Chapter 2
Integrating AI-Enabled Food Safety, Compliance, and Future Innovations for Resilient Food Supply Chain

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ABSTRACT

The chapter explores how AI technologies can be applied to overcome some of the

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challenges facing quality assurance, compliance with regulation, and disruption of supply chains in the global food supply chain. This chapter further highlights that AI-powered systems, machine learning, and predictive analytics enhance supply chain resilience. The present chapter takes into consideration various other aspects of food safety, such as AI-based hazard detection, automated quality control, predictive maintenance in food processing equipment, AI-enhancing traceability of food items, compliance monitoring, real-time reporting, food safety-related decision support, incorporation of AI into standards and regulations on food safety, automation in compliance, real-time monitoring for regulatory compliance, AI-driven audit systems, risk management, smart contracts on food safety, and automated regulatory updates. The chapter emphasizes that AI plays a crucial role in shaping the future of food safety compliance, improving global food security and earning consumer trust.

INTRODUCTION

The modern food supply chain has been facing many challenges lately on how to assure quality, comply with regulations, and manage supply chain disruption. With the advent of artificial intelligence, this changed as novel solutions to these issues have been developed, revolutionizing how food safety and compliance are conducted. Active AI technologies, such as machine learning and predictive analytics, will help in improving resilience within the supply chain through real-time monitoring and putting in place mechanisms for rapid responses in case of eventualities(Smith, 2022).

AI-powered systems enhance traceability in food products even more with regulated full standards, hence their safety is warranted. For instance, temperature-sensitive shipments can be analyzed with the application of AI-driven analytics to spot those that may be exposed to spoilage and take measures so that food reaches consumers in good condition(Johnson & Lee, 2023). Also, artificial intelligence can help in routine quality control processes and reduce potential human errors in majority of the steps, increasing efficiency along the entire value chain(Doe, 2024).

Furthermore, with AI working its way into supply chain management, this could favor future food innovations that includes predictive modelling for demand forecasts coupled with logistics optimization. It is these kinds of innovations that will go the extra mile in reinforcing the resilience of supply chains and reducing risks associated with shortages of supplies in the supply chain and volatility in the markets(Miller et al., 2023).AI has much to say about the future of food safety, compliance, and supply chain resiliency, heralding new prospects toward enhancing global food security.

ICTs for Agricultural Development and Food Security in Developing Nations

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