural producers are facing multiple obstacles, from seasonal changes to the broken supply chain also their occupation is very laborious and demanding. Most of the losses produced here are due to misinformation, miscommunication and lack of trust between the different tiers. The proposed system uses blockchain technology which facilitates the transfer of data or useful information in a decentralized and transparent manner. The proposed system can have various nodes; shares information with them in the form of blocks. Each block is associated with hash value and contains transaction information verified by each node in the supply chain. The proposed system uses smart contract i.e. agreement between different parties that executes automatically without Third-party interference, which helps to build trust and transparency between them.

Keywords: Blockchain, Supply Chain Management, Smart Contract.

I. INTRODUCTION

The Supply Chain Management (SCM) is a group of processes and sub-processes carried out for transforming raw material into a final product, maximizing customer value and achieving a maintainable competitive advantage et al[1]. It is also interpreted as a network of entities that are part of the system from production to trading. The whole supply chain network is divided into several stages. Processes involved in these stages often take months to complete et al[2]. In such situation, if the final product lacks in quality, it becomes extremely difficult to track the root cause of the problem. The demand for top quality products and interest of end consumers in the provenance of data is

increasing rapidly. Therefore, it has become necessary for every supply chain system to track the movement of products from origin to the end consumers et al[3]. To gain end consumers' trust, the supply chain authorities have to be efficient and accurate in delivering information. Agriculture development is predicated by improvement in farm production and productivity, better utilization of agriculture inputs, proper marketing infrastructure and support, and also efficient food management. But currently traditional agriculture supply chain management facing many problems in terms of centralized network, lack of trust, less quality product and lack of communication. By introducing blockchain in traditional agriculture supply chain will overcome the problem that it is facing today. Blockchain is secure system that plays a significant role in evolution of supply chain with its inherent properties like decentralization, transparency and immutability.

Proposed system is based on cryptographic hash. It is a Decentralized and encrypted ledger system for storing transactions. the transaction may include the data like quantity, raw materials, etc., Several crop insurance schemes like the National Agricultural Insurance Scheme, can be maintained using Blockchain Technology for tamper proof records and for periodic checking of settlement of claims during crop losses. it eliminates the need for third-party representatives as smart contracts can be used to settle transactions. This ensures that the transactions and the identity of the user can never be compromised. If such a fraudulent transactions occurs, the decentralized mining system will block it to enter into the encrypted chain. Bringing transparency helps us in improving the processes involved in production. Traceability is also very important that we can know the source of the item including details like the producer details, harvested and produced time etc.

II. LITERATURE SURVEY

- Agricultural Supply Chain Management Using Blockchain Technology[4]

Published Year: 2020

Author: Bhagya Hegde et al[4]

Today, agricultural SCM System facing many obstacles. This paper explains how blockchain technology helpful for SCM to transfer the information in secured way. The Third-party interference in this aspect curbed using a data ledger which is reliable and incorruptible. It analyse the different ways in which blockchain technology can be incorporated in the agricultural supply chain, as a transparent and dependable transaction mechanism.

- A Theoretical Implementation: Agriculture- Food Supply Chain Management using Blockchain Technology[5]

Published Year: 2019

Author: S. Madumidha et al[5]

This paper Present a fully decentralized blockchain based traceability that enables to build blocks for agriculture that continuously integrate with IoT devices from provider to consumer. To implement, we introduced Provider-Consumer Network a theoretical end to end food traceability application. The objective is to create distributed ledger that is accessible by all users in the network that in turn brings transparency.

- Blockchain-Based Agri-Food Supply Chain: A Complete Solution[6]

Published Year: 2020

Author: AFFAF SHAHID et al[6]

In the proposed system, all transactions are written to blockchain which ultimately uploads the data to Interplanetary File Storage System (IPFS). The storage system returns a hash of the data which is stored on blockchain and ensures efficient, secure and reliable solution. system provides smart contracts along with their algorithms to show interaction of entities in the system. Furthermore, simulations and evaluation of smart contracts along with the security and vulnerability analyses are also presented in this paper.

- Blockchain technology in current agricultural

systems: from techniques to applications[7]

Published Year: 2020

Author: WEIJUN LIN et al[7]

In this paper provide a survey to study both techniques and applications of blockchain technology used in the agricultural sector. First, the technical elements, including data structure, cryptographic methods, and consensus mechanisms are explained in detail. Secondly, the existing agricultural blockchain applications are categorized and reviewed to demonstrate the use of the blockchain techniques. In addition, the popular platforms and smart contract are provided to show how practitioners use them to develop these agricultural applications. Thirdly, identify the key challenges in many prospective agricultural systems, and discuss the efforts and potential solutions to tackle these problems. Further, we conduct an improved food supply chain in the post COVID- 19 pandemic economy as an illustration to demonstrate an effective use of blockchain technology.

- Blockchain-Based Soybean Traceability in Agricultural Supply Chain[8]

Published Year: 2019

Author: KHALED SALAH et al[8]

The proposed system's solution eliminates the need for a trusted centralized authority, intermediaries and provides transactions records, enhancing efficiency and safety with high integrity, reliability, and security. The proposed solution focuses on the utilization of smart contracts to govern and control all interactions and transactions among all the participants involved within the supply chain ecosystem. All transactions are recorded and stored in the blockchain's immutable ledger with links to a decentralized file system (IPFS) and thus providing to all a high level of transparency and traceability into the supply chain ecosystem in a secure, trusted, reliable, and efficient manner.

III. LIMITATIONS OF EXISTING SYSTEM

The existing agricultural supply chain in India is highly fragmented. It consists of multiple agents or intermediaries tapping into the marketing channel to realize a profit and successfully pass on the losses to the producer. It is an age old system which has gone through years and years of customization. Owing to all the market

research done over the years, the system is highly efficient. It works because everybody knows where they stand. The farmers may sell to traders, both retailers and wholesalers. This depends on the type of produce grown. Example: commercial crops such as coconut and areca nut are sold to wholesalers or institutions like APMCs. Horticultural crops such as pineapples and other fruits are sold to retailers. Also, there exist secondary processors who will utilize the produce to create a product of their own.

Example: vanilla, cocoa. On failure of sale through other mediums, producers may sell the produce directly to the customers. There is lack of communication between the different tiers of the supply chain. Most producers, smallholders in particular, have limited knowledge about markets, pricing, and quality control and in general are uninformed. The market research done by the higher tier players of the supply chain who sell directly to the consumers is not shared with the lower tiers. Thus the production and transfer of inventory is not efficient and leads to wastages. There are a lot of price and demand fluctuations during the sale of these goods. The prices see a dip during the harvest season since there is an abundance of produce. Though there is a high demand, wastage can be observed. But the price soars during the off season. Thus goods stored in cold chains are sold with high profits. But the demands may not be met since there is not enough inventories to be sold. This is due to the uninformed decisions made by the lower tier players/farmers who did not invest in or sell to cold chain logistics. Thus, the lack of transfer of information has been the main cause of this shortcoming.

IV. PROPOSED SYSTEM

Proposed system is secure that provide encryption for all transactions. It is a Decentralized in means of sharing information to all peer of network. it eliminates the need for third-party representatives as smart contracts can be used to settle transactions without interference of third party. All participants of network will able to trace the information. the Ethereum blockchain and smart contracts efficiently perform business transactions tracking and traceability across the agricultural supply chain. that eliminates the need for a trusted centralized authority, intermediaries and provides transactions records, enhancing efficiency and safety with high integrity, reliability, and security. the

farmer creates the smart contract. The farmer then agrees to the purchase terms with one of the registered companies. After this stage both party agrees on the contract parches will be by side of company. The all transaction information is permanently saved on blocks and it will available as readable format to all parties involved in network. Modification of transaction by every peer is chained with blocks. At the end customer will able to access all information and will satisfy with the product purchase.

V. SYSTEM ARCHITECTURE

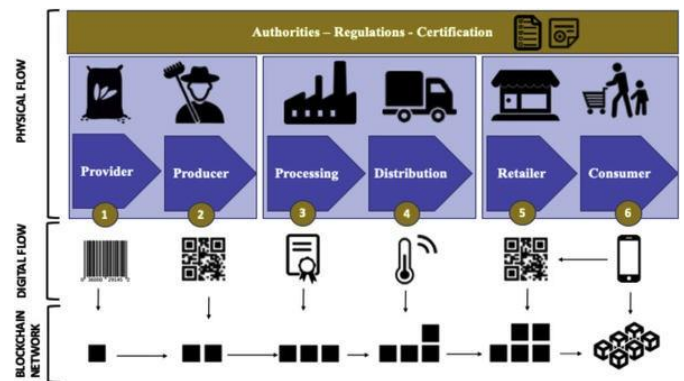


Fig. 1. System Architecture

VI. ADVANTAGES

- Producers will have security. They will be able to receive a reasonable percent of profit. They will have knowledge regarding the various factors affecting their crops (i.e., unprecedented seasonal changes, soil quality, water availability, etc.) and thus will be able to take well informed decisions.
- Traders can eliminate competition.
- Processors will be able to procure goods they specifically want for the product they are trying to produce and also control the quality from the bottom up.
- Traceability: Players in different tiers can be held responsible for any damages.
- Increase in multidirectional information transfer.
- All increase in efficiency: Only required amount of goods will be produced thus decreasing wastages and

increasing profits.

VII. LIMITATIONS

- Technological knowledge of many stakeholders is of low level.
- Products throughout the chain undergo many transformations.
- The roles and business of the large number of stakeholders involved are extremely heterogeneous.
- The food supply chain is distributed to large geographical areas, even in different continents across the globe, a fact that poses significant interoperability and deployment obstacles.

VIII. CONCLUSION

By employing blockchain in different aspects of the Indian agricultural supply chain, many problems found, can be cleared up. Data collection, verification, storage and transfer will be done in a transparent and reliable manner. Usage of which will lead to increase in efficiency, decrease in wastage and overall improvement in the industry.

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