BLOCKCHAIN TECHNOLOGY FOR AGRICULTURAL SUPPLY CHAIN

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Abstract: In this project we are using IOT network and Blockchain security technology in agriculture food supply chain. In propose work IOT network will be setup in agriculture farms and this IOT will sense food quality growing farms and then report to its nearest cluster head and cluster head will report to base station. Base station will collect food quality data from Cluster Head and then store that data in decentralized Blockchain nodes. This data can be access by various users such as distributors, suppliers, farmers and consumers to know the quality of the food. All existing techniques were using centralized server (single main server) to store data and if this server hack by malicious users, then they can easily alter data on that servers and user's may get wrong or fake data and there is no proper software to detect that alteration and to overcome from this problem Blockchain technology has been introduced. Blockchain support decentralized (data stores at multiple nodes) storage and each node will store data as block of transaction by associating each block with hash code and whenever new data arrive for storage then all nodes will verify hashcode of existing blocks and if all nodes contains same hashcode then data will be consider as secured and unaltered and then new block will be added. If any node report incorrect hashcode then that node considers as attacked and then collect data from genuine nodes. Above verification of hash code is consider as PROOF OF WORK.

Keywords:
BlockchainTechnology,Agriculture applications,Hashcode,Internet of things(IOT)

1.Introduction

Blockchain is a decentralized and distributed ledger technology that enables secure, transparent, and tamper-resistant record-keeping of transactions. It serves as the underlying technology for cryptocurrencies like Bitcoin, but its applications go beyond digital currencies. Here are some key aspects of blockchain:

1. Decentralization: Unlike traditional centralized systems, blockchain operates on a network of computers (nodes) that work together to validate and record transactions. This decentralized nature enhances security and eliminates the need for a central authority.

2. Blocks and Chain: Transactions are grouped together into blocks, and each block contains a reference to the previous block, creating a chain of blocks. This structure ensures the integrity of the entire transaction history, as altering one block would require changing all subsequent blocks, making tampering highly impractical.

3. Consensus Mechanisms: Blockchain networks use consensus mechanisms to agree on the validity of transactions and the order in which they are added to the blockchain. Common consensus mechanisms include Proof of Work (used by Bitcoin) and Proof of Stake.

4. Smart Contracts: These are self-executing contracts with the terms of the agreement directly written into code. Smart contracts automatically enforce and execute the terms when predefined conditions are met. Ethereum

is a notable blockchain platform that supports smart contracts.

5. Transparency and Immutability: Transactions recorded on the blockchain are visible to all participants in the network, promoting transparency. Once a block is added to the blockchain, it becomes extremely difficult to alter, ensuring immutability and security.

6. Cryptocurrencies: Blockchain's most well-known application is in the creation of digital currencies, such as Bitcoin and Ethereum. These cryptocurrencies use blockchain to enable peer-to-peer transactions without the need for a central authority.

7. Distributed Ledger Technology (DLT): The term "blockchain" is often used interchangeably with Distributed Ledger Technology (DLT). DLT encompasses a broader range of technologies that distribute and synchronize data across multiple locations, of which blockchain is a specific type.

8. Use Cases: Beyond cryptocurrencies, blockchain has applications in various industries, including finance (for secure and transparent transactions), supply chain management (for traceability and authenticity), healthcare (for secure and interoperable health records), and more.

While blockchain technology has the potential to revolutionize various sectors, it also faces challenges, including scalability issues, energy consumption concerns (especially for Proof of Work systems), and regulatory uncertainties. Ongoing developments and advancements aim to address these challenges and expand the scope of blockchain applications.

The Internet of Things (IoT) refers to the network of interconnected devices that communicate and exchange data with each other through the internet. These devices, which can range from everyday objects like household appliances and industrial machinery to wearable devices and sensors, are embedded with sensors, software, and other technologies that enable them to collect and exchange data.

In recent years, the agricultural industry has been undergoing a transformative shift, driven by the integration of innovative technologies. One such groundbreaking technology poised to revolutionize the agricultural supply chain is blockchain.

Blockchain, originally designed as the underlying technology for cryptocurrencies like Bitcoin, offers a decentralized and transparent platform for recording and verifying transactions. When applied to the agricultural supply chain, it brings about a paradigm shift in how information is shared, transactions are conducted, and trust is established among stakeholders.

2. Literature Review

Blockchain technology is also used in project management for more accurate and transparent project control to support success in managing projects (Chofreh et al., 2019). Blockchain is a ledger based on the concept of digital transactions supported by various machines that do not rely on reliable third parties (Erol et al., 2020). Separate files related to transaction data, known as blocks.

Aiken A. Zooming in on privacy concerns: Video app Zoom is surging in popularity. In our rush to stay connected, we need to make security checks and not reveal more than we think. Index Censorsh. 2020;49(2):24–27**.**

Bermeo-Almeida O., Cardenas-Rodriguez M., Samaniego-Cobo T., Ferruzola-Gómez E., Cabezas-Cabezas R., Bazán-Vera W. International Conference on Technologies and Innovation, 6-9 November 2018. Guayaquil; Ecuador: 2018. Blockchain in agriculture: a systematic literature review; pp. 44–56.

Brewin D. The impact of COVID-19 on the grains and oilseeds sector. Can. J. Agric. Econ. /Rev. Can. Agroecon. 2020; 68:185–188. Brewin (2020) was optimistic about the fate of the Canadian grains and oilseeds sector in 2020 as the COVID-19 pandemic descended on the world. The sector did generate a large crop and, towards the end of 2020, saw a lift in prices. This contributed to record farm income in Canada in 2020. The pace of grain and oilseed

exports in Canada and ethanol demand in the east were affected by COVID-19, but the forecast of a “near normal” 2020 was relatively accurate.

Chofreh A.G., Goni F.A., Jofreh M.G. Enterprise resource planning (ERP) implementation process: project management perspective. Adv. Mater. Res. 2011; 338:152–155.

Chofreh A.G., Goni F.A., Shaharoun A.M., Ismail S. A review on sustainability transformation roadmaps using project management methodology. Adv. Sci. Lett. 2015;21(2):133–136.

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3. Methodology

Data Collection and Standardization:

Determine the critical data points to be tracked on the blockchain. This could include farm origin, soil conditions, fertilizer types, processing details, storage temperatures, and transportation logs.Establish a standardized format for data entry to ensure consistency across participants.

Sensor Data Collection with IoT:

Equip farms, storage facilities, and transportation vehicles with IoT sensors. These sensors can capture real-time data on various parameters like temperature, humidity, soil moisture, and location.Each sensor can have a unique identifier and transmit data securely to a central hub.

Blockchain Platform Selection:

Choose a blockchain platform that aligns with your needs. Consider factors like scalability, security, permissioned vs. public ledger, and existing industry adoption.

Smart Contract Development:

Develop smart contracts - self-executing code on the blockchain - to automate tasks and enforce agreements. These can manage payments based on pre-defined quality checks or trigger alerts for temperature deviations during transport.

System Integration and Pilot Testing:

Integrate the blockchain system with existing enterprise resource planning (ERP) or other relevant software used by participants.Conduct a pilot test with a limited group of stakeholders to identify and address any challenges before full-scale deployment.

Training and Adoption:

Train all participants on using the blockchain platform and interpreting the data it provides. Encourage wider adoption by demonstrating the benefits of transparency, traceability, and improved efficiency.

Data Privacy:

Ensure compliance with data privacy regulations regarding consumer information collected throughout the supply chain.

4.Proposed Method:

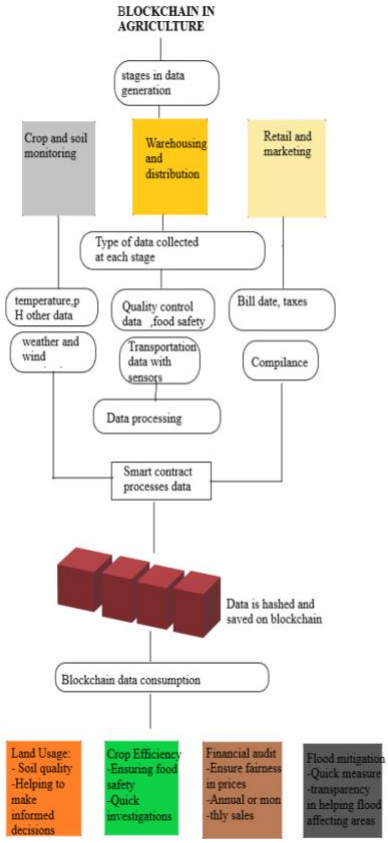

Fig 4.1 proposed method

Generate Network: using this module IOT network will get setup

Cluster Head Selection: all IOT networks exchange there available battery power and then check which IOT covering more number of nodes and can reached to base station with less energy consumption then that node will be elected as cluster head.

Collect Data: using this module IOT will collect/sense food data from agriculture farm.

Data Transmission Routing Phase: using this module IOT will find shortest path to reached cluster head and then transfer data to selected cluster head. CH will send data to base station. Base station will collect data and then store in Blockchain node. Blockchain store each data as block of transaction and will generate hashcode for verification

View Blockchain Data: various users such as consumer, farmers, distributors and many more users may use this module to retrieve data from Blockchain and view it. In this project they have used IOT sensors and agriculture field but we don't have any sensors so we built this concept as simulation.

5.Experiment Results Screenshots:

Generate Network: using this module IOT network will get setup.

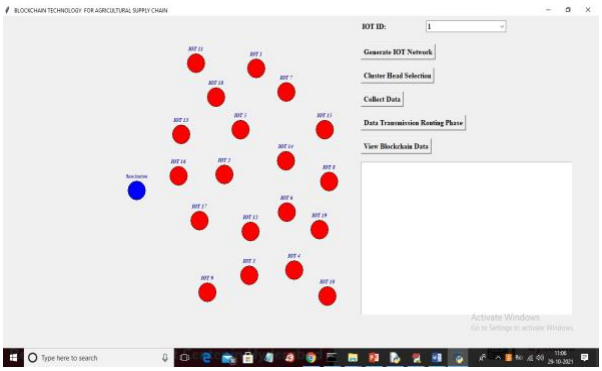

Fig 5.1 Generate IOT Network

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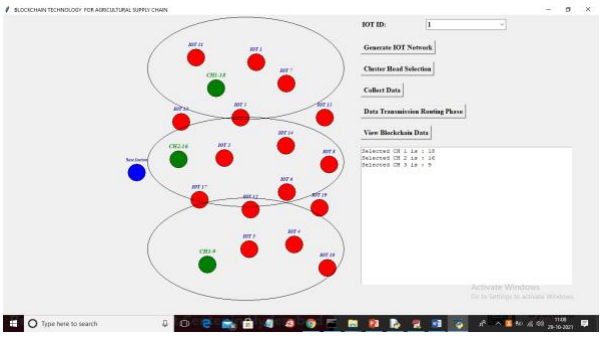

Fig 5.2 Cluster Head Selection

3) **Collect Data:** using this module IOT will collect/sense food data from agriculture farm.

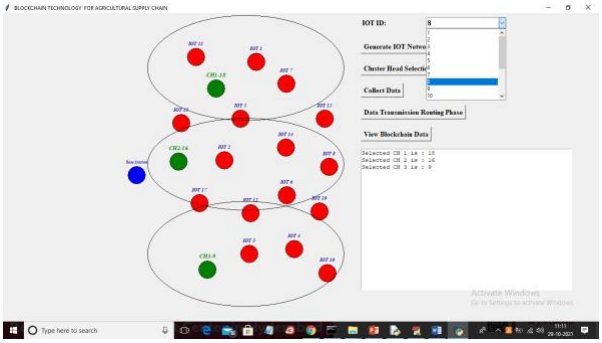

Fig 5.3 Collect Data

4) **Data Transmission Routing Phase:** using this module IOT will find shortest path to reached cluster head and then transfer data to selected cluster head. CH will send data to base station. Base station will collect data and then store in Blockchain node. Blockchain store each data as block of transaction and will generate hashcode for verification.

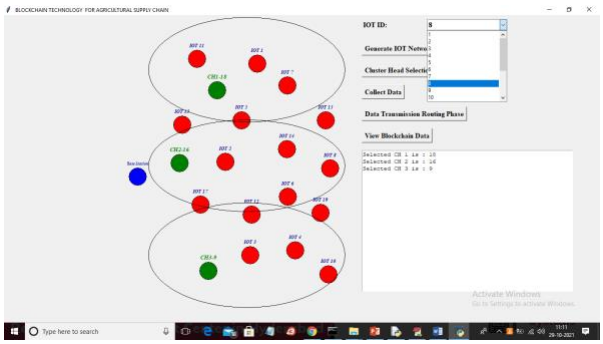

Fig 5.4 Data Transmission Routing Phase

5) **View Blockchain Data:** various users such as consumer, farmers, distributors and many more users may use this module to retrieve data from Blockchain and view it. In this project they have used IOT sensors and agriculture field but we don't have any sensors so we built this concept as simulation.

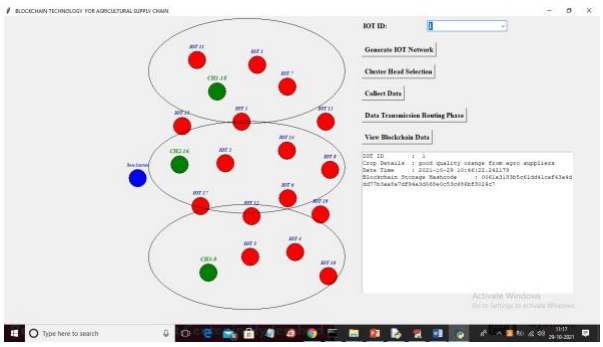

Fig 5.5 View Blockchain Data

6. Results and Discussion In this project we are using IOT network and Blockchain security technology in agriculture food supply chain. In propose work IOT network will be setup in agriculture farms and this IOT will sense food quality growing farms and then report to its nearest cluster head and cluster head will report to base station. Base station will collect food quality data from Cluster Head and then store that data in decentralized Blockchain nodes. This data can be access by various users such as distributors, suppliers, farmers and consumers to know the quality of the food.

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7. Conclusion

In conclusion, Above Blockchain technology helps in detecting attack nodes and make data secured. In propose work we are using IOT networks and this IOT network implemented following operations successfully, Generate Network: Cluster Head Selection: Collect Data: Data Transmission Routing Phase: View Blockchain Data: In this project we have used IOT sensors and agriculture field but we don't have any sensors so we built this concept as simulation and analyzed successfully.

8. References

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