

Blockchain Technology for Sustainable Supply Chain Management

Aman Varma, Vishal Waghmode, Tushar Kakade, Prof. Anita Mhatre

Department of Information Technology
Datta Meghe College of Engineering, Airoli, Maharashtra, India

Abstract: *The supply chain is the network of stakeholders or individuals through which a product from the source is reached to the customer. There are different supply chains for different products. Agricultural supply is of them, perhaps the most complex and important one. The traditional supply chains are centralized and they depend on a third party for trading. These centralized systems lack transparency and accountability. The lack of transparency between the producer and consumer by means of food safety and security always lags. Food safety is an increasingly serious threat globally lack of a food security system would affect people's health and life directly or indirectly. The proposed solution focuses on recording interactions and transactions among all the participants involved within the Agri supply chain . All transactions are recorded and stored in the blockchain's immutable ledger with links to a decentralized file system , thus providing a high level of transparency and traceability into the supply chain ecosystem in a secure, trusted, reliable, and efficient manner. Now, the consumer can scan the QR code on the product and will get all the details about the product.*

Keywords: Agricultural supply chain, Blockchain, Information database, Resource wastages

I. INTRODUCTION

Blockchain is a computing technology that facilitates the transfer of data or useful information in a decentralized and transparent manner. It was developed by Satoshi Nakamoto in 2008, and it serves as a distributed ledger that verifies records and timestamps transactions. Like name says, a blockchain is a chain of blocks that contains information. A blockchain is an open distributed ledger t. They have an amazing property: once some data has been recorded inside a blockchain, it becomes very difficult to change it.

Smart contracts are also part of the blockchain. They are computerized contracts or procedures that have been previously agreed upon by the parties and are automatically enforced without the need for human participation. Smart contracts will allow parties who may or may not trust each other to conduct business with one another. As a result, moral dangers in the industry are reduced.

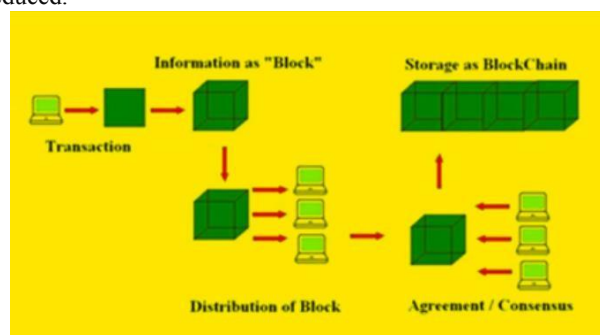


Figure 1: Blockchain Working

Blockchain is a time-stamping decentralized network. This means that each asset in the network has a copy of all document timestamps. On the other side, these timestamps cannot be tampered with or tricked with. The usage of cryptographic problems is used to accomplish this. Blockchain technology creates a decentralized digital public record of transactions that is safe, anonymous, tamper-proof, and immutable. Rather than a bank or other intermediary maintaining



a private database of documents, blockchain technology makes all records publicly accessible. A new block of data is added to the digital chain every time a transaction takes place on the blockchain. If person (A) sends money or information to person (B), for example, the transaction will be recorded on the blockchain and given a unique number.

II. EXISTING AGRICULTURAL SUPPLY CHAIN

The supply chain is the network of stakeholders or individuals through which a product from the source is reached to the customer. There are different supply chains for different products. Agricultural supply is of them, perhaps the most complex and important one. The traditional supply chains are centralized and they depend on a third party for trading. These centralized systems lack transparency and accountability. The lack of transparency between the producer and consumer by means of food safety and security always lags. Food safety is an increasingly serious threat globally lack of a food security system would affect people’s health and life directly or indirectly



Figure 2: Typical Agricultural Supply Chain

Product safety requires constant monitoring of agricultural product development and effective logistics management in the food and agricultural supply chain. Growing worries about food safety and contamination hazards have re-emphasized the importance of improved supply chain traceability. Furthermore, agricultural items transported across multiple countries necessitate meticulous tracking and adherence to national regulations. In order to ensure product traceability in the agricultural supply chain, important information must be collected, communicated, and managed, as well as numerous information exchanges throughout the supply chain. The agricultural/food supply chain's dynamic nature makes it difficult to manage and trace information because items are generated, processed, and transferred through multiple intermediaries. Food and agricultural supply chain is getting a lot of attention from the research community due to the problematic long supply chain, from raw materials to the end consumer makes it extremely hard and time-consuming to track back the origin of a product. Hence, there is a need to create a secure framework for tracking the details about the origin, farming methods adopted, and safety of the food product throughout the supply chain cycle without a third party or centralized control

III. AGRICULTURAL SUPPLY CHAIN USING BLOCKCHAIN

The blockchain allows us to eliminate intermediaries, but the commitments and trust boundaries between the contributing parties often necessitate the use of something known as a smart contract. Smart contracts establish organisational rules and conditions that govern trust inside the scope of the contract, similar to how regular contracts regulate trust between the parties. The sole difference between a smart contract and a regular contract is that a smart contract is written in a programming language. The rules, terms, and conditions contained in the agreement are executed exactly as agreed by all parties using controlled coding. The concept of a smart contract has been around since the 1980s, but it lacked the ability to eliminate intermediaries. Nick Szabo first proposed smart contracts in 1996. A smart contract encases the contractual obligations in a combination of hardware and software, making them difficult to breach and prohibitively expensive. As a result, smart contracts improve security by limiting the number of assaults.

In 2016, the Ethereum blockchain popularised the concept of smart contracts and their implementation in real life. The Ethereum network combines a Turing-complete decentralised blockchain with a smart contract ecosystem and integration capabilities. In other words, in blockchain technology, a smart contract automates procedures. We can potentially employ blockchain in other real-world circumstances by storing the contract within the blockchain. Smart contracts are computer programs that are executed when certain conditions are satisfied and are stored on a blockchain. They're frequently used



to automate contract execution so that all parties are immediately aware of the results without the need for middlemen or time loss. Blockchain technology has rendered traditional contracts obsolete. The typical supply chain also has a lot of paperwork and documents, which makes tracking and recording proofs difficult. Smart contracts, which are automatically implemented and activated when predetermined criteria are met, can help to address the shortcomings of transparency, efficiency, security, and traceability, as well as eliminating the need for a middleman. These auto-executed code-based contracts allow agreed-upon activities (such as payments) to occur quickly after the contract's terms are met. This is a key feature that distinguishes blockchain from Ethereum. For example, when a client verifies their shipment, a smart contract will transfer money to the carrier based on the instructions. Smart contracts are unique in that they allow you to write code that executes itself without the need for a third party, saving you a lot of money, time, and effort while also eliminating the possibility of errors or fraud. In contrast to a standard contract, a smart agreement between two parties involved in a transaction keeps each party accountable for their part in the transaction and guarantees that it is carried out. Smart contracts improve the transparency, traceability, and efficacy of a supply chain, allowing it to be more flexible in forming links between parties. Every smart contract has its own address. One of the contracts deployed in the blockchain is never changed by this address. A contract address is the sole place where user transactions can be sent. The transaction will be executed by each consensus node in the network in order to obtain consensus on its result. Deterministic and non-deterministic smart contracts are the two types of smart contracts available.

IV. DETAILS OF OUR PROPOSED SYSTEM

The proposed solution focuses on recording interactions and transactions among all the participants involved within the Agri supply chain. All transactions are recorded and stored in the blockchain's immutable ledger with links to a decentralized file system, thus providing a high level of transparency and traceability into the supply chain ecosystem in a secure, trusted, reliable, and efficient manner. In simple words, we are recording all the transactions which are happening in the supply chain and storing it on the blockchain at a decentralized location. After every transaction, a QR code is generated which contains all the data about the entire provenance of the product. Now consumers can get entire information about the product just by scanning QR code of the product .



Figure 2: Visual Representation of Proposed System The project can be broadly divided into two parts:

- 1. Centralized Part
2. Decentralized Part

4.1 Centralized Part

The centralized part of the project contains data about the users which are stored at a centralized location. In a typical supply chain, there are various actors which perform different work. On the basis of their jobs we have divided them into 4 categories:

Farmer/Producer Module:

They are the first actor or person who starts or initiate the agricultural supply chain. In this module, we have given 3 features to the users : i)Add Product- User can add their product and initiate the supply chain.



Check Product

Users can check the provenance of the product by scanning QR code of the product.

Scan Product

Users will scan the QR code of the product in order complete the transaction.

Distributor/ Retailer Module:

A distributor is an intermediary entity between a producer of a product and another entity in the distribution channel or supply chain. The distributor and retailer have been provided with just 2 features i.e. To check the Product and scan the received product.

4.2 Consumer Module

Consumers are individuals or organizations that purchase and use a product or service. a consumer may be an organization (a producer or distributor) that purchases a product in order to incorporate it into another product that they, in turn, sell to their customers (ultimate customers). The consumer has the feature of Check Product wherein information about a product’s entire journey right from the origin will be displayed

With the rise in malware threats, it's more necessary than ever to secure our computers and cellphones with anti-virus software. Machine learning is a valuable technology for detecting malicious software. It has been trained on millions of samples so that it can learn to recognise their properties at scale, even when new varieties of malware are discovered. It is a type of artificial intelligence that may be used to detect malware. It works by extracting information from a file and comparing it to known malware signatures. It also entails scanning the entire system or portions of it, extracting harmful software traits, matching these features to known behaviors, and detecting malware. The battle between malware designers and examiners is fierce. Both the research and hacking communities are working in the same direction; one is constructing a malware detection system, while the other is designing malicious software that will assault computer and network resources. Malware examiners look for known malware and try to detect it so that the user's computer systems are not attacked.

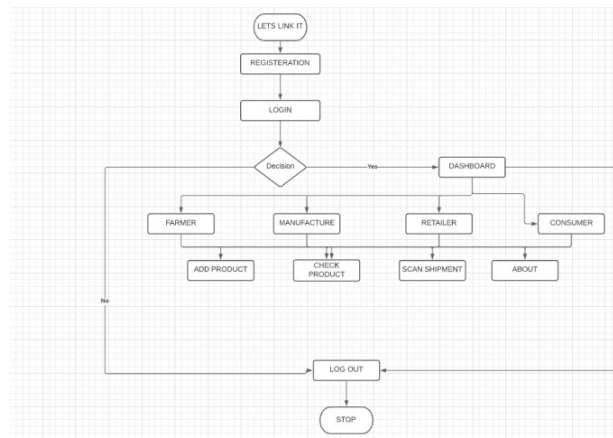


Figure 2: Data Flow Diagram Of Proposed System

Decentralized Part

In the decentralized part, we have used blockchain concepts and smart contracts. Here the details about the product such as product name , farmer name , whether the product is organic or not, etc. are stored inside the blockchain

4.3 Advantages

- Producers will have security. They will be able to receive a reasonable percent of profit.
- Unwanted middlemen and agents will be removed.



- Consumers can know what type of food they are consuming, whether it is organic or not.
- Traceability will be improved.
- Helps .to achieve food security.

V. CONCLUSION

This work implements a user-friendly web-based platform in Agricultural Supply Chain Management using blockchain technology, which is a decentralized secured system to get transparency, and enhanced product quality. As the transactions are getting recorded, the producers (farmers) will get fair prices for their produce, and their chances of getting scammed by middlemen on account of their illiteracy are greatly reduced. The use of blockchain enables traceability of the asset. From the farmer to the consumer, throughout the supply chain, we can keep track of the product. Also, the whole supply chain will become more accountable. The consumers will also be benefitted as they will not be paying inflated prices for the goods they buy because the unwanted actors from the supply chain will be removed and buyers will get authentic information about the goods. This, in turn, will improve the overall standard of living of the society.

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