BLOCKCHAIN-BASED TRACEABILITY SYSTEM FOR AGRICULTURAL PRODUCTS

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ABSTRACT: The potential applications of blockchain technology in agriculture for the purpose of establishing systems for the tracking of fruits and vegetables are the focus of this study. To guarantee the safety of food, the preservation of quality, and the transparency of the supply chain, traceability is essential. The use of blockchain technology facilitates the maintenance of a distributed, immutable record of all transactions pertaining to the movement of agricultural products from the farm to the table. Accessible, immutable, and transparent data regarding the origin, cultivation, harvesting, processing, and distribution of fruits and vegetables is made possible using blockchain technology, which benefits all parties involved in the supply chain. Gaining consumers' and producers' trust, making it simpler to comply with regulations, improving recall processes, and swiftly identifying and fixing food safety issues. Through research and case studies, this report examines the benefits and drawbacks of blockchain-based traceability technologies in agriculture and identifies potential applications for these technologies. Making products safer and increasing client trust are the major goals.

*KEYWORDS:*Blockchain-Based Management System (BCBM), On-chain and Off-chain structure, SmartContract,SHA-256algorithm,CBC encryption, P2PProtocol andAnti-counterfeiting Process.

1.INTRODUCTION

In the last few years, safety, sustainability, and openness have become more important in the global food business all along the supply chain. Because fruits and veggies are important parts of a healthy diet, scientists are looking into where they come from, how they are grown, and how they are processed. In order to follow government rules, lower the risk of food contamination, and fix safety issues, new technologies have been created to make it easier to track farm products. Blockchain is a possible answer that is not like other technologies because it is open, safe, decentralized, and can't be changed. This part gives you the basic information you need to fully look at how blockchain technology could be used to make it easier to keep track of farm products like fruits and vegetables. It is made clear how important tracking is for making sure food is safe and of good quality, as well as the problems with the way supply chains work now. Blockchain is thought to be a cutting edge technology that will make the farming business more open and responsible. One of the main goals of this study is to find out the pros and cons of using blockchain technology for tracking systems. This will be done by going over important ideas, concepts, and new trends. The main goal is to make goods safer and get more people to trust the agricultural sector around the world.

2.LITERATUREREVIEW

This piece suggests using Blockchain technology to make a new supply chain system that fixes the problems with the old ones. The Blockchain method being thought about helps keep costs low and makes sure that items and papers can be tracked. There is no need for a middleman because a distributed, unchangeable ledger keeps track of the past of each good from production to sale. This study shows that the suggested method works very well with Hyperledger Fabric.

This piece talks about a Blockchain-Based Administration (BCBM) platform-integrated system that uses a user-specific standard identification to check the item's standard tag to

find fake goods. The design that was mentioned will still have a database where each item has a unique number and a point of interest. The client's unique code is used to check certain parts of the blockchain database. The client is told if a location is found. If they don't, the system asks the customer where they bought the fake things so that it can figure out where they came from.

In order to show how useful square chains might be in FSCs, the people who wrote this study have to look at and evaluate existing concerns. This article talks about how piece chains can be used in FSCs and looks at a number of selection factors, such as how flexible, interoperable, and far-fetched they are. It also suggests a number of ways to deal with these problems. There is also a detailed bibliometric study to help professionals and academics understand how the research on this topic is structured and where it is at the moment. The researcher says that most of the studies have been about the accuracy of the items, how they fit together, and the component chain at the back. In addition, square chain could be a big step forward in making FSC more open and traceable, lowering risk, and, most importantly, building trust between many people.

The suggested system design gets rid of the need for a central group of reliable experts and brokers. It also keeps track of transactions and improves security and expert science by making sure that good judgment and uniform quality are used. The supply chain has a decentralized framework that is linked to an unchangeable log that keeps track of all activities. This makes the supply chain more visible and easy to keep track of, while keeping it stable, profitable, and reliable.

This part is going to be about the European Escherichia coli problem that happened in May and June 2011. When it comes to Germany, the harmful Shiga toxin-making E. The event with the most cases of hemolytic-uremic sickness was caused by Coli O104:H4. At first, it was thought that a new source started the outbreak. But different tactics and methods were needed to keep the supply of vegetables that were causing problems under control. A small, short-lived outbreak of the same illness in France led to a study all over Europe. In both cases, the study

found that tainted fenugreek seeds were to blame.

3.METHODOLOGY

the data collection process is underway, details about the product are gathered from many people in the supply chain, such as manufacturers, distributors, and stores. Some of this information is where the object came from, the company that made it, and unique parts like barcodes. One example of modern technology used to speed up data collection at different points in the supply chain is barcode readers.

A Blockchain-Based Management (BCBM) system needs to be set up so that gathered product data can be moved to the blockchain. As soon as data is collected, it is sent safely to the blockchain network and turned into trades. Because of this, you can be sure that information about products will be kept and sent safely.

Putting product data into groups makes it easier to find and check. This is called data sorting. Among other things, the data will be put into the right groups based on the type of product, the maker, the batch number, and the date it was made.

Cryptographic hashing algorithms, like SHA-256, protect the privacy and integrity of product information that is exposed to the public. Every unique identifier and piece of public information about the item is turned into a hash. This includes things like who made it and where it came from. This method makes it hard to get back to the source data from the hash.

The hashed product information is stored in a new block on the blockchain that is made for each transaction. These new blocks have been checked and approved by the blockchain network's consensus processes. They make sure the info is correct and can't be changed. Customers can use the product number to check that the product is real through a special tool. Users can use this interface to connect to the blockchain and see details about goods that are linked to the code they entered. The above information, including the product's maker, hometown, and other details, helps to prove that the product is real. Customers are also asked to let the business know about any fishy behavior or fake things they see. If you do that, there will be a review and then corrective

measures.

4.SYSTEMDESIGN

As it stands, the Ethereum traceability plan adds traceability data for every agricultural product hub directly to the blockchain. Increasing the capacity stack weight of the blockchain means adding more nodes that receive exchange data. The way blockchain is set up means that only people in the same blockchain group can see all the information in a chain record. Blockchain is great for searching because of this trait. To fix these problems, the capacity mode of the blockchain traceability system was made better so that it could handle goods from rural areas. Also, an idea was put forward to add data store with double-traceability to the "database + blockchain" chain. Figure 2 shows how the framework sorts the data that is made after the tracking data is sent. The neighborhood database holds the item's open details. There are now two parts to the blockchain: the hashed value of public data and the encrypted text that has been jumbled. Open data is protected with the SHA256 method to keep it safe because there is only so much space. Any string you give it will be turned into a 64-bit hexadecimal number by the SHA256 method. The two parts of the blockchain-stored information structure for origin data are the piece head and the square body. The current square number, the date, the hash value of the previous square, and some other details make up the piece head. The square body mostly holds information about transactions. In Table 1, you can see how the traceability data are grouped by capacity. "Key," the comparison ID for the "Value" entry, is made up of a unique and counted proof field. Sort, ID, Private Information, and Data Hash are all given weights in the blockchain's "Value" column. The structure body's title is set by the "Value" parameter, and then the "Type" parameter meets it. The "ID" parameter is the source message record's interesting proof field, which is compared to the secret source tracking data in the next database. "Private Data" is a feature that shows the compressed private data that was mixed up during the CBC process. On the other hand, the "Info Hash" choice saves the value of the source provenance data that has been hashed. The picture shows how blockchain

technology can be used to keep track of farm-grown fruits and vegetables in rural places.
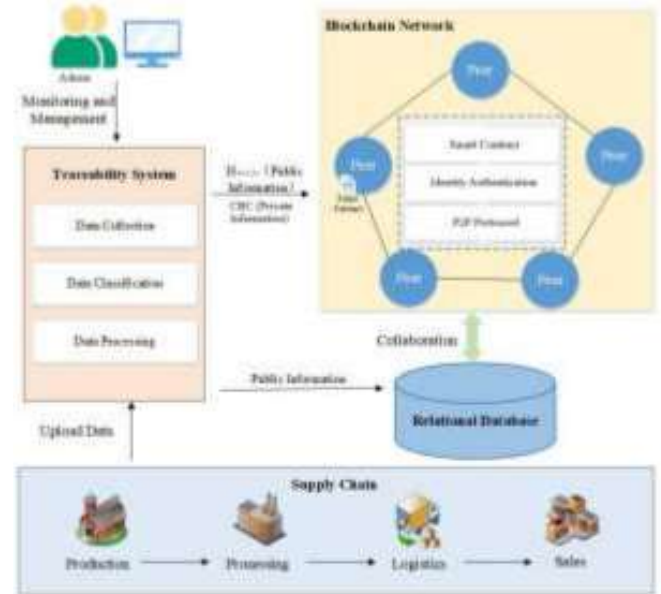

FIGURE1.On-chainandoff-chaindatacollaborationstorage.

Traceability data can be collected by a Web of Things gadget or entered by hand. Customers give information that can be used to keep track of how the framework is planned, developed, coordinated, and used. Based on the framework classification, the traceability data is split into private and public parts. Public data stays in the local database, while private data is protected with CBC and sent to the blockchain. The SHA256 method is used to hash the information that is being sent. The person is given a piece number when the hash value is saved to the blockchain. It turns into an open data record when the item number meets the database. The public data hash value must be added to the blockchain in order to change the piece number of the country item data. People can read the QR code to get to the database's open data and piece numbers. Once they have the piece number, they can compare the hashed open data to the hash value stored in the blockchain to see if the data on how to track an item has changed.
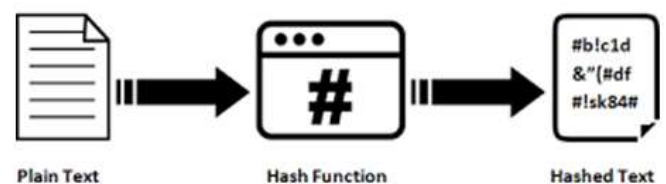

FIGURE2 .HashingText.

5.FINDINGSANDDISCUSSIONS

The food supply chain has changed a lot since blockchain-based traceability systems were put in place. The buyers and traders both own the data in these systems, and the administrators are in charge. The open record makes sure that everyone in the supply chain is responsible and can be trusted by keeping track of who owns the data. Vendors make sure that all of a product's information is carefully written down. This includes where the product came from, how it was made, and quality signs. Customer trust grows because they can quickly get this knowledge, which helps them make smart decisions. Administrative control makes sure that laws and rules are followed so that the system stays honest. Buyers and sellers can quickly and easily trade verifiable data over blockchain networks that can talk to each other and set up protocols, as shown by pilot installs. Stakeholders gain from customers having more faith in the safety and authenticity of agricultural goods, transaction costs going down, and the supply chain becoming more open.

Figure 3:Admin login

Figure4:Viewauthorizedusersanddataowners

Figure5:Dataownerregistrationandlogin

Figure6:Viewdataownerproducts

Figure7:Userregistrationandlogin

Figure8:Useraccountdetails

Figure9:Userproductpurchase

Figure10:Viewallpurchasedproductstraceabilitywi
thblockchain

6.CONCLUSIONAND FUTUREWORK

As part of this project, an agricultural goods tracking system was designed and put into action. This system allows natural products and veggies to be tracked. We looked over the framework and made it possible to keep track of data drawn from blockchain technology without changing it. We also looked at its investigative approach and ability to do its job. To ease concerns about the large amount of data and lack of privacy security in the blockchain traceability system as the amount of data grows, an on-chain

"Database + blockchain" is one idea for how to store data off-chain. The public info that clients see is kept in a local database and is far down the supply chain. SHA256 processing is used to send the database's hash value to the blockchain system. Private data that is encrypted with CBC is kept on the blockchain and sent to the right people. The information stack on the blockchain is made lighter by adding real-life examples to the capacity method suggested in this study. As an example, it says that open data must be monitored across the supply chain and private business data must be kept safe. The piece of data that is open to the public is kept so that a link can be made between the database and the blockchain. If clients scan the QR code and follow the on-screen directions, they can open data in the database. The

system then compares the new item data to the piece number that is stored in the database to see if the item data has changed. As blockchain technology improves, the ability to use more than one chain becomes more important for real-world business needs. More study into cross-chain innovation involving many chains will also be supported, along with the creation of a modern agreement component for keeping track of things. The project's main goals are to make the blockchain-based record system last longer and work with more systems. For more information, look into how AI and IoT might work together in the future to improve data analysis and automation. Adding processed foods and items with extra value would make it easier to track. The public would have more faith in the food supply line, and food would be safer.

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