

Editorial Title: **Advancing the Digital Frontier in Agri-Food Supply Chains**

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In recent years, the agri-food industry has witnessed a transformative wave propelled by digital technologies, revolutionizing the way we perceive and manage the entire supply chain. This special issue delves into the intricate landscape of digital solutions and their profound impact on enhancing transparency, security, and efficiency within agri-food supply chains. The selected papers contribute valuable insights across five overarching themes as shown in Figure 1, each unravelling a unique facet of the evolving digital ecosystem.



Figure 1. Themes of the papers submitted to special issue

1. Blockchain Solutions for Secure and Transparent Agri-Food Supply Chains

The integration of blockchain technology emerges as a central theme, exemplifying its versatile applications in securing and enhancing transparency within agri-food supply chains. The paper by Saha et al. (2023) explores how blockchain can combat food fraud by leveraging an immutable ledger, data security, and safety – critical elements in ensuring trustworthiness and transparency across complex supply chains. Panghal et al. (2023) extend this exploration by investigating the potential of blockchain technology in promoting sustainable food production and consumption from a consumer perspective. Their study, rooted in India's context, unravels factors such as reliability, sustainability, impact on health, trust, and switching intentions that drive consumer acceptance of a blockchain-enabled food system.

2. Emerging Technologies in Agri-Food Supply Chains

The metaverse, near-infrared imaging, and the confluence of Web 3 and AI technologies form a dynamic cluster of emerging technologies reshaping agri-food supply chains. The study by El Jaouhari et al. (2024) explores the role of the metaverse in ensuring agri-food supply chain security, providing a structured framework for understanding the potential benefits and challenges associated with metaverse solutions. On the other hand, Patel and Pathare (2023) delve into the principle and applications of near-infrared imaging for fruit quality assessment. Their comprehensive overview elucidates the importance of non-invasive technologies based on optical properties for real-time quality assessment in the agri-food industry. Issa et al. (2024) present a systematic review that navigates the uncharted territories of Web 3 and AI technologies in the meat supply chain. Their work emphasizes the need for further research to explore the role of these technologies in different stages of the supply chain, promising advancements in food safety, quality, and traceability.

3. Quality Assessment and Fraud Prevention in Food Industries

Ensuring the quality and preventing fraud in food industries are perennial challenges. The paper by Bai et al. (2024) introduces a feasible wine popular quality analysis system (WPQAS) inspired by the Appellation d'Origine Contrôlée (A.O.C) system. The WPQAS, grounded in machine learning algorithms, aims to tackle the deceptive practices challenging the wine industry, offering a lightweight and scalable solution. In the realm of microbiological threats, the study by the team of researchers led by Soni et al. (2024) pioneers the use of hyperspectral imaging (HSI) and deep learning for the detection and quantification of germination in *Bacillus cereus* spores. This innovative approach showcases significant potential for non-destructive detection, a crucial advancement in preventing food poisoning.

4. Digital Transformation and Collaboration in the Meat Industry Supply Chain

Digital transformation takes centre stage in the meat industry supply chain. Gupta et al. (2024) present an empirical investigation into the digitalization of the Indian meat industry's supply chain. Their study underscores the pivotal role of top management commitment in the successful

implementation of digital technologies, offering valuable insights for industries striving for increased collaboration and enhanced performance.

5. Digital Technologies' Impact on Risk Assessment in Food Supply Chains

The final theme underscores the broader impact of digital technologies on risk assessment in food supply chains. The paper presented by Tyagi et al. (2024) highlights the significant potential of digital technologies, including the Internet of Things, Blockchain, and common digital platforms, to improve transparency and mitigate risks in the complex dynamics of food supply chains. The study introduces a preference rating approach for assessing the impacts of risks and their mitigation strategies, paving the way for a more resilient and future-ready food supply chain.

In conclusion, this special issue 'Digital Technology to Combat Food Fraud in the Agri-Food Supply Chain' unearths the multifaceted dimensions of digital technology in agri-food supply chains, offering a nuanced understanding of its applications, challenges, and potential benefits. As the industry strides into an era defined by innovation and connectivity, these contributions serve as beacons guiding us toward sustainable, secure, and transparent agri-food supply chains. We extend our gratitude to the authors for their invaluable contributions and hope that this special issue sparks further exploration, collaboration, and advancements in the realm of digital agri-food supply chain solutions.

Conflicts of Interest: The authors declare no conflicts of interest.

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