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Block chain Based Agri-Food Supply Chain Management

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ABSTRACT

It is very difficult to a track of Food item Cost and maintain its traceability during whole Supply Chain Network. The previously used supply chains are centralized and they have to depend on a third party for trading purpose .so these centralized systems results in lack of transparency, accountability and auditability. In this project we have implemented a blockchain based agri-food supply chain management system where the agri-food transactions will be maintained on distributed Servers by using the block chain technology. We have proposed the Completely transparent system for Consumers. The consumer will be able to view whole transaction history from Farmer to Retailer, view all details about the product and can make necessary decision based on this information.

Keywords— Introduction, objectives, supply chain, traceability, transparency, credibility, centralized.

I. INTRODUCTION

The supply chain management System is the collection of processes and various other sub-processes performed for transformation of Raw crops into a Final Product,which aims to maximize customer value and to achieve a maintanable competative advantage. It is also Explained as a network of multiple entities that are involved in the system from production to trading of Final product. The complete supply chain network is split into several stages. Processes involved in these stages often take several weeks to complete. In such situation,if the final product results in poor quality product,it gets very challenging to identify the root cause of problem. The demand for high quality product and interest of consumers in origin of data is increasing rapidly. Therefore, it has become essential for every supply chain system to have control over the every movement of product from origin to Consumer. To acquire the trust of consumers, Supply chain authorities must be efficient and accurate in the delivery of information. It is also necessary for the suply chain authorities to comply with integrity,quality and credibilty of entire supply chain process. Various regulatory authorities have enforced standards for maintaining good quality,transparency ,Security and for maintaining traceability of supply system.several countries have strictly enforced these standards. The Government of Canada has enforced the use of tags and bar codes to identify the origin of products. Similar enforcements are implemented by The Government of China. The objective of these regulations is to improve transparency of traceability systems and to make sure that high quality product is being produced.

Along with the responsibility of maintaining traceability, Supply chain management systems can also act as a gateway for trading of products. These systems add more complexity to the network architecture because very huge amount of trasactional data is processed by these systems. There is risk involved for false or inaccurate representation of information as these networks are generally centralized.There is a lack of trust and credibilty due to their centralized service arcitecture.

II. OBJECTIVE

A. To satisfy the demands of a growing population for more high-quality food and provide advance technological Solutions to meet changing consumer needs

B. To develop an online agro-shopping application on which the farmers will be able to sell their crops/products to food processer

C. To implement blockchain technology for storing transactions in transparent way

D. To maintain transparency between farmers, processors,

III. LITERATURE SURVEY

In the literature survey section, we discuss and analyze related schemes proposed for improvement of Agri-Food supply chain system and accentuate the differences to our proposed solution. Regarding safety of food in recent times is a growing issue for commercial and academic industries. Most of the solutions till date are centralized and result in serious problems such as fraud, tampering and man-in-the-middle attack. Therefore, this section has introduced several blockchain-based traceability and information security in Agri-Food supply chain systems. Hereof, author in has proposed a traceability scheme based on Hazard Analysis and Critical Control Points (HACCP), block chain and IoT. Furthermore, blockchain having it's advantages as well as disadvantages itself, i.e., it lacks scalability when data increases to a certain level. In this regard, Big Chain DB is

used to fill the gap which provides a scalable solution. The proposed solutions then applied to an example scenario to show the significant transparency and efficiency and how it favors HACCP regulations. However, the proposed scheme does not define the current ownership details of products. According to the authors, tracing the origin of products in supply chain must be transparent, tamper-proof and adaptive to the changing environments. Therefore, they have designed an origin-chain that uses private and public blockchain. As blockchain has limited storage, origin chain stores the data on chain and off chain. On-chain storage includes the hashes of data while off chain storage has the raw files and addresses of smart contracts. Additionally, they have also conversed about the adaptability of the solution and concluded that the blockchain is a better option for traceability in SCM. However, security and privacy are the main concerns. In this regard, authors in have introduced blockchain-based food information security in SCM. In last 20 years, It is being reported that the food epidemic incident, like in Europe (2001) the foot-and-mouth Disease, (2006 in USA)the Escherichia coli in spinach, the Sanlam milk scandal inching (2008), the E.coliO104:H4 outbreak in Germany (2011), South African listeriosis outbreak (2017–2018), etc. Health organizations and Government, in a bid to stop such dangerous outbreaks, have established on point directives, laws as well as standards and regulations. For example, in Europe, the food product's traceability is compulsory according to the European Directive 178/2002 since 1 January 2005, together along with the HACCP (Hazard Analysis and Critical Control Points) principles. Likewise, the regulations have been established pointing to diminish food epidemic incidents all over the world. In this case they are called miners,as it is required for computer nodes,are used tocalculate difficult tasks before validating transactions and be able to sum up to the blockchain. To solve the puzzle bundles that to the block to the chain first miner is used, which is validated by the rest, and gets rewarded with minted coins plus a small transaction fee.

IV. SYSTEM MODEL

On this section, we describe our proposed answer. We have provided a traceability scheme for digitally tracking agri-food merchandise from beginning to quit purchasers. Our system introduces a trading and transport mechanism to allow relaxed trading among entities of agri-food supply chain. The proposed version follows a layered architecture and is classified into three layers. The first layer, i.e., data layer, handles the interactions among entities of agri-food deliver chains. These interactions contain the trading of merchandise together with a evidence of an auditable shipping. The second one layer is the blockchain layer that handles the transactional statistics of the buying and selling and transport activities. Also, it continues track of the reputation of the entities involved inside the system. To enhance garage skills, the blockchain layer simplest maintains the hashes of the data and the actual facts is saved at the 1/3 layer, i.E., garage layer. The blockchain layer enforces strict get admission to manipulate techniques to prevent unauthorized reads and writes to the storage layer. The 1/3 layer is basically the garage layer and is solely answerable for storing the transactions' and events' data of blockchain on ipfs. As, ipfs is a decentralized garage medium, it leverages the proposed device with excessive throughput, low latency and scalability.

Traceability :

Supply chain systems contain a big wide variety of entities to carry out the entire procedure of production and transportation of agri-meals products from origin to the quit customers. Therefore, it is cumbersome to song and hint the complete process. So that you can achieve whole traceability, we document the buying and selling transaction from initiation, add the product's precise identification and lot wide variety to every succeeding transaction.

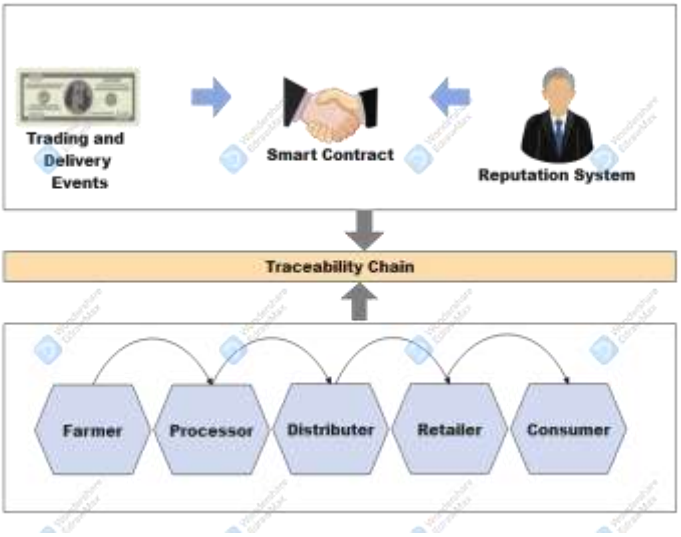

FIGURE 1. Blockchain-based end to end solution for agri-food supply chain

A) Farmer: a farmer is the primary entity in agri-meals supply chain and is the first one to invoke smart settlement for buying and selling. Farmer produces big quantity of vegetation and take the obligation for assuring and monitoring the vegetation' growth information. He sells those plants to the processors.

B) Processor: a processor buys the plants from farmers. He's answerable for putting off greater material from the crops and converting them right into a finalized product. Processor sells this finalized product to vendors

C) Distributor: a distributor continues a warehouse with the aid of buying finalized merchandise from processors and is chargeable for selling it to the outlets.

D) Retailer: a retailer buys the completed traceable products from distributors and sells them to clients in smaller quantities.

Traceable product refers to specific identifiers of the goods that allow monitoring the provenance records.

E) Consumer: client is an give up consumer who buys and consumes the goods from retailers. A purchaser verifies the credibility of a dealer via reputation machine earlier than shopping for the product.

Trading and delivery:

Earlier than discussing the trading and shipping mechanism, shall we recollect a situation while stop purchaser has no longer yet initialized the transaction and wants to recognise the marketplace recognition of traders. For this motive, popularity system is proposed as

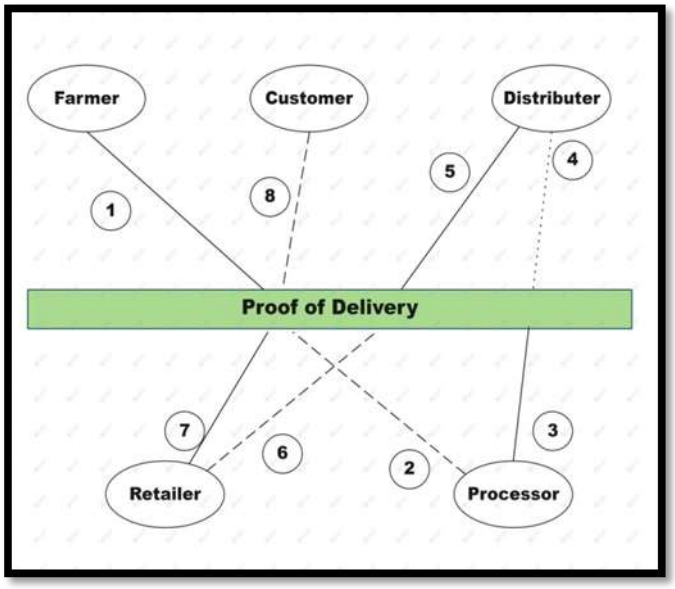

FIGURE 2. Trading and delivery mechanism

In the buying and selling and transport mechanism, i.e., product owner, lc and client. Wherein, product owner is the only who sells the product in deliver chain; lc is the courier service that transfers the goods; and client, as call depicts, is the one who desires to spend ethers to buy a product. The lc as cited earlier is a registered entity of the system. In case of disputes at some point of transactions, arbitrators are responsible for off-chain agreement of the disputes. But, figure2 represents the buying and selling and delivery model. With the intention to perform the trading process, before everything, the trad- ing entities are registered to the clever contract ,i.e., rc and authenticated using their ethereum addresses.

Supply Chain Management in Block chain :

Deliver chain structures involve a massive quantity of entities to perform the entire manner of production and transportation of agri-food merchandise from foundation to the end purchasers. Therefore, it's miles cumbersome to song and hint the entire manner. That allows you to obtain complete traceability, we record the trading transaction from initiation, add the product's precise identity and lot range to each succeeding transaction and file the hashes to hold hash chain

- Product deliver chain transactions might be maintained on allotted servers inside the form of blocks
- The blocks might be maintained in series so that the client can view whole product fee information

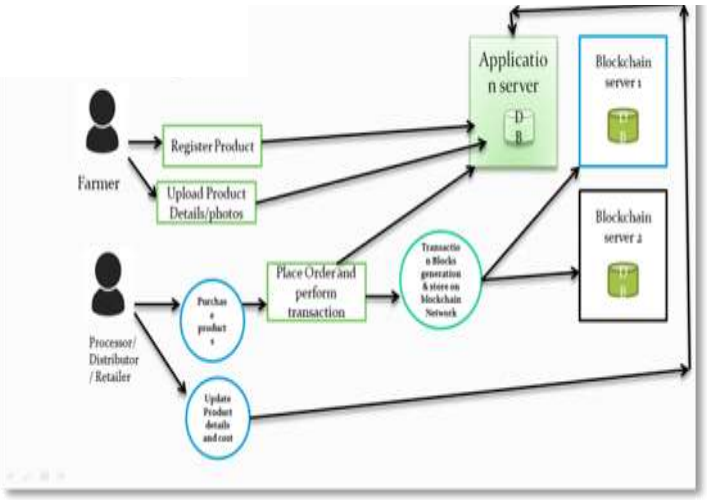

FIGURE 3. Supply Chain Management in Blockchain

CONCLUSION

With the use of blockchain technology, supply chain industry has many benefits such as Decentralization of data and transactions, trust of all users, and traceability of products. It is difficult to completely maintain trust between the buyer and seller of the product. Because the users may act maliciously, so the buyer can doubt their quality. Supply chain consist of multiple processes and sub processes that need to be carried out in a decentralized way in order to achieve accountability, security, and traceability. In this paper, we have proposed a blockchain based solution for agri-food supply chain. We have described information of proposed solution in terms of traceability, trading, and reputation. We have carefully analyzed and evaluated the performance of the programs stored on blockchain that runs when predetermined conditions are met to make sure that the proposed solution is robust and efficient. The system is proposed to maintain quality rating of the products and to maintain the

credibility of the food supply chain users. It maintains the integrity of data and transactions. It also maintains immutability of transactions and data as transactions are part of blockchain.

To conclude, for the successful implementation, this system should empower the following: (i) increase trust (ii) increase transparency (iii) reduce cost (iv) reduce risk. Stakeholders will adopt a new way of working only when they are convinced that the proposed solution increases productivity, brings benefit, and is user friendly. Considering all of the above points, it is clear that reinforcement of new technology in the traditional sector of agriculture is an excessive challenge, which should be carried out systematically and by efficiently engaging the directly affected users or stakeholders across the supply chain.

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