# Agriledger - Empowering the Green Supply Chain

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## Abstract

Supply chain consists of very complex processes, and as its processes & tech evolves that makes its controlling, managing and quality assurance much more complicated. Our paper focuses on creating a distributed application that employs ethereum blockchain to guarantee the traceability, transparency, accountability & security for agro products on a global supply chain. To tackle these issues, blockchain, as a scattered ledger technology is decentralized & distributed, supports data synchronization in nodes, traceable information & provides data security. Its realized by the creation and application of Solidity - language smart contracts & ethereum network. Using these technologies the application aims to realise - Supply chain openness ,Smart contracts , Data sharing & collaboration ,Quality assurance ,Reducing 1 fraud and counterfeiting , Environmental impact tracking ,Auditing and compliance.

Keywords: Ethereum, Traceability, Transparency, Accountability, Security, Scattered ledger technology, Data synchronization ,Smart contracts , Solidity language, Auditing & compliance

## Introduction

AGRILEDGER application aims to solve various issues in the agricultural sector by leveraging the strengths of ethereum blockchain technology. It allows for transparent and immutable data storage. The application uploads essential information within the blockchain at every step of the agricultural chain, from planting and harvesting to distribution. Contracts with smart features are digital agreements with predefined rules and regulations, when these are fulfilled the terms of contract are executed autonomously. Using them in agricultural products is employable in various processes like payments to farmers, business owners and other stakeholders. AGRILEDGER provides an efficient, transparent, and secure solution to supply chain of the agricultural industry, profiting farmers, distributors, retailers, and consumers alike. Blockchain will provide end-to-end visibility throughout the chain by documenting every step of production and distribution. The immutable quality of blockchain enables the storage of tamper-proof information quality information such as packaging date & time, temperature etc. For verifying The veracity and ensuring the quality of goods, blockchain proves to be very effective. For Payments and Confirmations, Contracts with smarts can process and execute various contracts and payments between farmers, suppliers, vendors and retailers. Access to financial services: Blockchain can make it easier for farmers to receive financial services by providing transparent information about assets and businesses. This can help small farmers access credit and insurance that is necessary for their growth and their livelihoods. It will allow the producers to securely share information such as weather data, pests and diseases, and optimal farm activities. This valuable data can be then utilized for effective decision-making and efficient resource allocation. It will reduce assist reduce the no. of intermediaries within the chain ofsupply by working directly with farmers, logistics and buyers. This will lead to fairer prices for farmers and lower prices for consumers. Consumers of today pay extra emphasis on the ethical as well as environmental factors of their food. This is beneficial to all parties involved like farmers and other producers can attract customers by providing proof of fair trade and ethical practices. In areas where proof of ownership is uncertain, Agriledger enables transparent and secure recording of land ownership and insurance, resulting in reduced land disputes and improved land management. Sustainability and environmental impact, To track and record land ownership and activities. Explore permaculture practices such as organic certification and carbon footprint reduction. This promotes more

environmentally friendly agriculture. Police Insurance and Risk Management, Thanks to blockchain, crop insurance can be better managed and claims processed faster and more transparently, reducing fraud and increasing farmers' compensation for crop losses.

# Literature Review

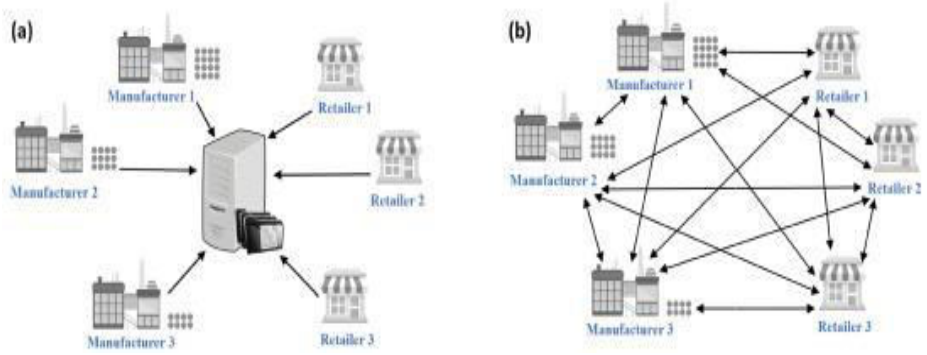
Here we discuss inventory information management throughout the supply chain by means of ethereum blockchain within the application. Dujak and Sajter discussed the necessity of open connections in connected devices D. Dujak et al. [22]. They said open access to the information kept within the blockchain about the chain of supplies could bring benefits such as faster information, less direct communication and further details at the conclusion users. Actually, Maersk and IBM have developed transportation technologies, especially packaging materials and applications, to digitalize the global economy M. Linnet et al.[23]. To achieve this a partnership is required between IBM, Maersk and DuPont, Microsoft, & additional businesses to safeguard transactions and produce tamper-proof documents utilising an open blockchain regulations for the whole global shipping industry. The price of preparing documents and information for delivery containers can be inside the same proportion as the actual shipment M. Linnet et al .[23]. They can guarantee that each and every information and transactions occurring throughout the chain of supplies are open and understandable to all partners. A blockchain application is used for this that creates a digital workflow document containing credentials & details among all parties participating in the deal and movement of the product, such as who issued or moved the product, when and where.

Thus, building a blockchain platform results in minimum to zero contact between local as well as global levels, removes mistakes, hold-ups, and other waste, additionally makes good information trading and indirectly makes business transactions smoother. chain. Inventory moves faster D. Dujak et al. [22]. Every informational item is accessible and dispersed, reducing dishonesty and inaction. The key benefit for sea carriers, ports, airports, and intermediate carriers is the ultimate visibility into cargo, such as reliable and instant visibility, end-to-end equipment connectivity and better performance and planning within their business. Additionally, Rotterdam and Antwerp, Europe's two largest ports, are also aware of blockchain potential I. J. Orji et al. [24].

Blockchain technology has the capacity for impact all types of businesses which require transparency, not just agriculture, transportation and logistics. For example, along with RFID systems in production to determine the key product, as tracking and visibility are better S.A. Abeyratne et al. [25]. Demand additionally advantageous to forecasting is blockchain because the information It is unchangeable and dependable in the blockchain. Additionally, the technology helps prevent fraud because users need to confirm their identification. This function is especially helpful in pharmaceuticals and luxury goods because it can help reduce counterfeiting I. Haq et al. [26] ,L. E. Cartier et al. [27] . Lastly, employing smart contracts on-chain aids make transactions more flexible as it eliminates involvement of a third-party S.E. Chang et al. [28]. A more thorough examination of the current plans or announced smart contracts shows that agro solutionsfor Industry 4.0, chain ofsupplies, and IoT are the best contractsin the market G. Prause. [29], Z. Wang et al. [30]. In the chain, blockchain integrates information, money and information necessary for Reorganising. Gold State Foods, a significant restaurant service provider, employs blockchain technology to monitor, track and trace itsfood. Additionally, Kohl's, Macy's, and Nike launched Chain Integration Pilot (CHIP) programs in 2017. CHIP successfully retrieved 223,036 serialized product data points from the product catalog, allowing partners to coordinate and cooperate as the information is accessible to everyone [30]. Ozer et al. The necessity of good information in knowledge sharing Ozer et al. [31]. When talking about military procurement, Zaerens K. Zaerens et al. [32] proposes smart contracts to monitor the balance and validity of information between participants. The research regarding the execution of blockchain in Agrosupply chain supervision is still in its infancy, It might be very helpful investigating resources that will enable the chain managers should make use of the platform as proxy physical evidence for shared information and data. We determine that the COVID-19 outbreak highlights the need for logistics transparency and production allowing to share inventory in situations such as shortages or increased demand.

# Analysis

All about efforts to create a blockchain-based shared solution. Some solutions do not support storage, such as M. Linnet et al. [23]. We also discovered that none of these answers provide DApp assistance. Conversely, Our resolution offers a approach to handling transactions and collaborate on-chain using The blockchain of Ethereum and its intelligent contracts. Adding Dapps to our solutions will facilitate exchange of information between retailers and sellers while also supporting product sharing with stakeholders. Second, the DApp won't occur affected by the failure; Meaning all involved stakeholders easily access the stored data because The framework is not dependent on a single centralized application. Additionally, network partners do not have to rely on external stakeholders such as government agencies or developers to support their business.




(a) Centralized supply chain (b) Decentralized supply chain

# Conclusion

We discussed the importance of information exchange for our agro-supply chain to function as efficient and effective possible. Our solutions combine blockchain and decentralized storage technologies to increase trust, efficiency and openness in connected devices. It also helps improve collaboration between partners while cutting down on pointless pauses. It is possible to modify the solution to various products in the schematics, algorithms, system architecture, products, and conditions can be adjusted accordingly. Our resolution allows participants to communicate exclusively via smart contracts, thus protecting participants' integrity, trust and accountability. Smart contracts are accessible to the public on GitHub for study and community use. Solutions appeal etc. It should not contain honest information. We discussed its security from different angles. Different rates are offered to each participant. Our research shows that blockchain-based data sharing solutions can reduce efficiency, cost and economic efficiency, and enable stakeholders to access better information with trust and security. In the future, we aspire to develop business programmes that enable complete automation of other related procedures impacting every types of products. We also know that since blockchain research in its starting stages, in future issues such as scalability, governance, and performance are obvious problems needed to be addressed .

| Features | Guggenberger et al. [37] | IBM & Maersk [23] | Wang et al. [38] | Casino et al. [39] | our work |
|---|---|---|---|---|---|
| Inventory sharing | ✓ | ✓ | ✓ | ✓ | ✓ |
| Blockchain-based | ✓ | ✓ | ✓ | ✓ | ✓ |
| Smart contracts | ✗ | ✓ | ✓ | ✓ | ✓ |
| Decentralized storage | ✗ | ✗ | ✗ | ✓ | ✓ |
| DApps | ✗ | ✗ | ✗ | ✗ | ✓ |
| Publicly available | ✓ | ✓ | ✓ | ✓ | ✓ |

Fig: Relative to existing technologies

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