Chapter 6
Blockchain for Agri-Food Supply Chain and Logistics Management

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ABSTRACT

Today, the globalization of the supply chain in the food industry has surged remarkably; hence, food safety and quality certification have become critical. Blockchain is recognized as a promising technology in the agri-foods industry where it can act as a systematic and robust mechanism for increasing the food traceability and provide a transparent and efficient way to assure quality, safety, and sustainability of agri-foods. By lowering the cost and increasing value, this digital technology has the potential to increase profitability of agricultural produce along the value chain. This chapter aims to investigate the potential utilization of blockchain technology in the agri-food industry, where it can be used to address issues of trust and transparency and to facilitate sharing of information sharing among stakeholders. The technology is still in a preliminary stage; thus, this chapter is written to examine its implication in the agri-food supply chain, existing initiatives, challenges, and potential.

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INTRODUCTION

We are a part of technology driven age which is very unstable and evolving constantly. The impressive part of these digital transformations is that it affects each one of us directly or indirectly. In 1991, Haber and Stornetta wrote an article entitled "How to Time-Stamp a Digital Document" giving rise to the theory of Blockchain, while the first blockchain database was invented by Nakamoto (2008) where bitcoin was established as a cryptocurrency. Blockchain is considered as the latest digital boon and it is being applied in various applications such as industrial and business sectors. Blockchain allows safe handling and storage of corporational records, digital validation to build up intellectual property rights and patent systems in accordance with transparency throughout the supply chain for reduction in food frauds and enhancing food safety (Sharma and Singh, 2020).

Blockchain is defined as a digital dispersed ledger, sustained by a web of various computing machines. Data is stored in the form of different blocks that are secured cryptographically. Blockchain is also termed as an fixed ledger, which shows that if any damage or corruption of the data of a specific block is done, it will alter the hash of the respective block, leading to disruption in the cryptographic link because of the presence of varied hash(es) between the related blocks of the chain (Kendall et al., 2019). Causing alteration in one block of the chain, will cause invalidation of the rest of the blocks; which means that they will no longer remain attach to the chain. Thus, it assures that data once entered into the blockchain, no change can be done afterwards, as the rest of the entries after the corrupted block of the chain will be needed to altered, if alteration is done at any one point. Therefore, this basic structure makes it practically impossible to alter any one block in the chain, especially when greater number of components are added (Demestichas et al., 2020). Blockchain has developed its unmatched niche in the financial and business sector and has the potential to be applied in the food industry as well. However, it should be recognized that it is a nascent technology and requires more research and time before it is fully integrated with food industry.

Agriculture is one of the least digitized industries in the world. Much of the information that is produced on-farm is difficult to transmit off-farm because it is neither created nor processed in a way that promotes trust and cheap transmission. In modern agriculture, the low level of digitization is a basic constraint on the productive ability and efficiency of farming to gather value from information. As in all industries, information capture and use of information technologies can facilitate improved farm management practices, leading to productivity growth and improved on-farm yields. Fig 1 illustrates the quality features of farm produce as influenced through input of digitization and information technology.