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AGROSIGHT- An Agricultural Supply Chain

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Abstract - *One of the major challenges the agriculture sector is facing today is middlemen fraudulence. These days the process depends on a third party to coordinate the delivery. The sellers usually have an agent who ensures that the goods are delivered safely and buyers have an agent to recommend payment and audit the delivery. The involvement of multiple agents adds high costs to the system and makes the entire process time-consuming and vulnerable. In the end, the farmers are left with minimal income, and users may not get quality products. The idea is to develop a portal for buying and selling agricultural products using Blockchain technology. Using this portal, the entire chain of activities from producer to consumer can be tracked. Here the farmers can use this portal to sell their products in a more transparent manner. Since Blockchain technology is used, it is impossible for middlemen to tamper with the product details. Blockchain ensures security through the decentralized structure it provides and thereby reduces the middlemen fraudulence.*

Key Words: **Blockchain, Middlemen fraudulence, Decentralized, Time-consuming, Transparent.**

1. INTRODUCTION

We all know farmers are the backbones of our nation's economy as the Indian economy is primarily agriculture-based. But it is hard to say that Indian farmers still face many difficulties about the price of farm produce, over-ripening of products due to uncertain weather, diseases of crops, lack of agri-services, and technology. But people don't consider their issues. So we understand the significance of solving their problems thereby attracting many people and youth coming to this industry. Also, harmful chemicals applied in the agricultural industry which will cause deadly diseases should be prevented. Thus we come across the project.

1.1 Background

Current agricultural scenario requires new techniques and innovations to create a more transparent and accountable environment in the agriculture sector. One of the emerging tools is Blockchain technology. Blockchain applications in agriculture enhance diverse aspects of agricultural systems, especially supply chain. It overcomes the drawbacks of current systems that are

- Supply chain management system is over-reliant on the centralized database (single-point failure problem).

- High costs when involving a third party to verify and monitor transactions.

More than that, consumers with high overall trust are more willing to purchase online, however, the basic information of agriculture products is not easy to be confirmed and trusted by consumers. Blockchain technology enables the traceability of information in the supply chain and thus helps improve reliability. It provides a secure way of storing and managing data, which facilitates the development and use of data-driven innovations for smart farming and a secure supply chain. In addition, it can reduce transaction costs, which will benefit farmers' access to markets and generate new revenue streams. Thus Blockchain technology could enable supply chain management more efficiently than traditional monitoring mechanisms by lowering signalling costs for each entity.

1.2 Objective and Scope

The idea is to develop a portal for buying and selling agricultural products using Blockchain technology. Using this portal, the entire chain of activities from producer to consumer can be tracked. Here the farmers can use this portal to sell their products in a more transparent manner. Since Blockchain technology is used, middlemen can't tamper with the product details. Blockchain ensures security through the decentralized structure it provides and thereby reduces the middlemen fraudulence.

Consequently, this enables the farmers to sell their products at a better rate. Consumers can use this portal to know product details like the origin of the product, expiry date, price etc, and thereby get the best product. Using a private blockchain enables the admins to identify each and every node that has access to the blockchain. The financial transactions are made through a bank gateway and these transactions are made transparent through Blockchain.

2. MODULES

The system is divided into four modules :
(1) Farmer Module
(2) Customer Module
(3) Admin Module
(4) Transportation Module

2.1 Farmer Module

The farmer module is designed for farmers for their activities. Using this module, farmers can register themselves as a user by providing basic details like name, age, gender, date of birth, email id, phone number and any of their personal IDs for verification. After becoming a user, the farmers will be able to avail all the services provided by the app. For selling their products, the farmers should add product details like product name, quantity, soil used, fertiliser used, expiry date and price. After the product is added, they can post it for sale. For the product to be sold, a smart contract is made between the farmer and the client. After the product reaches the client's destination, the payment is initiated and credited to the farmer's account.

2.2 Customer Module

The customer module is designed for customers for their activities. Using this module, the customers can register themselves as a user by providing basic details like name, age, gender, date of birth, email id, phone number and any of their personal id for verification. The customers can search for their preferred products. From the list of results shown, they can view each farmer's product details. The customer can buy the product of their choice. A smart contract will be made between the customer and the farmer. The payment process is initiated only after the product has reached the customer's destination.

2.3 Admin Module

Admin is responsible for validating each user and adding them to the supply chain. Validation is done by verifying the documents provided during the registration. Admin module is responsible for monitoring all the activities of farmers and customers. Admin connects different farmers and customers according to the flow of the process. Every transaction taking place in the supply chain is verified by the admin. The admin is also responsible for maintaining all the data that is part of the supply chain.

2.4 Transportation Module

Transportation module is responsible for assigning vehicles for transportation of the products from the customer to the client. Based on product type and quantity of product, vehicles are allocated. Delivery and price per kilometre is shown for every vehicle. Each vehicle is assigned a transport id. A GPS module is attached to every vehicle so that the customers can track the product.

3. EXISTING SOLUTION

There are some sources that provide an online e-commerce platform for agricultural products. AgriDigital is a platform that is a cloud-based commodity management application that has been built to be blockchain-enabled so that the AgriDigital Community of users can stay ahead of the latest digital supply chain technology developments and meet the demands of their customers and partners. They track every truck that leaves the paddock, create and manage delivered grain from and to any storage site fast. Other features are easy access to cash flow secured by grain and no credit checks or upfront fees. AgriChain brings together all stakeholders in the agricultural supply chain, allowing them to make better-informed decisions, reduce supply chain inefficiency and risk, open markets and increase their bottom line, all on one easy-to-use platform. As each delivery is recorded, it automatically updates all contract positions on delivery and users can track contract progress through to completion. GPS technology tracks every load at every stage along the supply chain, from field to any destination.

4. PROPOSED METHODOLOGY

The whole process starts with the farmer who uploads the product details. The details get stored in both blockchain and MongoDB, and the uploaded product appears on the home screen of every user. As blockchain provides a decentralized structure the middlemen fraudulence can be avoided. Any user can view the details of the product and buy the product of their choice. The farmer who uploaded the product can delete the product from the network at any time. The application provides all the features of an e-commerce website including shopping cart, filtering, sorting, searching etc. With the customer buying the product, the whole process comes to an end.

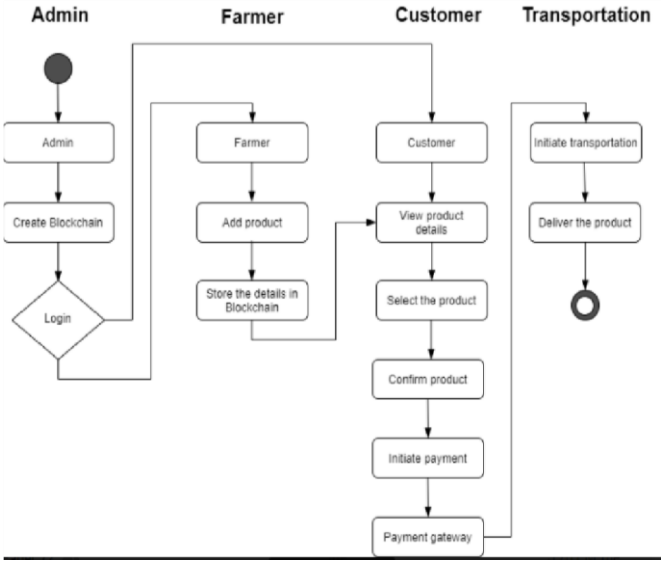

Fig-1: The architecture of our proposed methodology.

4. HARDWARE AND SOFTWARE TOOLS

In this section, we are going to discuss the hardware and software requirements of our project. Hardware and software requirements are the required specifications a device must have in order to use this project. It includes the operating system, processor etc.

4.1 HARDWARE REQUIREMENT

- Minimum amount of 4GB RAM is required. More than 4 GB can make all processes faster.
- Operating System: Windows 10 (64-bit)

4.2 SOFTWARE REQUIREMENT

- Node: 8.9 or higher (note version 9 is not supported):If you will be developing applications for Hyperledger
- Hyperledger Sawtooth:- works as an enterprise level blockchain system for operating distributed ledger applications and networks particularly for use by enterprises.
- VScode:-It is used as the text editor.
- Handlebars template engine:- Handlebars compiles templates into JavaScript functions. It makes the template execution faster than most other template engines.
- MongoDB:- It is a source-available platform and a document-oriented database program.
- Docker:- Docker can be used to run MongoDB instances.

5. IMPLEMENTATION

The website is developed using nodejs in an environment created by docker. The website consists of a front-end MongoDB application and blockchain as its back-end. The front-end website is developed using nodejs, Express framework, handlebars and a MongoDB database. The handlebars template engine is used to display the data obtained from MongoDB to the front-end of the website. The MongoDB database consists of 4 collections i.e; a collection to store the product details, a collection to store the user details, a collection to store the shopping cart details and a collection to store the details of the orders. The MongoDB database is used for features like, searching, sorting, filtering etc.

Initially, the data such as product name, price, expiry date etc. are entered into the add product form by the seller. The entered values are stored in both blockchain and MongoDB. The data in the blockchain are stored as address data pairs. The address part consists of a 70-bit hash value and it is hashed using SHA-512 hashing. The first 6 bits of the address block will be the same for all the blocks inserted except for the genesis block. These 6 bits refer to a common family name assigned to all the blocks. The family name is hashed with SHA-512 and the first 6 bits are sliced and used. The next 64 bits are the hash value of the attribute taken as a primary key. This primary key is also hashed using SHA-512 and the first 64 bits are sliced. Later the 6 bits of the family name and 64 bits of the primary key are joined to obtain the address of each block. When retrieving the data from blockchain the primary key is used to create the address. The primary key is hashed and joined with the family name hash to obtain the address. This address is then looked up in the blockchain to get the corresponding data. The data is encoded using base-64 encoding and then stored in the blockchain. The data consist of the entered data and a signer public key. Only users with the corresponding private key will be able to add and view products. After taking the data corresponding to the address generated, the data is decoded to obtain the original data.

6. CONCLUSIONS

The proposed system helps to maintain a decentralised blockchain which provides a transparent system to reduce the middleman fraudulence which is prevalent today and also help farmers to sell their product at a better profit.

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