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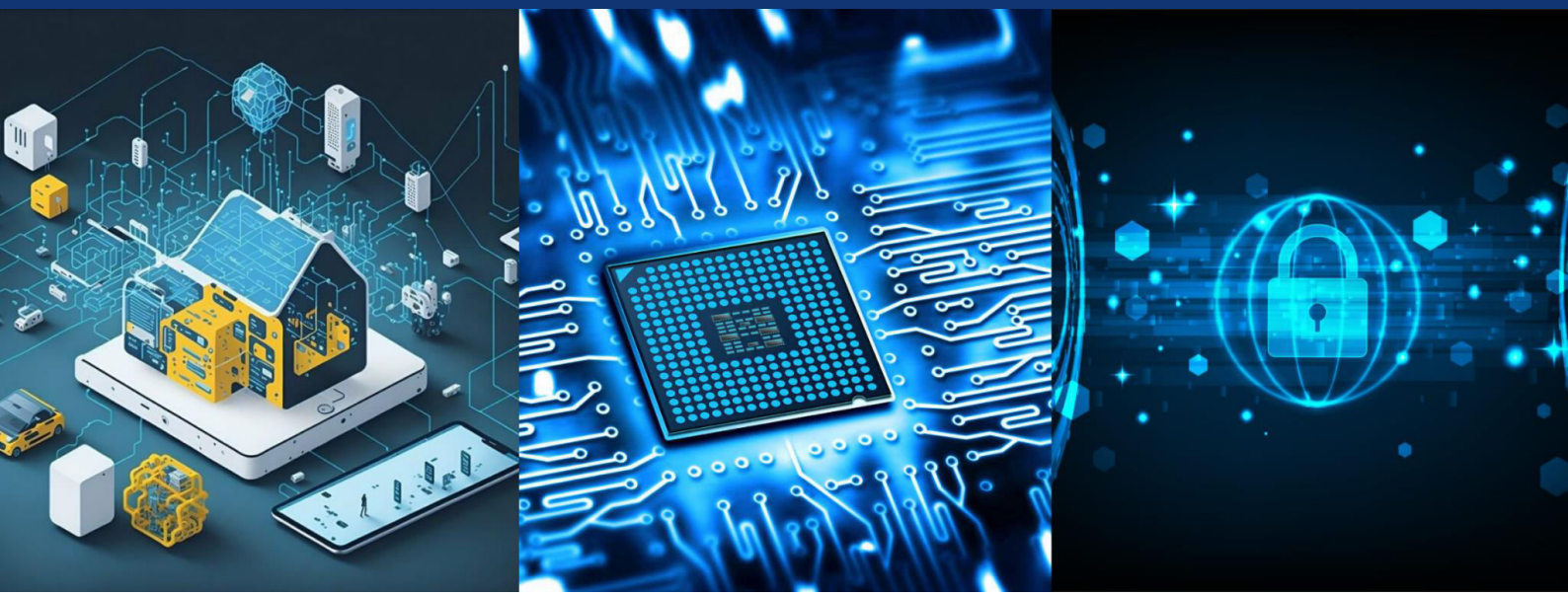

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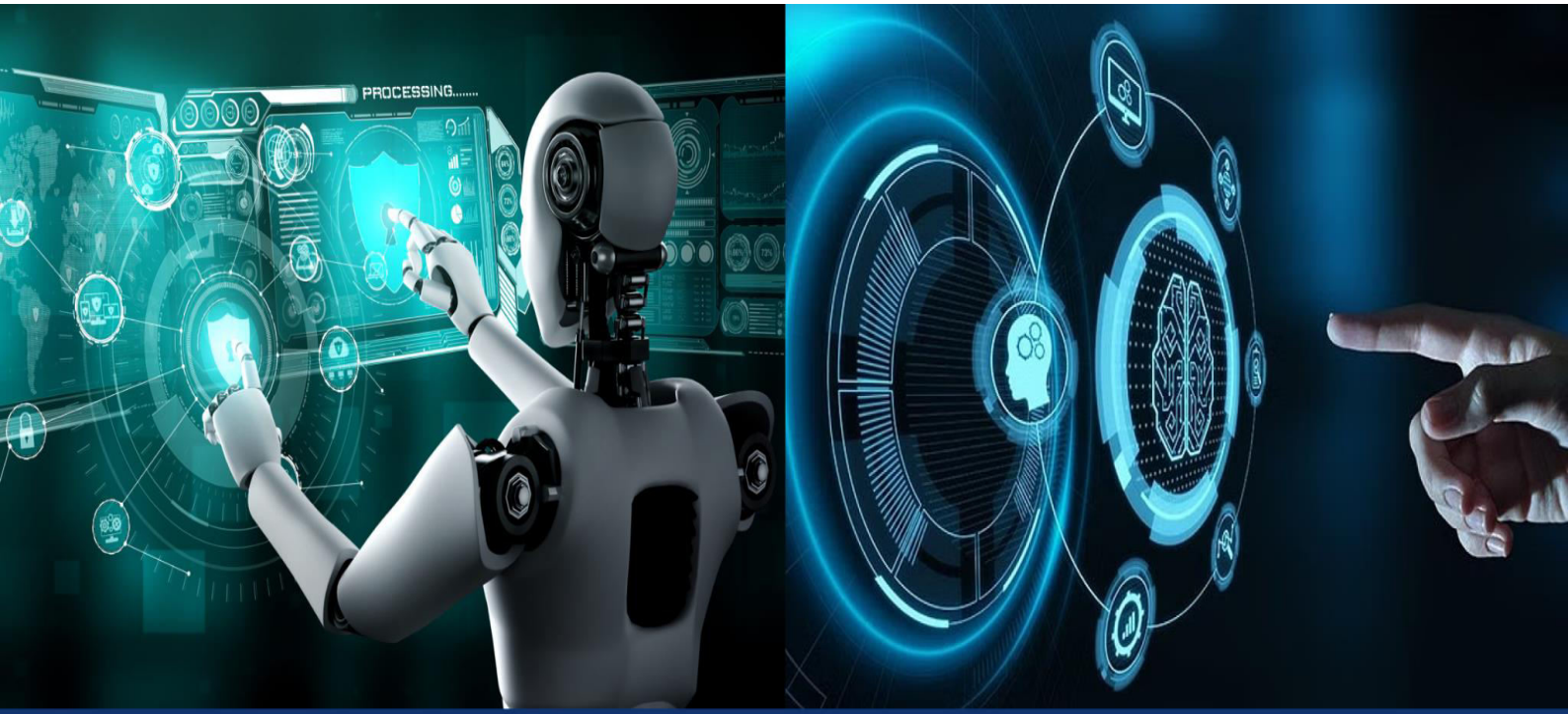

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International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

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Agro Manage Using Block Chain Technology

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ABSTRACT: The Distributed Ledger Technology (DLT) that underpins various crypto currencies may have a profound impact on the global economy. The Supply Chain Management (SCM) is one of the areas where the DLT is currently being used. By using the Distributed Ledger Technology, blockchain has the potential to vastly enhance different supply chains by facilitating faster and more cost-effective delivery of products. The main benefits of using blockchain in SCM is that it provides an enhancement technique for products traceability, improves coordination among the producer, manufacturer, distributor, retailer and consumer. Also, facilities easier access for funding. In the recent years, the Food Supply Chain (FSC) has been using the blockchain to utilize the benefits of SCM and provide better results for the Food Supply Chain. In this paper, a model is proposed, FARMSUPPLY, which uses blockchain in a Food Supply Chain to provide a better view of farmers, products and retailers. In this model, a Ethereum blockchain method and smart contract for the verification and validation of various attributes at each stage of the food supply chain is presented.

KEYWORDS: Distributed Ledger Technology (DLT), Supply Chain Management (SCM), Food Supply Chain (FSC), Blockchain, Smart Contract, Verification and Validation

I.INTRODUCTION

When it comes to recording any transaction and keeping tabs on various assets of any business organization, blockchain is the shareable, unchangeable ledger that makes the process easy. There are usually two types of assets: tangible and intangible. A blockchain network can be used to keep tabs on and facilitate the trading of any tangible and intangible assets virtually, thereby minimizing the associated costs and risks of trading . Moreover, all the business organization run on data. Blockchain has the ability to share the data accurately at a higher speed as the data is stored on an immutable ledger that only the members of that given business organization can access

The main advantage of using the block chain in the business organization is it keeps track of many things, including payments, orders, production, accounts and more . As the data is immutable, everyone in the organizations have the same view of the truth regarding any transaction. This gives any organization more confidence and opens up new ways to save time and money. Further, the blockchain can be used to provide better performance and security for the Supply Chain Management (SCM) operations. SCM operations provide various benefits like replacing slow manual process, strengthening traceability, reducing supply-chain IT transaction costs . Using the new permissioned blockchains, various new standard methods for encoding transactions on a block, and new rules governing all the transactions, the SCM operations can be easily completed. With the use of a block chain supply chain, business and other stakeholders can keep the track of price, timestamps, product quality, location,certifications and other relevant information for the effective management of the supply chain . Increased product supply chain traceability, decreased losses from counterfeit and black markets, enhanced visibility and compliance over outsourced contract manufacturing, and the possibility of elevating an organization to the forefront of responsible manufacturing are all the possible results of having the data readily available using the block chain .

Blockchain Food Supply Chain (FSC) has been emerging topic in the recent years. The entire process of a FSC using a blockchain has been given in Figure 1. Blockchain when used in the food supply chain, improves traceability of the food-related data and transactions, enables backtracking the food provenance in seconds rather than days, facilitates food safety and quality compliance verification, enhances protection of sensitive food supply chain data .

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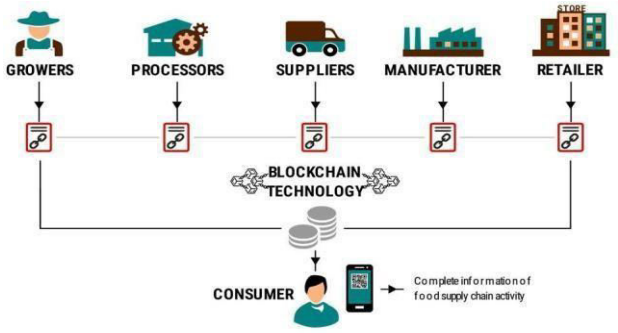

Fig1: Food Supply Chain using Blockchain Technology

II .LITERATURE SURVEY

1. Philipp Frauenthaler ; Marten Sigwart; Christof Spanring;Michael Sober; Stefan Schulte
LINK: https://ieeexplore.ieee.org/document/9284781 2020ETH Relay: A Cost-efficient Relay for agri supply Management Our relay scheme optimizes blockchain interoperability by introducing a Validation-ondemand model. Rather than immediate validation, blocks are validated when requested, using economic incentives. The novel validationon- demand relay scheme offers a promising solution for cost-effective interoperability between Ethereumbased blockchains. While addressing computational expenses, it introduces considerations such as latency and community acceptance.

2. Affaf Shahid; Ahmad Almogren; Nadeem Javaid; Fahad Ahmad Al- Zahrani; Mansour Zuair
LINK: https://ieeexplore.ieee.org/document/9058674 2019 Agri-Food Supply Chain: A Complete Solution
The proposed methodology involves implementing a blockchain-based solution for the Agriculture and Food (Agri-Food) supply chain. The proposed Agriculture and Food (Agri-Food) supply chain system offers enhanced traceability and transparency. While addressing challenges in traditional supply chains, it introduces smart contracts and leverages Ethereum blockchain.

[1] Kumar R., Patel A. 2020 Secure Farm Supply Transactions Developed a blockchain-based system for secure transactions Increased transparency and reduced fraud.
[2] Leon G.M. Gorris LINK:
https://www.sciencedirect.com/science/article/abs/pii
/S0956713504002609
2005 Food safety objective: An integral part of food chain management The methodology involved the proposal and integration of key concepts, including Food Safety Objectives (FSO), Performance Objectives,and Performance Criteria. These concepts aim to establish targets for operational food safety management, ensuring flexibility across food chains while aligning with public health goals. The proposed food safety framework, comprising FoodSafety Objectives, Performance Objectives, and Performance Criteria, offers a robust foundation for operational food safety management. While providing flexibility, it may encounter challenges related to complexity and standardization.
[3] Smith J., Brown K. 2018
"Smart Supply Chain in Agriculture"
Implemented AIdriven demand forecasting for farm supply chains. Improved efficiency by 20% in supply chain management.
[4] Johnson P., Green T. 2021
"AI-based Pricing Model for Farm Supplies" Implemented AI to dynamically adjust prices based on market trends. Farmers benefited from 10% better pricing strategies.
[5] Fernandez M 2023 "Sustainable Farm Supply Chains"
Introduced an Eco friendly supply chain model integrating renewable energy. Reduced carbonfootprint in logistics.

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III.PROPOSED METHOD

The flow of the proposed model has been given in the Fig. In the Application Layer, various participants of the FSC such as farmer, manufacturer, distributor, retailer and consumer reside. In this layer all the participants can check any transaction related with each other. Also, the transactions which are being processed or completed can be seen by the business organization having the access to the FSC. Further, in the blockchain layer, rating system, smart contracts or the trading system is used. The main purpose of the blockchain layer is to provide an action for any given transaction being processed. For example, if a transaction is being processed from the manufacturer to the farmer, the smart contract work is to notify the farmer that the transaction being processed is a verified process or unverified process. Finally, in the infrastructure layer, the Inter Planetary File System (IPFS) and the nodes reside. IPFS (Interplanetary File System) is essentially a file system that allows you to store files and track versions over time, much like Git, keeping track of them on a distributed network. Blockchain nodes are network stakeholders and their devices authorized to keep track of the distributed ledger and serve as communication hubs for various network tasks. A blockchain node's primary job is to confirm the legality of each subsequent batch of network transactions, known as blocks. In addition, allocating a uniqueidentifier to each node in the network helps to distinguish a node from other nodes easily.

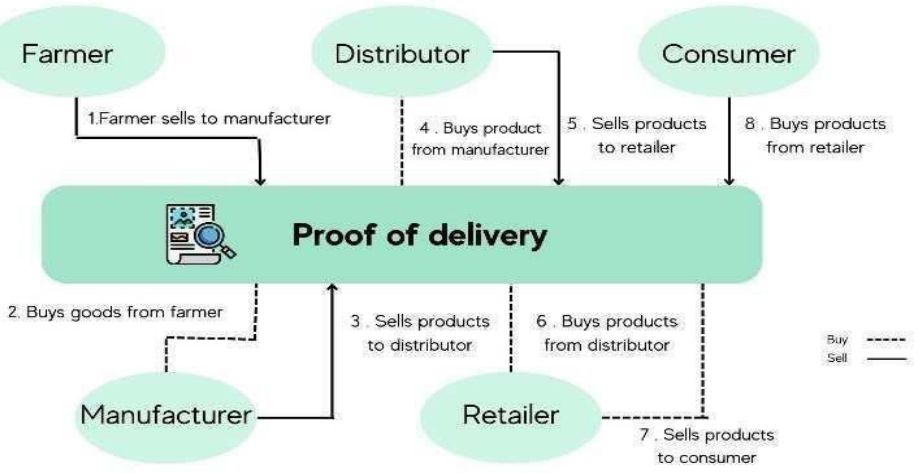

Fig:2 : Participants in the Food Supply Chain.

The participants of the FSC have been given. In the first stage the farmer sells all the crops which they have grown to a manufacturer. In the next stage the manufacturer buys goods and does a transaction. Further, after processing all the raw material gained from the farmer, the manufacturer process and makes the raw material into a product. In the next stage the manufacturer sells the products to the distributor and a transaction is done. The distributor buys the product from the manufacturer and does another transaction. Further, in the next stage, the distributor sells the products to the retailers completing another transaction. The retailer buys the products and does a transaction. The retailer further sells the products to the consumer completing a transaction. Finally, the consumer does a final transaction and buys from the retailer. In this cycle there are totally 8 transactions. If any of the transactions are missed, then it leads to fraud. Hence to evaluate each transaction and verify whether the transaction is being successful or not, Ethereum blockchain and smart contracts have been introduced in the FSC. The foundation of blockchain for the FSC is a Distributed Ledger Technology (DLT) that documents every transaction and action that takes place inside the FSC. Blocks of encrypted, time-stamped data are linked in chronological order to build the ledger. A group of transactions that have been verified according to the consensus process are stored in every block. Each participant in the FSC uses a web-based app suited to different role to connect with the blockchain ledger. For evaluation of these transactions, Ethereum blockchain is used. The entire Ethereum network may be thought of as a state machine that operates on the basis of transactions: start in one state and gradually change it by carrying out transactions. This "version" of the Ethereum universe is considered to be the definitive one. All information that is currently recorded by a machine just at present time is par for the course for such state, and this comprises financial accounts, reputations, trust relationships, information referring to data of the physical world, and so on. Therefore, a transaction is a legitimate arc connecting two states; this distinction is crucial, as there are far many incorrect state modifications than valid ones.

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IV .METHODOLOGY

The methodology for implementing a Farm Supply Chain Management system using blockchain involves a series of well-defined steps aimed at improving transparency, efficiency, and traceability within the agricultural supply chain. Initially, the project begins by defining the scope and identifying the key challenges in existing supply chains, such as fraud, lack of transparency, and operational inefficiencies. A comprehensive literature review is conducted to understand the potential of blockchain technology and explore its use in similar industries. Following this, the system requirements are gathered, including the identification of data needs, technology stack, security protocols, and the roles of various stakeholders in the system. The next step involves designing the blockchain architecture, which includes deciding on the type of blockchain (permissioned or permissionless), the consensus mechanism, and the design of smart contracts and decentralized applications (DApps). Development of the system includes setting up the blockchain network, creating smart contracts to automate processes, and integrating IoT devices for real-time tracking. After development, a pilot deployment is conducted in a selected region or among a group of stakeholders to assess the system's effectiveness. The pilot results are then analyzed based on performance metrics such as transaction speed, system reliability, and user feedback. Optimization and scaling follow, refining the system based on pilot outcomes and expanding it to more stakeholders. Finally, the project concludes with an evaluation of the outcomes, identifying limitations, and suggesting future improvements for scalability and interoperability. Throughout the process, the primary goal is to create a blockchain-based supply chain system that enhances traceability, reduces costs, and increases stakeholder trust in the agricultural supply chain.

V. RESULT

The result of implementing a Farm Supply Chain Management system using blockchain technology demonstrates significant improvements in several key areas of the agricultural supply chain. First and foremost, the system enhances **transparency** by allowing all stakeholders to track the movement and status of products in real-time, ensuring that all transactions are recorded in an immutable ledger. This leads to a reduction in **fraud** and **misreporting**, as data cannot be altered once it is recorded on the blockchain. Additionally, **traceability** is greatly improved, allowing consumers to trace the origin and journey of a product from farm to table. This is particularly important for food safety and quality assurance, as any issues with a product can be quickly traced back to their source. The use of **smart contracts** automates key processes like payments and product verification, reducing the risk of delays and human error, while also lowering **transaction costs** by eliminating intermediaries and manual paperwork. Another key result is improved **efficiency** across the supply chain. Farmers, transporters, processors, and retailers can access real-time data and make more informed decisions, reducing delays and optimizing inventory management. In turn, the project leads to **cost savings** for all parties involved, as inefficiencies in logistics, processing, and data management are minimized. During the pilot phase, feedback from stakeholders indicates a positive reception, with farmers and retailers appreciating the ease of access to supply chaininformation and the automation of processes through smart contracts. However, challenges such as the need for infrastructure upgrades in rural areas and stakeholder training were identified. The system's **scalability** was successfully tested, with the blockchain network performing well as more participants were added. Ultimately, the project demonstrates that blockchain technology can effectively transform farm supply chains by ensuring **security**, **transparency**, and **accountability** throughout the entire supply chain process, paving the way for broader adoption and further innovations in agricultural logistics and management.

VI .CONCLUSION

a blockchain food supply chain: FARMSUPPLY has been proposed. Various existing works have been discussed that have been proposed in recent years using the blockchain in the food supply chain. In this model, the Ethereum blockchain and smart contracts have been used for the evaluation of every transaction in the food supply chain. The blockchain has been used as it provides shared truth among the various participants of the supply chain. Also, the proposed method is consistent, efficient and has transparent data. It also avoids the anti-fraud and peerless environment. Whenever a transaction is processed, the proposed method keeps a ledger which makes easy for tracking and for data retrieval. The working of the model has been showed using the screenshots. Using the screenshots, it can be said that the proposed method using blockchain helps for tracing from the raw material to the processed product reached till the consumer. The blockchain also helps to save the data of the payments and provides a streamline inventory management. In conclusion, using the proposed blockchain technology in the food supply chain, the performance of the food supply chain can be improved.

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