Agriculture Supply Chain Management Using Blockchain

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ABSTRACT:
Agricultural farmers have a number of challenges these days, including seasonal variations and a broken supply chain; their work is tough and time-consuming. In this circumstance, a separate information database with validated data would be extremely beneficial. Knowledge exchange is critical in all facets of our industry, whether it's regarding market trends or successful techniques. In this area, third-party influence could lead to the spread of incorrect information. To mitigate this risk, blockchain, a secure and immutable data ledger, can be used. The purpose of this study is to investigate the many ways in which blockchain technology can be applied as a transparent and dependable transaction mechanism in the agricultural supply chain.

Keywords: *ASC, BCT, AES, visual cryptography, SHA 256, Java, JSP, Servlet, Web, etc.*

1.Introduction:
Sunil Patidar, a farmer, drove 50 kilometers to a mandi to sell his onions (wholesale market). However, he returned disheartened. He couldn't even recoup his costs of production, let alone earn a profit. This isn't about him alone. Many Indian farmers, like Sunil, are deeply unsatisfied. Their biggest gripe is that they don't get a fair price for their produce. The main reason for this is because they do not receive a minimum support price for their products (MSP). Farmers' produce is guaranteed at the government's minimum support prices. The government establishes a price to protect the producer, the farmers, against price decreases that occur during years of abundant output. At an Indore wholesale market, onions were selling for Rs 5-6 a kilo (Rs 500-600 per quintal). Our inputs are more expensive. Patidar, who lives in Harsola village, Mahu block, Madhya Pradesh, 40 kilometers from Indore, stated, "We often ask why we are even farming onions in such a scenario." Harsola, a peaceful Madhya Pradesh village, is known for producing high-quality, low-starch potatoes. Following the murders of six farmers in Mandsaur, Madhya Pradesh, when police opened fire on demonstrators on June 6, 2017, the state government agreed to purchase onion directly from farmers at a rate of Rs 8 per kg. Onions, however, are no longer sold at this price following the government change. Gaon

Connection conducted a survey in 19 states, polling 18,267 persons about the main challenges that Indian farmers confront. According to 43.6 percent of respondents, farmers not obtaining a fair price for their products is a big issue that needs to be addressed (4,649). While 19.8 percent of respondents said climate change is causing them problems, 17 percent said growing input costs are giving them sleepless nights. Based on our findings, we consulted with a number of experts, who all agreed that the main reason farmers don't get a fair price is that they don't earn the minimum support price for their produce. According to an OECD-ICAIR investigation, farmers lost Rs 45 lakh crore between 2000 and 2017 because they didn't get a fair price for their produce. Only 6% of farmers benefit directly from MSP, according to a report issued in 2015 by the high-level committee for restructuring of the Food Corporation of India (FDI), chaired by Shanta Kumar. This means that 94% of the population does not benefit from MSP. According to a 2016 study published by the NITI Aayog, 81 percent of farmers were aware that the government provides Minimum Support Prices on a variety of commodities, but just 10% knew the rates before harvesting season began. This brings up an intriguing point. How can Indian farmers get a fair price for their produce if they aren't aware of the MSP's benefits? According to the study, 62% of farmers learnt about the MSP after their crop was ready to harvest. According to the study, 32% of farmers received cash payments, while 40% received checks. As a result, we'll put in place a mechanism that ensures farmers receive a minimum fixed price for their produce.

2.Literature Survey:

Fei Xiang [1] Under the influence of the internet era, the agricultural product intelligent supply chain encompasses a broader development area. This paper, taking the internet because the background, proposes the concept of AN intelligent supply chain platform supported advanced technologies like huge information and the Internet of Things. underneath this platform, the most bodies of the agricultural product supply chain will get
together effectively for an extended time to maximize advantages and share advantages. Agricultural product may be standardized and planted on an oversized scale in step with market demand, shoppers will trace back to the supply of product, and provide chain provision will notice standardization of packaging. the provision chain may be additional precise, intelligent and manageable, and therefore the service of agricultural product are higher.

Amjad Gawanmeh [2] Food production, management and distribution is taken into account a potential drawback each in developed and developing countries. It is estimated that enormous quantity of food losses occurs after harvesting stages in developing countries. Therefore, several ways area unit being projected to watch and manage agricultural supply systems which ends in huge information. This requires proper security mechanisms to safeguard this information. This paper projected security mechanism so as to safeguard big information in agricultural supply systems. Next step of this project is to possess an example implementation, with real time data assortment and process that involves validating the applicability of the projected food security design by creating associate intelligent agricultural information monitoring system. The validation method is conducted through practical information

aggregations and assortment, so providing associate implementation for the protection framework with the support of cloud systems and Big Data.

LI Xiaoling [3] Based on the current integrated supply chain model of agricultural products, this paper designs a traceability system based on block chain technology, and makes data tracking records from the links of agricultural products production, processing, logistics and sales. The client uses the QR code of agricultural products for data query to obtain the traceability information of agricultural products. This system not only use block chain technology decentralization, the characteristics of the data is difficult to tamper with the traceability and trading to ensure the information security and can solve the problem of food safety of agricultural products, and combining with the agricultural products supply chain model improves the transparency and integrity of the agribusiness before, has improved the competitiveness between the enterprises, at the same time create more value for the enterprise. In addition, the alliance chain established by this system allows other high-quality agricultural products enterprises to join, providing more valuable information for agricultural products traceability and promoting the better development of agricultural products traceability system.

Chenxue Yang and Zhiguo Sun [4] In this paper, they have proposed a data management system based on supply chain system and affords efficient data extraction, management and access control for heterogeneous forms of data across the agricultural supply chain. The data management system includes four credible data management platforms: agricultural production information, recording transportation information, farmer-consumer transaction information, and consumer credit information. In the future work, we can further optimize the access control logic in the smart contract and the design of the main user authority table for various types of agricultural production and operation to improve the problem of reduced storage and query efficiency when there is too much data in the user authorization list of agricultural product producers, transporters, and consumers.

Massimo Conti [5] Many traceability systems are currently available, but due to the heterogeneity of implementations, the exchange of data among the different organizations involved in the production process is very difficult. In many cases the only way to achieve traceability is through paper-based systems. This paper proposes a difficult traceability technique based on NFC recognition and applied as a test case to the fruit and vegetables supply chain. The main goal of the system is to bring the information to the consumer using his smartphone with NFC.

Indra Eluubek kyzy [6] Social fairness is one of the main concerns for societies. There are many attempts to remove obstacles to reach this goal. Generally, there are many reasons for social unfairness which in business category transparency and inability to access resources are the main ones. In this study, we considered agricultural supply chain management systems as one of most important industries which is tightly related to under-development societies. Then, a comprehensive discussion was presented to illustrate how unfair conditions can happen for suppliers, buyers, and final consumers. Afterward, the general conceptual model of cyber

physical social systems was proposed to highlight practicability and efficiency of these systems to overcome challenges and help societies for achieving a perfect living condition.

Affaf Shahid [7] Using blockchain, industry has gained numerous benefits to grow and move towards decentralization and achieve a trustless environment for all processes. However, despite the trustless nature of blockchain, it is difficult to fully maintain trust between the seller and buyer of the product. This is because the entities may act mischievous and the buyer can doubt their trustworthiness. Besides, supply chain involves numerous processes that need to be carried out in a decentralized way in order to achieve traceability, accountability and security. In this paper, they have proposed an end to end solution for blockchain-based Agri-Food supply chain. They have provided detailed information of proposed solution in terms of traceability, trading, delivery and reputation. They have evaluated and analyzed the performance of smart contracts in order to ensure that the proposed solution is efficient and robust. This system is proposed to maintain the credibility of the Agri-Food supply chain entities and quality ratings of the products. Moreover, it also maintains the unchangeability and integrity of the transactions as these transactions are based on blockchain.

Chuntang YU [8] In this paper, they have studied the application of blockchain technology in the integrated application system of agricultural product traceability, solved the problems of low trust and system security of the centralized traceability system. The characteristics of agricultural product traceability chain such as distributed, tamper proof and consensus verification improve the security and credibility of the system. The results show that the strong trust traceability system based on blockchain has high availability and stability, and has good performance in scalability of distributed traceability data. The next step is to optimize the traceability chain details to improve the overall performance of the system in different scenarios.

Nurhayati Sembiring [9] As per the paper, tropical fruit supply chain system in North Sumatera consists of several sub-systems, namely the consumption, supplier, and producer sub-systems. Several variables such as planting area, harvested area, amount of working days, agroecosystem, land change, an extension of planting area (prolongation), and household income influence the producer sub-system. The variables were entering industrial consumption, total consumption, household consumption, industrial income, tropical fruit production, and household income influence supplier sub-system. Consumer subsystem, tropical fruit consumption is influenced by how people's conduct in consuming tropical fruit.

Pipit Rahmayanti [10] In this research paper, a medium-fidelity prototype design has been built based on the criteria of a good, effective and efficient agricultural marketplace get a success percentage value of 77.14%. In further development, it is expected that the prototype is still in medium-fidelity form so that for further design it is developed into high-fidelity so that the implementation of the prototype is better.

3.Proposed System:

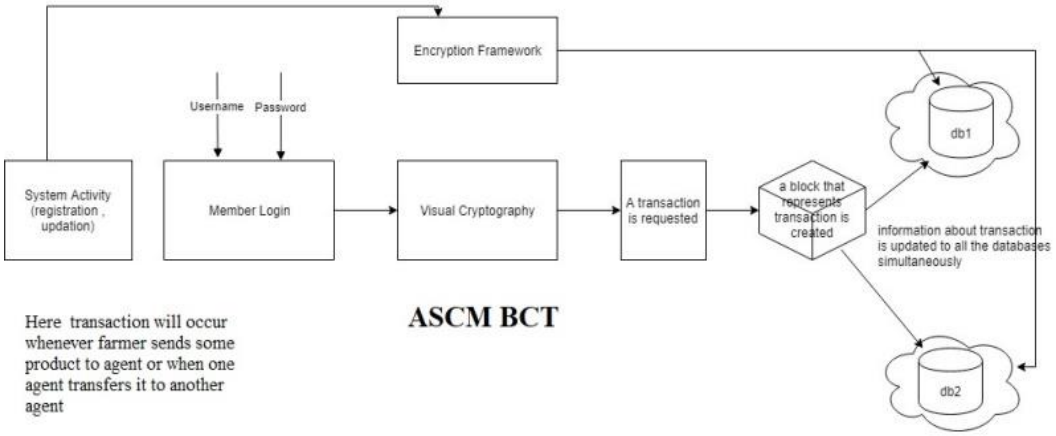

Fig: Proposed System

Whenever any transaction occurs within the system, the record of that transaction is maintained in the type of hash value in a succeeding block. Every next block can get connected to the previous block and in this manner a virtual block chain will occur. The hash value of a current block is generated using the data of a current block and also the hash of the previous block. In this manner if any of the block is tampered the following all the block's hash should be modified. Such multiple copies are maintained at completely different servers, which is able to assure the data security and confidentiality. As everything is through application interface, it will maintain the transparency within the agricultural supply chain management.

MATHEMATICAL MODEL:

Let

S be Closed system defined as, S = Ip, Op, Ss, Su, Fi, A

To select the input from the system and perform various actions from the set of actions A so that Su state can be attained.

S=Ip,Op,Ss,Su,Fi,A

Where,

IP1=Username, Password, image

Set of actions=A=F1,F2,F3,F4

Where

F1= Send Mail

F2= Merge Images

F3= Encrypt Database

F4= Generate Hash

S=Set of users

Ss=rest state, registration state, login state

Su- success state is successful analysis

Fi- failure state

Objects:
1) Input1: Ip1 = Username, Password
2) Input2: Ip2= image from mail
1) Output1: Op1 = Transaction Record
2) Output2: Op2 = Encrypted Database
3) Output3: Op3 = Hash Codes.

Result:

No.	Test Case	User Input	Expected Result	Actual Result	Status
1.	Register User	User gives all the credentials asked by the system	Registration successful	Registration successful	Pass
1.	Register User	If User miss any information to enter	Registration Failed	Registration Unsuccessful please Try again	Pass
2.	Login	System takes the username and password	Login successful	Successful	Pass
2.	Login	If incorrect information is entered	Login failed	Login failed, please give correct password or username	Pass
3.	Browse Image	Click on browse Button	Unless image is selected button should remain disabled	Button is disabled Unless proper image is selected	Pass
4.	Browse Button	Click on browse Button	Browse File Dialog should open	Browse file dialog opened successfully	Pass
5.	Select non image file	Select image	Error message to be shown	Error messaged Is seen	Pass

IV. Conclusion:

Thus, we have implemented a prototype web-based software application in Java for application of BCT in supply chain management. We have implemented block chain features such as: 1. Decentralization 2. Visual Cryptography 3. Hash Algorithm 4. Encrypted Database. Thus, it is possible to track agricultural supply chain and to give minimum price for agricultural products. As a result, we have implemented an ASCM with BCT; the system with BCT will be an excellent answer to ASCM challenges. JSP and Servlet technology will be used to construct the system, which will be written in Java. In future, we will implement a project on large scale with some domain and hosting space online.

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