Chapter 9
Systematic Literature Review of Blockchain Technology Applications in Agri-Food Supply Chain

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ABSTRACT

Blockchain is a fundamentally disruptive technology that will soon revolutionize the agri-food supply chain. Blockchain is a decentralized, digital, and unchangeable ledger of transactions that is distributed and duplicated throughout the network of computer systems. In order to determine the enabling features of blockchain technology that facilitate its use in the agri-food supply chain, this systematic review looks at the literature. Essential features including transparency, immutability, redundancy, adaptability, automation, and remittance were identified in the examined literature. Immutability and automation stand out among these characteristics in the current implementation, especially in food traceability. There are certain issues with the use of blockchain in the agri-food supply chain, though. Regarding technical advancement and its effects on the environment, further research is required.

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1. INTRODUCTION

Transparency in the supply chain is still a major problem for enterprises and governments. It focuses on guaranteeing product quality and encouraging sustainable practices, going beyond operational optimization or regulatory compliance. Traceability, which entails monitoring a product's journey from its point of origin to the end user, is at the heart of this problem. According to many studies Blockchain technology (BCT) is a crucial way to deal with this complexity. Blockchain was first introduced by Nakamoto in 2008 for use in decentralized ledgers and financial transactions. Its success in cryptocurrencies demonstrated its versatility, with uses in a variety of sectors, including agriculture, food, and pharmaceuticals. Its use in supply chain management transforms conventional supply chain operations by showcasing features like smart contracts and increased transparency. From experimental applications, blockchain has become a key instrument for increasing visibility, efficiency, and trust in supply chain management. High-value items, such diamonds, were the focus of early installations in an effort to improve traceability and fight fraud. Its application has grown over time to include industries like pharmaceuticals for protecting drug supply chains and agriculture for confirming origin. Modern supply chains are becoming smarter and more resilient as a result of blockchain's integration with technologies like artificial intelligence (AI) and the Internet of Things (IoT), signaling a move toward full digital transformation (Tang et al., 2024).

This convergence of blockchain with AI and IoT not only enhances traceability and operational efficiency but also has profound sustainability implications. AI algorithms can analyze blockchain-logged data to optimize resource use and predict supply chain disruptions, while IoT devices ensure real-time monitoring of storage and transport conditions. Together, these technologies create more transparent, resilient, and environmentally responsible agri-food supply chains, aligning with global sustainability goals (Zhao et al., 2025; Tang et al., 2024).

Blockchain is a cutting-edge, distributed, decentralized, and “state-of-the-art” technology that protects the availability, secrecy, and integrity of all data and transactions. It is a distributed, open, and shared ledger that may be used to store and record information and transactions across a peer-to-peer network that are supported by a cryptographic value (Dutta et al., 2020; El Jaouhari et al., 2025). The blockchain is a network-distributed digital shared ledger. It is extremely safe for commercial operations since once the records are uploaded, they cannot be changed without altering the earlier records (unless all or most of the people concerned agree). It has countless uses in a variety of domains, including as creating smart contracts to monitor financial fraud or safely transferring medical records between medical specialists (Jaouhari et al., 2022; Sandhu et al., 2024).