

AgriDAO: Decentralizing The World of Agriculture

"Food is as important as energy, as security, as the environment. Everything is linked together"

- Louise O. Fresco -

Abstract

This article explores the use of decentralized autonomous organization (DAO) and Turing-complete blockchain technology in agriculture. By decentralizing agricultural systems and leveraging blockchain principles of security, transparency, and accountability, stakeholders can actively manage the value chain analysis and supply chain management. This enables optimization of agricultural processes, traceability, efficiency, and cost reduction. AgriDAO, operating on web 3.0, creates a secure and transparent ecosystem for informed decision-making and contributions to agricultural development. The ecosystem includes distributed ledgers, smart contracts, tokens, governance, decentralized applications (DApps), and community participation. The integration of DAO and Turing-complete blockchain technology holds potential for sustainable agricultural practices and food security, requiring collaboration and collective efforts.

Keywords: Agriculture, value chain analysis, supply chain management, Web 3.0, Turing-complete blockchain, DAO.

Introduction

Agriculture is like a monumental inscription that signifies humanity has entered a new stage of civilization's evolution. Until now, that inscription continues to shape itself. The initial carving narrates how hunter-gatherer humans decided to settle in a particular area. They began cultivating plants, raising animals, forming tribes, establishing social systems, developing knowledge and technology. As they entered the industrial phase, the inscription kept on evolving and carving itself.

The inscription has now split into two parts, and each part continues to carve itself. One part calls itself agriculture, which tells the story of the development of agricultural practices, techniques, management, and agricultural outputs as efforts to fulfil human's clothing and food needs. The other part calls itself agronomy, which is a science encompassing agricultural knowledge, technology, and engineering, along with its connections to economic, social, political, and environmental systems. It narrates how humans study, create systems, develop agricultural issues, and strive to address them.

It appears that humans have successfully developed agriculture by applying food system science. In the 1960s, the world population significantly increased, and the per capita calorie needs rose by 25%. Nowadays, households allocate only 10% of their income for food needs compared to the mid to late 20th century when households had to allocate 40% of their income for food-related matters. Although many developing countries still allocate more

funds, the percentage continues to decline. Thanks to the perseverance and commitment of farmers and agronomists in developing sustainable food systems, humans can consume more calories from animal protein, fats, and sugars. For the first time in human history, the percentage of people with excess weight exceeds those suffering from hunger. The application of agricultural and food system science seems to have become a success story, once again thanks to the perseverance and commitment of farmers, agronomists, and the collective capacity of humanity, who constantly learn and make adjustments.

Background

However, there is no reason to immediately feel satisfied with achievements and success stories. The availability of food for the growing rural and urban population worldwide requires maximum production capacity and agricultural outcomes in terms of quantity and nutritional quality. Preserving biodiversity is also an important mission of the agricultural world for the balance of bioecosystems. In fact, natural challenges ignite the passion of farmers and agronomists to implement more sustainable and long-term food systems, as well as the adoption of technology and autonomous systems aimed at creating climate-resilient, flexible, and disease-resistant agro-ecosystems. The challenges in the agricultural world, if not problems themselves, include financial issues, policy matters, and natural challenges such as climate change and human consumption behaviour.

Infrastructure, academic/scientific aspects, financial resources, and the right to participate in agricultural policies are accessibility issues that hinder the enthusiasm of communities to be involved in the development and establishment of agricultural systems. The younger generation quickly moves away from the agricultural and food sectors, and academic entities such as universities fail to attract potential students to delve into related subjects. The reality is that the entire applied agriculture and food engineering generation, who began their studies in the late 1960s and early 1970s, are now few in number. They have left a gap, resulting in a lack of experienced individuals in the fields of livestock, agriculture, land, and food. Accessibility of communities to the financial system and the right to participate in policies is truly necessary. Unfortunately, it is beyond the scope and very challenging to achieve.

The only option is that the agricultural world requires a decentralized protocol that enables users or communities to have the widest possible access in managing their own financial systems and policies without the authority of third parties.

The Application of DAO (Decentralized Autonomous Organization)

A sustainable and long-term agro-ecosystem is not about creating a stable ecosystem, but rather about the ecosystem's ability to withstand various challenges and make necessary

adjustments. This can be achieved when the ecosystem is managed by the public in a decentralized manner.

The development of blockchain technology has reached the stage of applied technology, one of which is the DAO (Decentralized Autonomous Organization). This applied blockchain technology enables real-world ecosystems like agro-ecosystems to be fully managed by the public. We know that this technology offers principles of security, transparency, accountability, accessibility, and public participation through decentralized consensus protocols. With these principles, it becomes highly feasible for agro-ecosystems to accelerate decentralized, scalable, and secure agricultural and food system science.

There are several basic components of an agro-ecosystem that can be fully managed by a DAO: distributed ledger, nodes, smart contracts, tokenomics, and governance. The distributed ledger serves as the comprehensive bookkeeping system that records all activities and transactions within the agro-ecosystem. This ledger is recorded, verified, and validated by decentralized nodes and can be accessed by all DAO participants. Tokens are used as a means to carry out activities within the ecosystem through smart contracts. The ecosystem will consist of Decentralized Applications (DApps) built by contributors such as universities, marketplaces, informational media, and others. Tokens serve not only as users' or communities' access rights to the entire ecosystem built on the DAO but also as governance rights. In a DAO, tokenomics refers to the decentralized financial system.

These basic components can be integrated into a blockchain technology with high computing power to support the principles of security, scalability, and decentralization. Equally important is the need for infrastructure that accelerates DAO interoperability, composability, and accountability. Therefore, the agro-ecosystem, along with its agricultural and food system science, will be integrated with Turing-complete blockchain technology.

Managing Agriculture with DAO and Turing Complete Blockchain

This subsection briefly discusses how the agricultural world can be managed by a DAO using Turing-complete blockchain technology. The focus of this discussion is to bring the agro-ecosystem into the CoreDAO¹ to accelerate agricultural and food system science. AgriDAO is the chosen project name to represent the agricultural world operating on the third-generation web or web 3.0 and fully managed by the public.

¹ Core is a layer-1 blockchain to operate at the core of Web 3. Powered by a new consensus mechanism, Satoshi Plus, Core is a Turing-complete blockchain leveraging the Bitcoin mining hashrate and the Ethereum Virtual Machine (EVM). Satoshi Plus applies a protocol-driven validator election mechanism to combine the optimal features of Proof of Work (PoW) and Delegated Proof of Stake (DPoS) in order to ensure the maximization of security, scalability, and decentralization.

Technically, AgriDAO will outline how the concepts of value chain analysis and supply chain management can be fully decentralized and managed by the public powered by CoreDAO Turing Complete Blockchain.

Value chain analysis involves identifying all the activities and processes involved in bringing a product or service from production to the end consumer. In AgriDAO context, this would entail mapping out the various stages of agricultural production, processing, distribution, and consumption, and understanding the value added at each stage. By having a decentralized approach through the DAO, participants can actively contribute to optimizing and improving each step of the value chain.



Figure 1. Common Value Chain Analysis

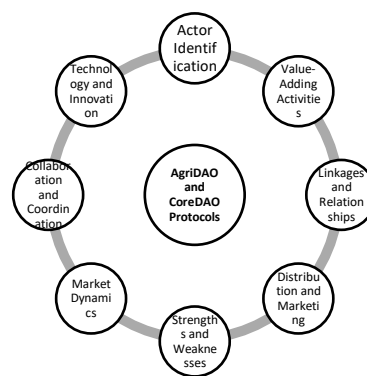


Figure 2. Decentralized Value Chain Analysis

Supply chain management refers to the coordination and control of the flow of goods, services, and information from the initial suppliers to the final consumers. With AgriDAO, supply chain management can be decentralized, allowing multiple stakeholders to collaborate and transparently track the movement of agricultural products. This can lead to enhanced traceability, improved efficiency, and reduced costs in the agricultural supply chain.

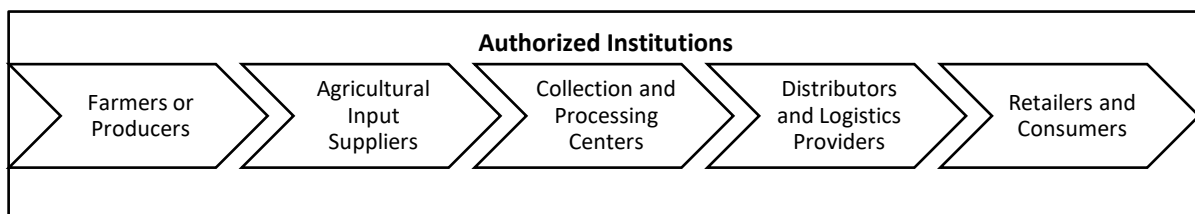


Figure 3. Common Supply Chain Management

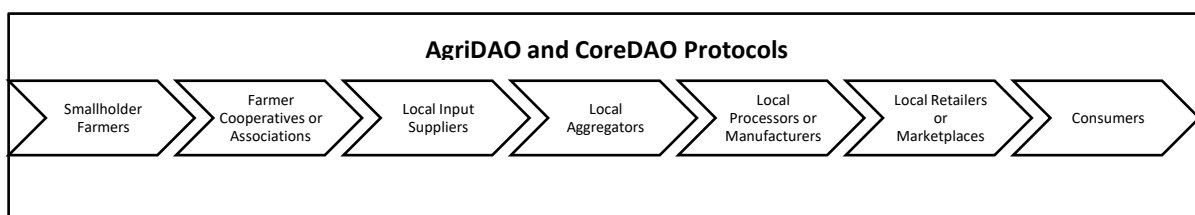


Figure 4. Decentralized Supply Chain Management

Meanwhile, the Turing-complete blockchain CoreDAO has the ability to execute complex programs and smart contracts. By leveraging the hashing power of Bitcoin mining, CoreDAO can integrate the well-established features of the Bitcoin blockchain with Turing-complete capabilities to execute smart contracts using the Ethereum Virtual Machine (EVM).

The integration of the EVM and Bitcoin hash power in CoreDAO refers to the utilization of the Ethereum Virtual Machine, which is a secured, scaled, and decentralized environment capable of executing smart contracts written in the Solidity programming language. By utilizing the EVM, CoreDAO enables developers to create and execute smart contracts similar to those existing in the Ethereum ecosystem.

AgriDAO leverages the capabilities of a Turing-complete blockchain to enable secure and transparent data sharing, automate processes through smart contracts, and establish trust among participants. This decentralized approach empowers the public to actively participate, make informed decisions, and contribute to the development and optimization of the agricultural and food system science. By bringing together value chain analysis, supply chain management, and decentralized governance, AgriDAO aims to transform the agricultural landscape. This utilization of a Turing-complete blockchain has the potential to redefine the way agriculture is managed, leading to more sustainable and efficient practices in the agricultural sector.

Ecosystem and Infrastructure

The AgriDAO ecosystem and infrastructure supported by the Turing-complete blockchain CoreDAO consist of several key components that enable effective development and management. Here is an overview of the ecosystem and infrastructure:

1. **Distributed Ledger (Blockchain):** AgriDAO utilizes the layer-2 on Core blockchain. This layer-2 provides a secure and transparent distributed database that allows participants in the ecosystem to interact, transact, and execute smart contracts that support AgriDAO operations.
2. **Smart Contracts:** Smart contracts in AgriDAO are used to govern various operational aspects within AgriDAO. These smart contracts can include asset management, profit distribution arrangements, monitoring of agricultural conditions and metrics, as well as management and voting for collective decision-making.
3. **Tokens:** Tokens in AgriDAO are used to represent ownership and interests, as well as access rights within the ecosystem. These tokens can be acquired or generated through various mechanisms, such as participation in agricultural activities, contributions to ecosystem development, or token issuance through public offerings. Tokens can be used as a means of exchange within the ecosystem, facilitating

financing, and providing voting rights in DAO decision-making. Tokenomics will be further explained in the technical whitepaper.

4. **Governance:** As a DAO, AgriDAO allows member participation in collective decision-making through governance. A voting platform integrated with CoreDAO can be used to conduct voting on important decisions that affect AgriDAO's operations and development direction. Decisions democratically made by members will be implemented through smart contracts.
5. **Decentralized Applications (DApps):** AgriDAO can be supported by decentralized agricultural applications that leverage the CoreDAO infrastructure. These applications can include agricultural product marketing and distribution platforms, agricultural trade markets, supply chain tracking, logistics management, or even applications that facilitate the sharing of agricultural resources such as tools or land. These applications operate on top of the layer-2 and interact with existing smart contracts.
6. **Community and contributors:** AgriDAO builds an active community and contributors who participate in the development and growth of the DAO-supported agricultural ecosystem. Membership in AgriDAO grants access to agricultural facilities, participation in activities and programs, as well as voting rights in DAO-related decision-making.

Physical agricultural infrastructure, such as land, farming facilities, equipment, and technology, is also an integral part of the AgriDAO ecosystem. AgriDAO can utilize or provide access to such agricultural infrastructure for production activities, research, or experiments in the development of sustainable agricultural innovations.

For further exploration, AgriDAO may have integration with external infrastructures such as oracle, layer zero, ZKtech, SSP powered Blockchain, Layer-3, or even smart contract based IoT.

Conclusion

The development of agriculture and agronomy has been a remarkable journey throughout human history, providing sustenance and shaping civilizations. While significant progress has been made in achieving sustainable food systems and addressing challenges, there is no room for complacency. The agricultural world faces pressing issues such as increasing food demands, preserving biodiversity, and coping with natural challenges like climate change.

To overcome these challenges, a decentralized protocol is needed to ensure accessibility, transparency, and participation in agricultural systems. The emergence of blockchain technology, particularly Decentralized Autonomous Organization (DAO), offers a promising solution. By decentralizing agro-ecosystem, we can achieve decentralized

management and leverage the principles of security, transparency, accountability, and scalability.

The application of DAO in agriculture enables the public to actively participate in managing the entire value chain analysis and supply chain management. Through DAO, stakeholders can optimize agricultural processes, enhance traceability, improve efficiency, and reduce costs. Furthermore, the utilization of Turing-complete blockchain technology, CoreDAO, empowers developers to execute smart contracts and establish trust among participants.

AgriDAO, an agricultural DAO operating on the web 3.0, holds the potential to revolutionize the agricultural landscape. It leverages distributed ledgers, smart contracts, tokens, and governance to create a secure and transparent ecosystem. With AgriDAO, stakeholders can make informed decisions, actively contribute to agricultural development, and optimize the agricultural and food system science.

The AgriDAO ecosystem relies on key components such as distributed ledgers, smart contracts, tokens, governance, decentralized applications (DApps), and active community participation. By integrating physical agricultural infrastructure with external infrastructures, AgriDAO can further enhance its capabilities, such as integrating with oracle, ZKtech, and smart contract-based IoT.

The integration of DAO and Turing-complete blockchain technology in agriculture holds tremendous potential for creating sustainable and efficient agricultural practices. By embracing decentralization, transparency, and participation, we can shape the future of agriculture and ensure food security for generations to come. The journey towards a decentralized agricultural ecosystem is an ongoing one, requiring collaboration, innovation, and the collective efforts of farmers, agronomists, researchers, policymakers, and the wider community.