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A PROPOSED AGRICULTURE TRADE AND SUPPLY CHAIN TRACEABILITY SYSTEM USING BLOCKCHAIN

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ABSTRACT

From divan to kitchenettes around the globe, demand for a smarter and safer food supply chain is on rise. The current situation of the food supply chain in India is that whenever farmer tries to sell their crops they are dependent on third party people which are the mediators who takes a margin of farmers profit while buying crops from farmers and later the mediators sell the crops at their desired price to end consumers. As a result, farmers get less profit, and there lacks traceability, transparency, and trust ability. In this research paper, we are focused on providing a secured and reliable trade system connecting farmers to the end consumers without any intervention of a third party which implies a direct profit in hand for farmers. Our trade system is backed by Blockchain technology which helps in making our trade system decentralized, which in order makes our system secured, reliable and helps to maintain transparency within our clients.

Keywords: Blockchain Technology, Food Supply Chain, Traceability, Transparency, Secured.

I. INTRODUCTION

India, as a nation, is blessed to have a rich and beautiful agricultural diversity. It is known as the nation "of the Farmers, for the Farmers and by the Farmers". But we have to overcome some issues to vitalize the roots of Indian Agriculture. One of these issues is lack of trustability and transparency in present agriculture system which will be solved by our proposed system using the power of Blockchain. Blockchain is said to be a list of documents/records called blocks which stores data publicly and in sequential order. The encryption of information is done using cryptography to ensure that the user data privacy is not compromised and the data remains immutable. Blockchain assures an immutable, decentralized ledger in which the data is maintained by the participants of the peer-to-peer network. The backbone of any blockchain system is its 'consensus protocol'. Consensus protocol is an algorithm which keeps the integrity of blockchain intact by synchronizing all the nodes in the system with each other. Consensus algorithm also acts as the first line of security in a blockchain system. It keeps scanning each and every block in a blockchain to verify that every block is linked to other with correct hash value. All these attributes of blockchain technology provides a solid base for a system conducting trade transactions and product traceability. Our proposed system will basically emphasize on creating a better agricultural trade environment for farmers using the power of BlockChian. The system will also enable supply chain traceability for the consumers and will allow one-to-one/direct trading between Farmers and Consumers. Farmers will also have facility to maintain their personal ledger which will contain the list of transactions carried out. Our system will also diminish the role of mediator parties which will result in higher profit margins for farmers.

Main objectives of work:

- To establish a base for the proposal of a trustworthy environment for farmers.
- To understand the intricacy of blockchain architecture and its contrivance in the agricultural sector.

II. LITERATURE SURVEY

The distribution of agricultural products and the production globalization brought a renewed focus on some key features like safety, quality, and the authentication of various major criteria in agriculture and food supply chains. There seems a great requirement for an effective traceability system due to the growth in the number of issues regarding food safety and contamination risk which will also serve as quality management tool in order to ensure appropriate product safety in food supply chain. Disruptive technology like blockchain can offer innovative solutions in the field of product traceability in agriculture and food supply chains [1]. The actual reason for proposal of blockchain was to Improve financial efficiency and reduction in the cost of transaction by

eliminating the intermediate parties and audit cost by means of enhanced accountability in the process of business trading. As a part of evolving e-agriculture system, blockchain technology has reformed agriculture sector completely in recent past to solve food crisis. Blockchain plays an important role from farm to end consumer in plenty of aspects: it assures data integrity and privacy with the combination of précised agriculture techniques and smart farming to enhance farm productivity; it generates better food supply chain by creating trust among involved parties [2]. A research on organic food market in India with the help of hierarchy process analysis shows that blockchain came out to be superior to other technologies [enterprise resource planning (ERP), supply chain with limited technology social media, radio frequency identification (RFID) and IoT combined with RFID]. A system developed on blockchain technology ensures fair-trading and helps to maintain circularity in the economy, and blockchain can act as key in assisting farmers to elevate the quality of food in the supply chain [3]. Generally, traceability is described as the ease of tracing products/goods in every part of the supply chain, i.e., from farm to the end user. Though traceability in goods like livestock and meat products has shown improvement via the use of harmonization in animal identification systems in many countries, but the same level of traceability for other food commodities are still far from being achieved [4]. Distributed ledger cites to a category of database which can be replicated, shared, and synchronized among the participants of the decentralized network. Blockchain is a kind of decentralized ledger which consists of data blocks linked together in chronological order with the help of cryptographic hash function. A hash function is termed by two different characteristics: irreversibility (Retrieving back the original data from its hash is not possible) and uniqueness (there must be two distinct hashes for two different pieces of data). A page of a ledger can be termed as a data block which consist of list of transactions, timestamp of data block generation and hash values that links the blocks in chronological order with previous block. The fundamental component of distributed ledger is a consensus mechanism which entrusts that all nodes come to a common agreement on the data. A 'node' can be any physical device (desktop, iPad, smart phone, etc.) existing in a network which can send, receive or forward data/information. A block is entered into the ledger by the 'consensus node' [5]. Data encryption is a type of security method in which data encryption and decryption is done by user with the help of an encryption key. If someone tries to access the encrypted data without prior permission, the data appears unreadable or distorted to that person. There are two methods for encryption: symmetric cryptography or shared secret encryption, in this method encryption is achieved using a unique key which converts the respective cipher data into deciphered data. The receiver requires this unique key to decipher data. By altering the key, different encryption can be achieved. In few years, Diffie Partnered with Martin Hellman and Ralph Merkle introduced the new method of encryption: public key encryption (PKE) or asymmetric cryptography. This method splits the key into two smaller substitutes. The two of them are called as public key and private key. Recipient of the data uses public key to encrypt data and to decrypt data uses private key and vice versa. So, in order to send or receive data in a reliable and secured manner to someone, you don't need to have their private key. This feature allows safe and secured communication between two users without any prior exchange of keys and information [6]. Decentralized anchor scripts on blockchain technology or alike infrastructures that authorize the predefined processes to be executed transparently are known as Smart Contracts. The use of these smart contracts or assets such as money become programmable, which then opens up application potential which was previously inaccessible [7]. With the help of smart contracts, flexible and scalable businesses can be achieved by manufacturers at a lower cost and overall improved manufacturing services can be achieved [8]. There seems a profound impact of agri-food trade on social stability and sustainable economic development. But, there still exist several technical problems in present agricultural transactions [9].

III. LIMITATIONS

Till date, there are some key challenges faced by blockchain technology such as scalability, registration of governance identity, privacy, regulations and standards [1]. Following aspects can also be summarized as some major technical challenges: (i) integrating data intensive technologies forms scalability issues. (ii) integrating blockchain with already existing legacy systems. Multiple organizations have integrated their personal management systems within years and they find it hard to migrate their system completely to developing blockchain technology which may cause disturbance to their present services; and (iii) privacy and security. Blockchain inherits decentralized infrastructure that provides greater data transparency but data privacy is

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compromised. Although, recently developed platforms on blockchain technology grants transmission of encrypted records of transactions on-chain, greater security features might enhance security of data and privacy to greater levels because of various types of attacks The major challenges which were faced for improving the traceability using blockchain technology came out to be confidentiality, granularity, adoption, data validation, and data governance. Validating the data that will get stored in a blockchain dependent solution was an issue, since marking food as organic or fair trade can be non-compliant [3]. Since, the dimensions of blockchain technology are still in a developing phase or say blockchain is still in its initial phase, there exists plenty of chances regarding issues in current blockchain solutions. The fact that currently blockchain offers greater transparency but data security is still compromised. A fully fledged traceability solution for every product in agricultural sector encapsulating blockchain with other legacy technologies is still unavailable. There's also a need of a system prioritizing the needs of farmers and putting them on the driving seat of the ecosystem. Blockchain technology doesn't offer interoperability currently and its implementation is a high resource and cost consuming process but it's worth investing in such technology with high potential of reshaping the future of any sector.

IV. PROPOSED WORK

The proposed system will be hosted on a Web application for easy and effective access for the beneficiaries. Clients first must have to Sign-up into the system by authenticating their credentials. The sign-up section consists of two portals: Farmer's portal and Consumer's portal. Each portal consists of the input fields regarding respective client. After signing-up/log-in, the client would be directed to their personal account where they can view their portfolio and carry out transactions using our trade system. The transaction would be carried out as peer-to-peer trade among farmers and end consumers as shown in the figure below. Peer-to-peer trade helps to maintain trust between clients which makes our trade system more reliable. While initializing the trade, private key and public key are generated for both the farmers and consumer ends which are in the form of hash code which is obtained by using RSA algorithm. For each new instance, a new public key and private is generated for every trade transaction. The keys generated for each transaction are used to determine the hash value of the block. These hash values are used to link each block to their preceding and succeeding blocks. After the completion of trade, the ledger of respective clients would be updated simultaneously. Clients can view their updated ledger and keep an immutable record of all their past transactions. This prolongs the integrity of the system and yields a deep assurance to the users.

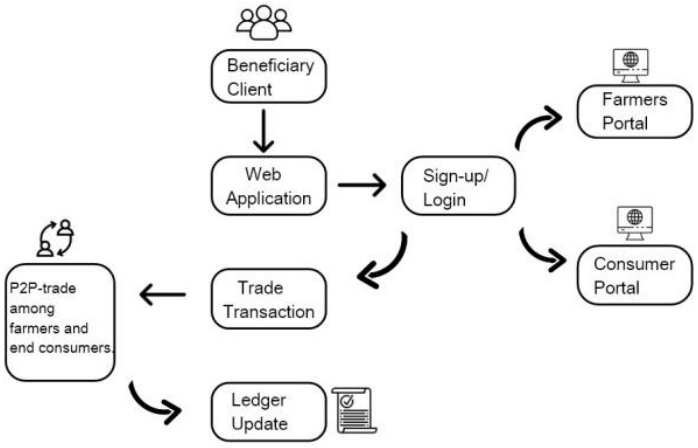

Fig. System Execution Flowchart

V. CONCLUSION & FUTURE SCOPE

Blockchain in any sector/field is self-sufficient to imply its impact; similarly Blockchain in Agriculture will help the farmers and consumers to get assured returns on their investment and hard work. In this article we have presented the rational framework of a trade system especially designed for the agricultural products. We showed the basic of how our system will work creating an impact on the issues in current agriculture trade system. Our trade system with inherited blockchain technology ensures transparency, reliability, accessibility and traceability. Therefore, a change indeed is a need for a healthy and steady growth of Indian Agricultural Sector's prolonged future. Our complete system will be unbiased in every possible way assuring the trust of the

users. As a future work, this article will lay a structure for a fully fledged system which will inherit all the mentioned features. This system will be completely capable of executing a secured transaction between users and will maintain complete transparency between them. The system will be able to maintain the track record of food supply chain from farmers to consumers or stake holders. The immutable state of the ledger of user will remain unhindered. The system will allow farmers to connect and reach out the world and express their work. There will be ease for the farmers to put up a deal of their choice and their scale getting proper value of their product and also the credibility that a farmer seeks for. End consumer will be getting the product of their choice at right price

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