IJARSCT

ISSN (Online) 2581-9429

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Impact Factor: 7.301

Volume 3, Issue 6, April 2023

Supply Chain Management Using Block Chain

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Abstract: *This project pursue to examine howblockchain technology can be appealed in thesector of supply chain management, beyond its common interconnection with cryptocurrencies. While technology is frequently interrelated with finance, it has several favorable applicationsin non-financial industries such as food and power. By make use of blockchain technology, it is feasible to generate enduring, attainable, and empirical data of products as they proceed throughthe supply chain. This improves the capability to track the products, guarantee their legitimacy and morality, and do so in a more cost-efficient manner. The possible advantages of using blockchain in agribusiness were also debated, as well as the casefor executing a blockchain based small business inthe automotive manufacturing industry. This project prefers to outline work of block chain technology in the field of supply chain. As an endeavor to cooperate with the physical one, we support a track of the journey of the supply chain products from producers to consumers. The user can access a complete documentation and confidence that the information is on target and precise. Block chain technology demonstrate to beuseful in the supply chain zone in the following ways: diminish mistakes, reduce product retards, delete fraud activities, enhance management, improve consumer or supplier belief..*

Keywords: Supply chain management, Distributed ledger, Smart contracts, Security, Cryptography.

I. INTRODUCTION

The issues of agri-food safety and farmer income have recently drawn a lot of attention. Each component of agri-food supply chains (ASCs) may experience problems with food safety, and ineffective ASC management will result in low earnings. The typical work of ASCs may be hampered by a variety of issues. First, because of the intricate design of ASCs, it is challenging to record the whole distribution of agri-food product information while making sure that the data is never altered. Second, the primary obstacle to precisely
deciding on the production and storage of agri-food items
while taking profit maximization into account is the shift in consumer preferences. Designing an effective ASC framework is obviously more difficult given these uncertainties and dynamics. Effective management and traceability of agri-food products in ASCs are now urgently required to address these issues. On the one hand, when building a mechanism of product traceability, the data of agri-food items in ASCs covering production, processing, storage, distribution, and retail should be collected and recorded in order to ensure agri-food safety. However, the majority of the conventional traceability solutions used by ASCs rely on a centralized system that is managed by a reliable third party and may be vulnerable to security risks including data leakage and single-node failure. An efficient architecture for trustworthy transactions on the Bitcoin network without the control of a centralized third party is provided by Blockchain, a distributed, append-only, and tamper-proof ledger.

II. LITERATURE SURVEY

Title: Managing food safety with pricing,contracts and coordination in supply chains

Author: Dung-Ying Lin; Chieh-Ju Juan; Ching-Chih Chang

Abstract: In order for centralised, decentralised, and the combination supply chain contracts to have a beneficial impact on confidence-dependent demand, this study attempts to develop a secure and sustainable food supply chain with food safety safeguards. With the suggested framework, we obtain the optimality of the order quantity, buy-back price, rebate/penalty, and sales target to analyse the supply chain for lard oil using the findings. conditions of comparable models. It has been discovered that supply chain agreements, when used in conjunction with a food safety mechanism, can significantly increase food safety, consumer confidence, and the revenues that follow for a food supply chain. Our work differs from past research because only a small number of studies have concentrated largely on food safety measures that incorporate a closed-loop supply chain for benefits.

Methodology Used: Blockchain

Advantages:

- It greatly enhances food safety and boosts consumer confidence.

Disadvantages:

- It does not advise or forecast the farmer's to product sales report to increase sales profit.

[2] Title: The Theoretical basis and system establishment of china food safety intelligent supervision in the perspective of internet of things
Author: Huiling Fan
Abstract: This study proposed the use of the Internet of Things (IoT) to enhance the current food safety inspection system in China. In order to fully supervise "from farm to table," this paper first analysed current food supply models before developing a model of the food supply chain that includes the four primary processes of food supply: planting/culture, processing, transporting, and catering/marketing. Next, in accordance with the characteristics and requirements of food transporting, this paper summarised challenges and difficulties of food transporting and logistics platforms, and highlighted the ma Finally, combining IoT benefits, this study highlighted the significance of developing an IoT-based food logistics platform. By examining each requirement for the platform's primary functions, The findings of this study demonstrated considerable significance in the areas of ensuring food safety, encouraging social peace and stability, and assisting in the long-term stability of the nation. As a result, this article addressed current concerns of the government, people, and society that are really important to the management of food safety in new eras and periods.

Methodology Used: IOT

Advantages:

- It guarantees food safety while also fostering societal harmony and stability.

Disadvantages:

- The lack of decentralized access control used to ensure food supply chain security is a drawback.

[3] Title: Applying blockchain technology to improve agri-food traceability: A review of development methods, benefits and challenges
Author: Huanhuan Feng, Xiang Wang, Yanqing Duan, Jian Zhang, Xiaoshuan Zhang
Abstract: In managing food quality and safety, traceability is crucial. Traditional Internet of Things (IoT) traceability systems offer workable answers for quality control and food supply chain traceability. The centralised server-client model used by the majority of IoT solutions, however, makes it challenging for consumers to obtain complete transaction information and trace the provenance of goods. By offering security and complete transparency, blockchain is a cutting-edge technology that has a lot of potential for enhancing traceability performance. The advantages, difficulties, and development strategies of blockchain-based food traceability systems, however, have not yet been adequately analysed in the literature. Therefore, the primary goal of this paper is to review the characteristics and functionalities of blockchain technology, identify blockchain-based solutions for resolving food traceability issues, highlight the advantages and implementation challenges of blockchain-based traceability systems, and assist researchers and practitioners in applying blockchain technology based food traceability systems by proposing an architecture design framework and suitability application analysis framework. The findings of this study lead to a greater understanding and knowledge of how to enhance food traceability by creating and putting into use traceability systems based on

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Volume 3, Issue 6, April 2023

blockchain technology. The study has a favourable impact on the enhancement of food sustainability and offers useful information for researchers and practitioners on the usage of blockchain-based food traceability management.

Methodology Used: Blockchain and IOT

Advantages:

- By creating and deploying blockchain-based traceability systems, it is possible to better study and learn how to improve food traceability.

Disadvantages:

- It does not take the farmer's profit into account.

[4] Title: Nutritional quality and safety traceability system for China's leafy vegetable supply chain based on fault tree analysis and QR code.
Author: Yuhong Dong; Zetian Fu; Stevan Stankovski; Siyu Wang; Xinxing Li
Abstract: The majority of daily diets consumed worldwide include leafy vegetables. Consumers are giving more consideration to food quality, safety regulations, and nutrition when buying green vegetables as living standards rise. This study suggests a traceability and evaluation approach for assessing the nutritional value of leafy vegetables. In order to create a traceability model for the full production and distribution process of leafy vegetables, the Hazard Analysis and Critical Control Point (HACCP) system and fault tree analysis (FTA) were both used. In order to create a nutritional quality index system utilizing fuzzy mathematics subordinate function method, four typical green vegetables-spinach, rape, lettuce, and the celery-are investigated. Then, for the complete traceability of leafy vegetable quality, a nutritional quality and safety traceability system based on browser/server architecture and quick response (QR) code is conceived and implemented. Through the management of important influencing factors, this technique can ensure food safety and hygiene Throughout the entire supply chain process, there is food safety.

Methodology Used: fuzzy math

Advantages:

- Include the assurance of food safety.
- It makes sure that green vegetables are clean.

Disadvantages:

- It doesn't take security into account.
- It doesn't take the farmer's profit into account.

III. METHODOLOGY

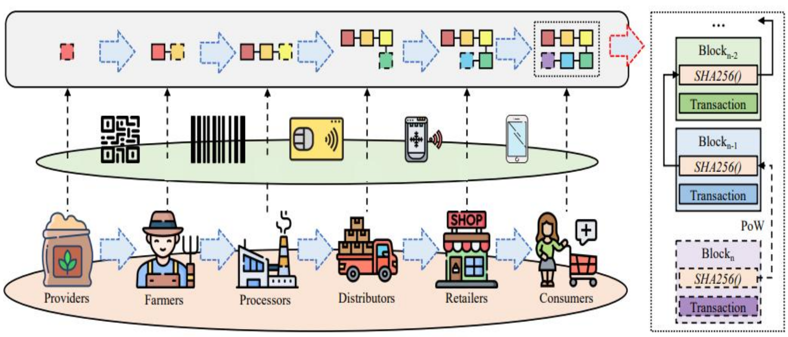

Fig.1: System architecture

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For ASC systems, we suggest a blockchain-based platform. Each transaction's tracing information from ASCs will be included in a block. Each block will be uploaded to the blockchain that the ASCs participants manage and turn into a safe permanent record once it has been verified by them and reached an agreement.

Providers: The tracking data consists of details about agri-food raw materials (such as seeds, insecticides, and fertilizers), farmer transactions, etc.

Farmers: The tracing data include details about farms, agricultural methods, the growing process, weather conditions, and business dealings with suppliers and processors, among other things.

Processors: Information on factories, processing methods, business dealings with farmers and wholesalers, etc. are all included in the tracking data.

Distributors: The tracking information contains information about the method of transit, the storage environment (such as temperature and humidity), the exchanges with processors and merchants, etc.

Retailers: The tracing data contains details about agri-food goods, such as their quality, quantity, price, and expiration dates, as well as information about their storage conditions and their dealings with distributors and customers.

Customers: Customers can utilize mobile devices to get comprehensive information on agri-food goods, including information from suppliers to merchants.

i. DR-SCM

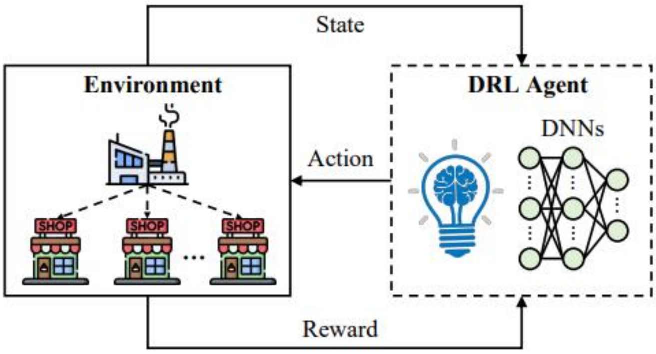

Fig. 2: Framework of proposed DR-SCM method

We provide a Supply Chain Management (DR-SCM) approach based on Deep Reinforcement learning. To maximize product revenues, maize production and storage can be efficiently determined using the DR-SCM. The Deep Reinforcement Learning (DRL) agent acts by interacting with the environment, which is represented as an ASC management scenario.

ii. SHA-256

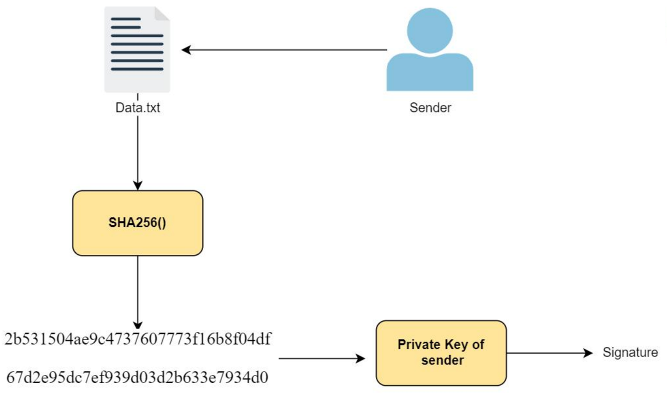

Fig.3: SHA256 Work flow

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SHA-256 gives dependability and security. Here are some of SHA-256's key characteristics that make it ideal for use as a blockchain's primary hashing function:

Collision-proof: Different input values cannot result in the same hash value. This guarantees that a distinct hash value is assigned to each block in the blockchain ledger.

Preimage resistance: When provided a hash value, the input cannot be reproduced. This makes sure that during the Bitcoin proof of work, miners cannot estimate the value of the nonce by converting the valid hash back into the input; instead, they must employ the brute force approach, which makes sure that the job is completed.

Deterministic: As long as the input is constant, the output of the hash function should also be constant. The computed hash against a given input should stay consistent when computed by the sender and receiver; this is a fundamental characteristic of digital signatures.

Large output: The 22562256 possibilities in the 256-bit output make it hard to use the brute force method to crack the hash.

IV. DESIGN

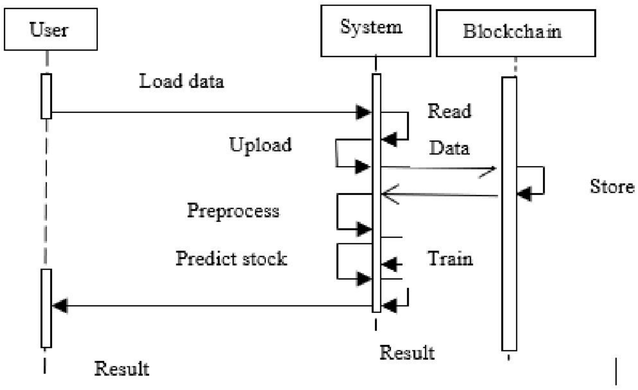

Fig.4: Sequence Diagram

In the Unified Modelling Language (UML), a sequence diagram is a type of interaction diagram that demonstrates how and in what order processes interact with one another. It is a Message Sequence Chart construct. Event diagrams, event situations, and timing diagrams are other names for sequence diagrams.

Determine the supply chain's size: Identify the supply chain components that will be integrated into the blockchain network. Suppliers, producers, distributors, logistics companies, and retailers may all fall under this category.

Choose the best blockchain platform: There are numerous blockchain platforms accessible, each with advantages and disadvantages. When selecting a platform, take into account elements like scalability, interoperability, and security.

The conditions of the contract between the buyer and seller are directly encoded into lines of code, which is how smart contracts are defined as self-executing contracts.

construct the blockchain architecture Make the supply chain data management and storage architecture for the blockchain. Think about things like interoperability, scalability, and data privacy.

Participants are onboarded after being invited to join the blockchain network and after receiving the training and tools required to operate the system.

The blockchain network should be regularly monitored to make sure it is operating properly and to spot any areas that could have improvement. Update the system as required to include new users or fix any problems.

V. CONCLUSION

In order to protect food data and increase farmer profit, we intend to design a desktop programme that employs the DRL algorithm to forecast product sales. In order to ensure the agri-food safety with product traceability in ASC systems, we first create a blockchain-based architecture. Next, we suggest using DR-SCM to decide how to produce and store agricultural and food products in order to maximise product profitability in ASCs. The thorough simulation tests confirm the efficacy of the suggested blockchain-based framework and the DR-SCM approach for ASC optimisation. More particular, the outcomes demonstrate that the suggested blockchain-based ASC architecture is capable of ensuring accurate product tracing.

VI. ACKNOWLEDGEMENTS:

We would like to express our gratitude to SJC Institute of Technology, our college, as well as to Prof. ARAVIND TEJAS CHANDRA, our project coordinator, and Prof. SUSHEELAMMA K H, our mentor, for giving us the opportunity to work on this project and for giving us the guidance and support we required to make it a success. We also wish to thank our teammates for their assistance, zeal, and contributions to this project. Our project wouldn't succeed without them.

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