



The Effectiveness of Blockchain Technology in the Field of Agriculture: A Path towards Digitalizing Agriculture in India

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The potential of blockchain technology to transform the agriculture industry by augmenting transparency, efficacy, and productivity is becoming more widely acknowledged. It provides solutions for monitoring agricultural product movement and origin, guaranteeing food safety, streamlining administrative processes, cutting expenses, and enhancing data management. Furthermore, blockchain can be used to anticipate crop yields by utilizing Internet of Things sensors and enabling smart contracts for transactions. Crop traceability, farm-to-table platforms, pesticide usage tracking, animal monitoring, and farm insurance management are some of the key applications in agriculture. Despite its potential, widespread usage will require addressing concerns with adoption rates, data quality, scalability, and regulations. Blockchain has the potential to drastically change agriculture by promoting more efficiency and transparency with the correct training, knowledge, and infrastructure in place.

Introduction

Blockchain is a decentralized digital record that protects and verifies transactions using cryptography. This technology, which was first created by Satoshi Nakamoto for Bitcoin, has since served as the foundation for other cryptocurrencies and shows potential for a wide range of uses. One prominent use case is smart agriculture, where supply chains' productivity, traceability, and transparency can all be improved by blockchain technology.

The agricultural sector plays a crucial role in the global economy by producing food and raw materials. With the growing global population, there is a pressing need to increase agricultural productivity and efficiency. Blockchain technology offers a promising way to address these issues, especially with regard to trust, efficiency, and traceability—aspects that have become increasingly important in light of recent technological advancements.

Blockchain is an immutable, secure technology that provides traceability, transparency, and security. These characteristics are particularly crucial in agriculture, where it's critical to establish a reliable and open food supply chain. By using blockchain technology, we can improve agricultural product tracking and monitoring, lowering the risk of fraud and foodborne illness. For consumers, regulators, and industry stakeholders, an accurate and dependable tracing system for the provenance, quality, and safety of food goods is essential, and blockchain offers a strong option to satisfy these objectives.

Role of BCT in Agriculture

- **Supply chain Management:** A supply chain is a system that links a business with its vendors in order to manufacture and market a particular good or service. It includes a range of tasks, including as obtaining raw materials, manufacturing, shipping, and delivering goods to final consumers.

Present supply chains, however, suffer from a number of inefficiencies:

Heavy and complicated documentation: This makes keeping track of events difficult.

Incoherent or unobtainable data: Causes information gaps.

Intransparency: Makes people more vulnerable to deception.

Incompatibility: Leads to inadequate cooperation during the data generation process.

High total transaction costs: Up to two thirds of the total cost of goods can be attributed to supply chain activities.

- **Crop insurance:** By the end of 2020, the insurance market in India is expected to have grown from USD 84 billion in 2017 to USD 280 billion. Agricultural insurance is essential for safeguarding farmers against weather-related hazards, like drought and rainfall, which helps to stabilize their income and maintain farming as a viable industry. Agricultural insurance comes in two primary varieties, which vary in terms of how payouts are initiated and losses are evaluated. They are:

Indemnity-based insurance: After both the insurance company and a government agency have investigated the damage at the farm level, payment for the loss of insured objects is made. In the most widely used system, payouts are made only if the harm satisfies the predetermined requirements for a claim.

Crop index-based insurance: By incorporating blockchain technology and smart contracts with all stakeholders, payments are automatically triggered when pre-determined and agreed-upon criteria are met. Beacon - Boosting Agriculture Insurance, as the name implies, leverages Earth observation data from Copernicus Sentinel missions, weather intelligence through data assimilation and seasonal forecasting, and ICT and blockchain technology (smart contracts) to issue insurance. Additionally, it provides early warning services, mitigation measures, and risk assessments related to weather conditions. A study by the Global Innovation Lab for Climate Finance and Etheric revealed that only 20% of smallholder farmers in developing countries have access to agricultural insurance. Beacon offers crop insurance using blockchain-based smart contracts, with claim amounts paid in DIP currency (their own currency). This technology reduces policy issuance costs by up to 41%, resulting in a premium reduction for farmers of up to 30%.

Microfinance -Self-help Groups: SHG-Bank Linkage Programme: The SHG-Bank Linkage Programme is dominated by SHGs in India. Less than 20 volunteers from comparable socioeconomic backgrounds who deposit a set amount of money into a bank on a voluntary basis make up a Self-Help Group (SHG). Banks lend small amounts to SHG members for revenue-generating endeavors with support from NABARD. However, because they lack knowledge about their creditworthiness or risk profile, borrowers frequently encounter obstacles while trying to secure loans from the official financial sector.

The Telangana government employs a decentralized blockchain platform to solve this problem by giving SHGs a credit rating and producing a tamper-proof transaction trail. As a member of the Society for the Elimination of Rural Poverty (SERP), Stree Nidhi, a Credit Cooperative Federation Limited, provides low-income SHGs with credit at a reasonable rate to augment the credit flow provided by banks.

It has collaborated with Cognitochain Technologies Private Limited to build B-PoS (Blockchain Protection for Stree Nidhi transactions), for which it received the Indian Express Technology Sabha Award 2020.

- **Sahyadri farms -Farmer Producer Company implemented Blockchain Technology:** Founded in Maharashtra in 2010, Sahyadri Farms is the biggest Farmer Producer Company in India, accounting for the lion's share of the country's grape exports. Their goal is to establish crop-specific value chains with open communication and effective management in order to generate sustainable revenue for small and marginal farmers.

They collaborated with Emertech Innovations Pvt Ltd to incorporate value-chain operations onto the blockchain platform AgroTrust in order to accomplish this. Sahyadri Farms' objectives of assisting smallholder farmers and bolstering the network of farmer collectives with cutting-edge technologies like blockchain, artificial intelligence, and the internet of things are in line with AgroTrust's mission. This software helps to establish sustainable farmer collectives by offering real-time produce tracking and cost transparency among supply chain participants.

By facilitating market access, providing FinTech solutions including fair insurance and credit facilities, and offering reliable certifications of yield, quality, and practices, these initiatives lessen the financial vulnerability of small-landholding farmers.

- **Other areas:** Increased traceability and transparency through the use of BCT will assist farmers in getting their produce valued at a fair price. Likewise, this can be used to related agricultural sectors (dairy). It is community driven (distributed) by using BCT enabled smart microgrids and smart Purchase Power Agreement.

BCT based use cases agriculture sector

- The agricultural industry is undergoing a revolution thanks to several blockchain firms and new digital technology.
- AgriLedger is a UK-based startup that makes it easier to track down the source of commodities and offers convenient product access and storage.
- AgriDigital provides comprehensive product management software, facilitating sophisticated transactions between agricultural sector stakeholders using smart contracts. Demeter uses digital assets to provide a central hub that facilitates micro-farming around the world.
- Etherisc offers farmers crop insurance as part of its decentralized insurance services.
- Ripe creates an open digital food supply chain by tracking the food's journey with high-quality data.
- TE-FOOD tracks shipments of fresh food, animals, and drivers along the whole supply chain using blockchain technology.
- Worldcovr provides crop insurance by employing satellites to track rainfall and initiate payouts automatically in the event of an output reduction.

Conclusion

Blockchain technology (BCT) offers the ability to solve a number of issues facing the agriculture sector. From farms to grocery stores, the food supply chain may benefit from increased trust, efficiency, and traceability thanks to its transparent, irreversible, and decentralized platform for recording and validating transactions. In the agricultural industry, BCT may handle supply chains, authenticate products, and streamline payments. But effective BCT integration in agriculture necessitates teamwork, clear legislative guidelines, and technological know-how. To see widespread adoption of BCT in the industry, challenges like regulatory frameworks, scalability, and interoperability must be resolved. Thus, in order to advance BCT in agriculture and create a robust, sustainable food system, policymakers, business executives, and technical specialists must work together. To address its problems, the agriculture sector needs a major overhaul, and blockchain technology (BCT) can be a key component in boosting the food supply chain's transparency, efficiency, and trustworthiness. It will need a team effort from numerous stakeholders to remove the different technical, social, and legal obstacles to BCT adoption in agriculture. In the end, BCT can offer a food distribution network that is more reliable, efficient, and transparent—a critical component for the planet's future.

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