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Technology In the Supply Chain for Agricultural Products

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ABSTRACT

The efficiency, effectiveness, and validity of many crucial criteria in the food and agricultural supply chain are receiving increasing attention as a result of globalized industrial and agricultural production. There is a great demand for effective traceability solutions that serve as crucial quality management tools to guarantee enough product safety throughout the agricultural supply chain due to the rising incidence of food safety and corruption risks. Blockchain is a cutting-edge technical approach that delivers a ground-breaking outcome for commodity traceability in food supply chains and agriculture. Today's agricultural supply chains are intricate ecosystems with many different players, making it challenging to validate a number of important needs, particularly with regard to the nation of initial origin, crop growth stages, compliance with quality standards, and yield monitoring. In order to track crop prices and ensure traceability, This study presents a technique that successfully handles business operations along the agricultural supply chain while levitating the blockchain. The recommended framework solution eliminates the need for intermediaries and centralized authority that can be relied upon while also providing records of the transactions, boosting effective science and safety with a high degree of dependability and integrity. With links to a decentralized network, all transactions are tracked and subsequently maintained in the blockchain's immutable ledger, providing a high level of traceability and transparency in the supply chain ecosystem in a reliable, dependable, and efficient manner.

Keywords : Agriculture Products, Blockchain, Supply Chain

I. INTRODUCTION

Handling the expansion of agricultural goods and efficient logistics chain management in the agricultural supply chain are critical for ensuring product safety. Additionally, farming goods exchanged across multiple nations require accurate tracking and adherence to nation-specific regulations. Tracing of goods in the agricultural field necessitates the collection, communication, and maintenance of critical data by specifically identifying the source, multiple data exchanges in the logistic network, and ongoing data maintenance. In the agriculture and food supply chain, where goods are produced, processed, and transmitted through several intermediates, the high-spirited nature of the data makes monitoring and tracing challenging. Traceability is essential as a tool for policy to monitor food quality and safety due to product contamination and its effects on public health. Current traceability practices in the agricultural supply chain are primarily impacted by data fragmentation and centralized controls that are open to information management and alteration. In the event of contamination, rapidly locating the source and removing the contaminated goods from the supply chain. The supply chain of today is getting incredibly intricate. Multiple stakeholders are present at different stages. For efficient and successful management, all of these stakeholders must work together in a variety of ways. The food sector is becoming more customer-oriented and requires speedier reaction times to deal with food safety concerns and mishaps. A reduction in the production and sale of hazardous or subpar items lowers the possibility of misleading advertising, liability, and recalls. Lowering the consequences of food safety. The growth of traceability efforts in the agri-food system is being driven by the need to increase food safety and provide a way to validate food quality attributes. The International Telecommunications Union (ITU) and the Food and Agriculture Organization (FAO) of the United Nations are still collaborating to make it easier for agriculture to adopt cutting-edge information and communication technologies (ICTs). The globalization of the food sector has greatly enhanced the significance of traceability. Consequently, a trustworthy identification and tracking system is required to guarantee the quality and safety of food that is delivered to consumers. A natural merger of two systems designed for mutual or shared ledge transactions is the blockchain for the supply chain. A supply chain frequently depicts how goods are distributed across sectors and between countries. One of the hardest issues for FSC to resolve is food provenance. Companies nowadays are dealing with this problem. End-to-end food tracking is incidental to the food sector due to a worldwide supply chain network with asymmetric food laws and numerous operating procedures across different jurisdictions. Blockchain and distributed ledger technologies are highly essential and can have a big influence on supply. This study illustrates how supply chains may be used to utilize blockchain technology for manufacturing and perishable goods. Companies are quickly using blockchain systems in the food supply chain. Blockchain may be used as an example for merchants like Carrefour to give access to extensive and detailed information about food products, reducing the ambiguity regarding quality and ingredients. In recent years, China has been quite concerned about food safety. Creating a traceability framework for agri-food supply is urgently needed since traditional agri-food logistic techniques are unable to meet customer needs.

II. RELATED WORKS

Traceability in a food supply chain: Safety and quality perspectives: In order to cope with food scandals and events, the food sector has to respond more quickly and with a greater focus on the customer. The creation and distribution of dangerous or subpar items are reduced with the use of effective traceability systems, reducing the likelihood of negative press, liability, and recalls. The authenticity, high quality, and safety of the food cannot be guaranteed by the existing system of food labeling. As a result, traceability is used as a tool to help ensure both the quality and safety of food as well as to build customer confidence. This essay provides in-depth details on traceability in the context of food supply chain quality and safety.

Food traceability as an integral part of logistics management in food and agricultural supply chain: This research has shown how difficult it is to design a full-chain FTS that is both efficient and successful since it necessitates a thorough understanding of real processes from a variety of angles, including those related to economic, legal, technological, and social concerns. Future research on traceability should thus concentrate on the following topics: FTS technology issues; integration of traceability operations with food logistics activities; the relationship between the traceability system and food production units; standardization of data collection and information exchange; strategies for raising awareness; continuity of information flow and effective dissemination of traceability information to consumers and other stakeholders; the relationship between various FTS drivers; FTS improvement strategies; and creation of frameworks for performance evaluation of FTSs.

Liability and traceability in agri-food supply chains: The growth of traceability projects in agri-food systems is being driven by the need to increase food safety, lessen the effects of food safety issues, and provide a way to validate food quality qualities. Examples abound and are diverse, ranging from supply-chain systems that integrate traceability and quality assurance to regulatory traceability initiatives, industry-wide animal traceability programs, and individual supply-chain projects. This study examines the economic benefits of traceability and how much it might increase the financial incentives for businesses to do due diligence. Using survey and experimental auction data, we empirically assess how much customers value traceability as a whole vs verifiable quality assurances offered by traceability.

Novel automatic food trading system using consortium blockchain: The difficulty of multi-stakeholder privacy protection is met by using consortium blockchain technology to create authorization and authentication for diverse roles in food transactions. The optimized transaction combination technique was created to make it easier for users to discover appropriate transaction objects. It can choose the best trading portfolio for customers. To reduce competition, a double auction technique is employed online. And to increase system efficiency, the enhanced PBFT (iPBFT) is applied. Additionally, a technique for managing the life cycle of smart contracts is described, and security analysis demonstrates how FTSCON enhances transaction security and privacy protection. Results from an experiment using a variety of data show that the suggested algorithm can increase retailers' profits.

Food traceability from _eld to plate: This article covers some of the factors in industrialized and developing nations that contribute to "traceability" as a quality criterion in the food trade. To particularly include traceability into current food safety rules and trade agreements, policy reforms are required. Further information technology expenditures will be needed to gather, store, and retrieve data for this. Implementing suitable food traceability systems to satisfy marketing compliance requirements presents significant technical and financial obstacles for small-scale farmers in many emerging nations moving toward market orientation.

Computer Vision-Based System for Apple Surface Defect Detection: Based on computer imaging technology, a brand-new automated approach for sorting out apple surface flaws has been created. The hardware system's ability to concurrently check all four sides of each apple on the sorting line is a benefit. The techniques were created, and they included picture background reduction, defects segmentation, and identification for stem-end and calyx sections. The findings demonstrate the viability and feasibility of the experimental hardware system as well as the efficiency of the suggested flaw detection technique.

III. METHODOLOGY

Proposed system:

In the proposed system, a blockchain is used to ensure the openness and integrity of the whole process beginning with the creation of crop information. Blockchain facilitates the management and transparent exchange of crop information.

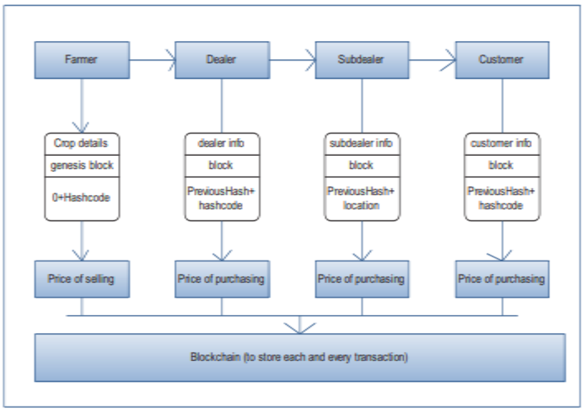


Figure 1: Block diagram

IV. Implementation

The project has been implemented by using the below-listed algorithm.

All networked transactions are stored in a distributed database called a blockchain. As the transaction state changes, a block with a connection to the prior block is added to the blockchain in a linear and sequential fashion. Each component of this database is referred to as a "block." So that every node has access to the same blockchain, the new block is then duplicated across the network. A copy of a blockchain is present on the devices of each party to this transaction. Consequently, each participant may verify a specific transaction. This method does away with the requirement for centralized, reliable third-party validation of transactions. Blockchain technology offers a wide range of applications and great scope for innovation. Business executives will thus employ this technology to investigate the variety of prospects available to their organization and sector.

Algorithm:

Since hashing is not "encryption," we are unable to reverse the process to get the original text. It is easier to compare "hashed" copies of texts than it is to decode the text to obtain the original version since a hash is a cryptographic one-way feature and it has a fixed size for any source text size. One of the strongest hash algorithms available is SHA-256, one of the SHA-1 (also known as SHA-2) successor hash functions. SHA-256 is not any harder to code than SHA-1, and it has not yet been hacked in any manner. AES is a good companion function thanks to the 256-bit key. It is described in the NIST standard "FIPS 180-4." (National Institute of Standards and Technology). Message Digest: A cryptographic hash function that may generate a digest message from binary data is represented by the Java Message Digest class. You cannot tell if encrypted data was tampered with during transfer after receiving it. This problem will be made easier with a digested message. The transmitter will create a digest message from the encrypted data and send it with the data in order to determine if the data has been altered during transmission. You can measure the message digest after getting the encrypted data and digesting it, then compare the measured message digest to the message digest received with the data. When the two digests match.

Implementation process

In this project, there are four modules

1. Farmer
2. Dealer
3. Sub-dealer
4. Customer

Farmer:

The farmer is the initial block in the blockchain, and it contains information about the farmer, including name, address, phone number, crop name, and crop selling price (FRP). All information is uploaded to the smart contract, which then uses the sha256 method to build the hash code. After that, the block is mined for the blockchain and uploaded to the network.

Dealer:

Dealers have login registrations that can save information on agricultural prices that are set by the government and certain organizations. Since the blockchain is irreversible, nobody can alter the farmer's information or crop price. The dealer, therefore, has his own data and the farmer's prior hash code.

Sub-Dealer:

Sub-dealers are able to purchase products from dealers at set prices set by the government. Additionally, the product's price cannot be raised by the sub-dealer. Due to the immutability of the blockchain, each time data is changed, the block might produce a new hash code.

Customer:

The final entity on the blockchain to buy goods is the customer. He is unaware of the actual cost of the goods, thus we are able to authorize checking the price of the goods from the farmer to the consumer. So that the buyer may obtain information about all chains and prices.

V. RESULTS AND DISCUSSION

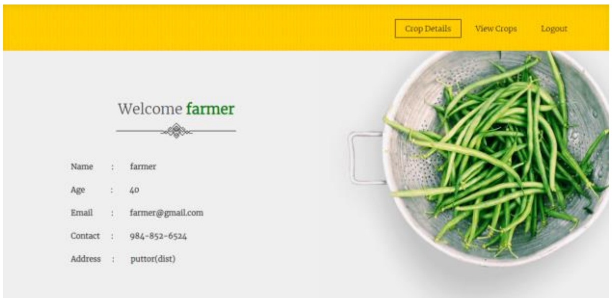
The following screenshots have depicted the flow and working process of the project.

Home Page: This is the home page of blockchain technology in the agriculture product supply chain.

Farmer Registration Page: Former can register here.

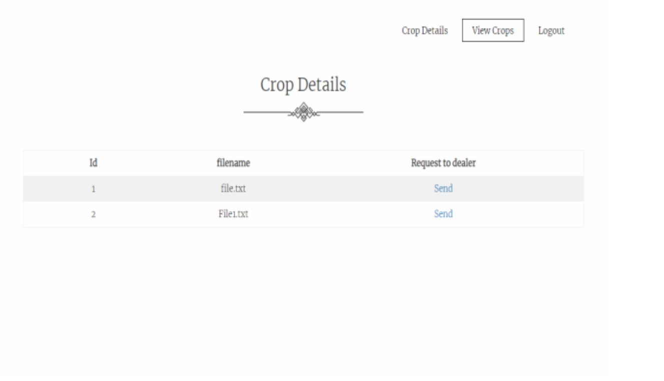
Farmer Login Page: Formers can log in with valid credentials.

Farmer Home Page: This is the page where the former can view his/her profile.

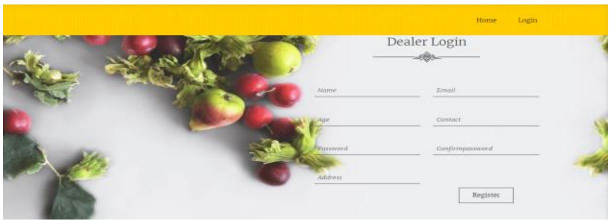


Crop Details Upload Page: This page has crop details.

Crops View Page: This page displays crops.



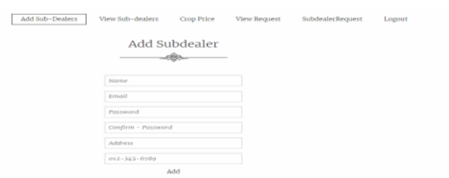
Dealer Registration Page: Here the dealer can get registered into the application.



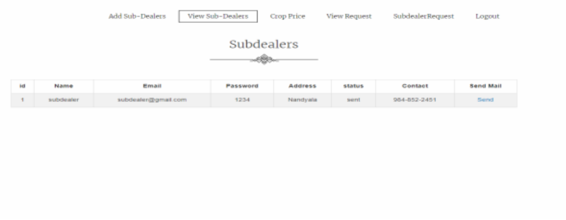
Dealer Login Page: The dealer should login with valid credentials.

Dealer Home Page: The dealer home page has the dealers profile.

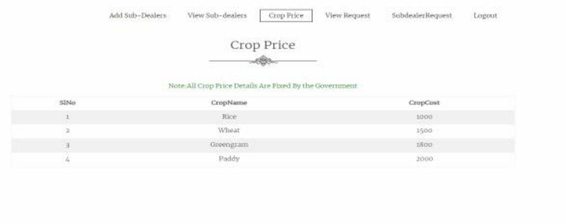
Add Sub-dealers Page: Sub-dealers will be added here.



View Sub-dealers page: This page displays sub-dealers details.

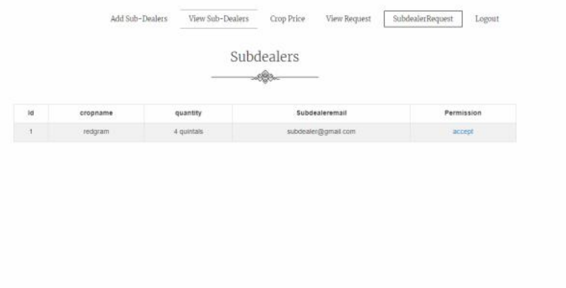


View Crop Price: This page displays crop prices.

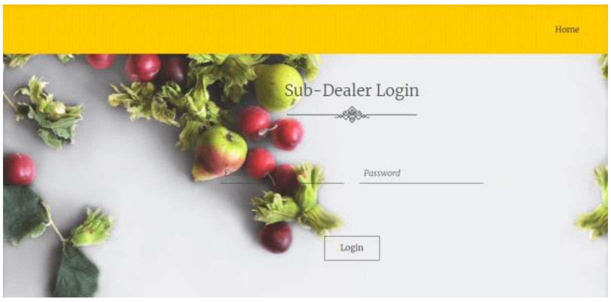


View Request: This page contains all the requests by the former.

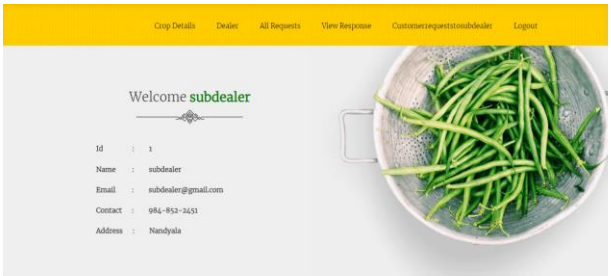
Sub-dealers Request: Here the sub-dealer can make the request.



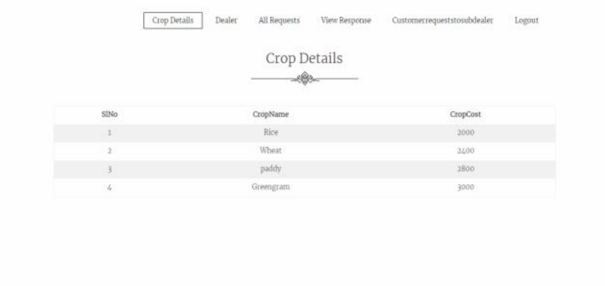
Sub-dealer Login Page: Sub-dealer can log in with valid credentials.



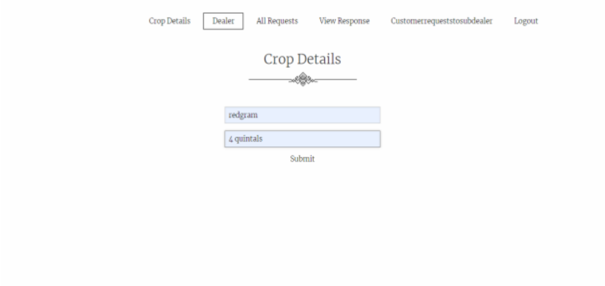
Sub-dealer Home Page: This is the page where the sub-dealer can view his profile and can access it.



Crop Details: This page contains crop details.

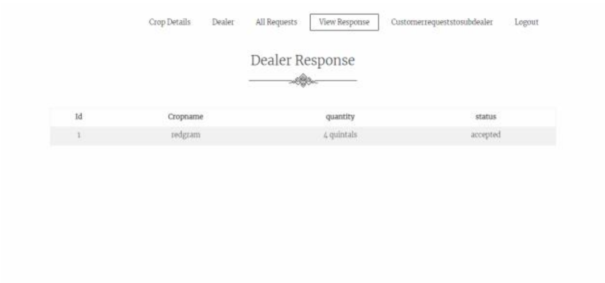


Send Request to Dealer: Sub dealer can send a request to the dealer.

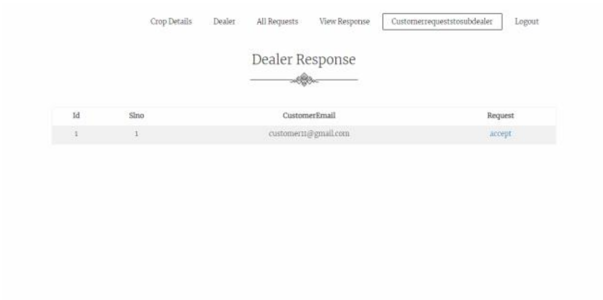


All Requests: This page contains all the requests.

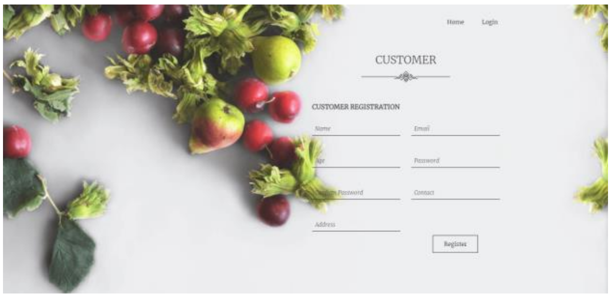
View Response: This page contains the response.



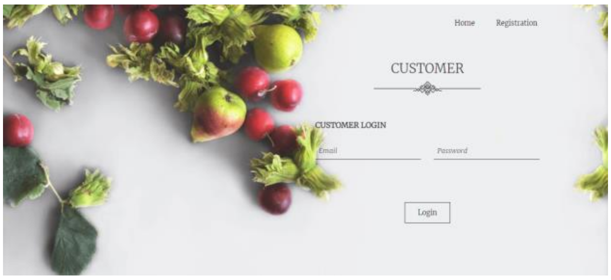
View requests:



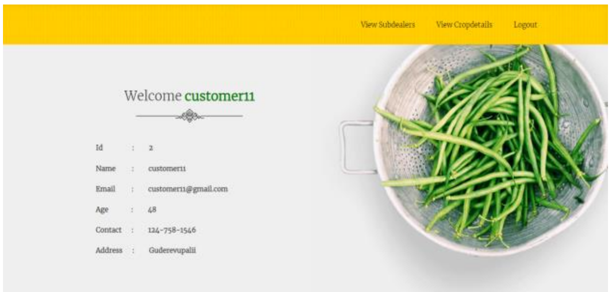
Customer Registration Page: Customers can gets registered into the application.



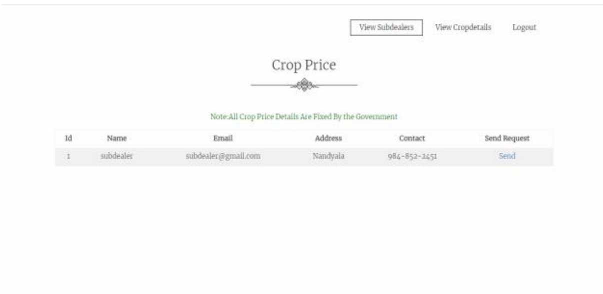
Customer Login Page: Customers can log in with valid credentials.



Customer Home Page: This is the home page of customer.



View Sub-dealers: This page displays sub dealers details.



View crop Details: Here we can see the crop details.

VI.CONCLUSION

This research suggests an unique EHR sharing system made possible by blockchain and mobile cloud computing. We pinpoint the most pressing difficulties with the present EHR sharing mechanisms and offer effective fixes through the use of a working prototype. In this study, we are primarily concerned with developing a reliable access control system based on a single smart contract to regulate user access and guarantee effective and secure EHR exchange. We construct an Ethereum blockchain on the Amazon cloud, where medical entities may communicate with the EHRs sharing system using a created mobile Android application, in order to test the effectiveness of the suggested strategy. To accomplish decentralized data storage and sharing, we also link the blockchain with the peer-to-peer IPFS storage system. In contrast to traditional schemes, the implementation results demonstrate that our framework may enable medical users to transfer medical data through mobile cloud environments in a timely and reliable way. Our access control, in particular, aims to provide the appropriate degree of patient privacy and network security by successfully identifying and preventing illegal access to the electronic health system. Additionally, we offer thorough evaluations of the technical features of the proposed system and security analyses, demonstrating the advantages of our approach over currently available options. We think that our blockchain-enabled solution is a step towards effective administration of electronic health records on mobile clouds, which is promising in many healthcare applications, based on the advantages of our approach.

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