Guest editorial

digitizing food supply chains: a path to ensuring food security

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The COVID-19 pandemic and the conflict between Russia–Ukraine have created and shown the vulnerabilities in global food supply chains (FSCs), showcasing their importance in securing food security (Jagtap *et al*., 2022). Even before these crises, food insecurity has remained a critical global concern, with over 820 million people facing chronic food insecurity and 135 million suffering from food insecurity at a crisis level (FSIN, 2020). These numbers increased during the pandemic, and the conflict between Russia–Ukraine has further exposed the vulnerability of FSCs, with enormous numbers of livestock vanishing and large areas of agricultural land rendered unsuitable.

Pre-existent challenges such as natural disasters, climate change and pest outbreaks were already hurting FSCs, but recent crises have increased these pressures. Both developed and developing countries are facing substantial food supply disruptions, resulting in inflation, price volatility and shortages. These issues have been worsened by consumer behaviours, such as panic buying, stockpiling and waste. Considering this, there is a rising need for innovative and resilient strategies to safeguard global food security.

This special issue titled "*Digitizing Food Supply Chains: A Path to Ensuring Food Security"* of the *International Journal of Industrial Engineering and Operations Management* investigates how advanced digital tools and technologies can address or offer food security solutions. By adopting digitalisation, FSCs can become more robust, sustainable and responsive to future crises. We invited contributions, both theoretical and practical, that explored how technologies such as blockchain (BCT), artificial intelligence (AI), the Internet of Things (IoT) and big data can transform food supply systems and lessen the impact of future disruptions.

Digitalisation provides several benefits to FSCs, such as increased visibility, traceability and adaptability, all of which improve resilience during times of crisis. For instance, the paper titled "Nourish Resilience in Digital Food Supply Chain in Post COVID Landscape: Literature Swill for Past Insights and Future Roadmap" highlights how various digital technologies and tools can improve FSCs resilience through increased visibility, traceability and adaptability, leading to FSCs flexibility and collaboration (Kumar *et al*., 2025). However, the adoption of digital technologies requires financial investment, particularly in smaller businesses and in developing countries where infrastructure limitations and Internet connectivity issues pose significant hurdles.

Similarly, Industry 4.0 tools in combination with Lean Six Sigma (LSS) have shown substantial promise in improving FSC operations. The paper titled "Achieving tractable and reliable agriculture supply chain operations through Industry 4.0 tools to support Lean Six Sigma application" investigates how combining LSS with digital tools can help address quality issues, reduce lead times and optimise supplier management in the hazelnut industry (Yeni *et al*., 2025). By identifying the root causes of inefficiencies and using digital solutions, this paper highlights the potential of digitalisation to improve supplier relationships and operational efficiency.

Moreover, the paper titled "Digital technologies and food supply chain: a scoping view from 2010 to 2024" provides a comprehensive review of digital tools applications within small and medium-sized enterprises (SMEs) focusing on sustainability, circular economy practices

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and food security (Panigrahi *et al*., 2025). It identifies barriers – such as financial constraints, infrastructural issues, organisational challenges and a lack of expertise – that demand policy interventions and strategic corporate support to realise the widespread adoption of digital solutions, especially for SMEs in the food sector.

Furthermore, the paper titled "Enabling retail food supply chain, viability and resilience in pandemic disruptions by digitalization – a conceptual perspective" investigates how proactive strategies and collaboration guided by scenario planning and digitalisation can significantly enhance resilience and viability in retail FSCs during disruptions such as COVID-19 pandemic (Muzamil *et al*., 2025). It also highlighted enhanced logistics, customer satisfaction and adaptability through strategic, collaborative planning enabled by digital technologies and tools.

Overall, the four papers published in this SI fully realise the potential of digital technologies in addressing food security. It also states that it is vital to address the barriers and develop comprehensive strategies wherein policymakers, businesses and governments must work collaboratively to create supportive regulatory frameworks, invest in infrastructure and promote education and training to bridge the digital divide. Moreover, further research is needed to assess the broader social, environmental and economic impacts of digitalisation, ensuring that its adoption improves not only efficiency but also long-term sustainability and resilience. The potential of digital technologies and tools to revolutionise FSCs is huge. For instance, BCT provides transparency and authenticity, AI optimises demand forecasting and supply chain operations and IoT enables real-time monitoring of food production and distribution. However, to unlock these benefits fully, digitalisation must be approached holistically, incorporating sustainability, resilience and equity considerations.

This SI invited contributions from researchers and practitioners to address these pressing issues. The digitalisation of FSCs provides an option towards better food security. However, it requires strategic and collaborative initiatives to address future challenges. We hope the papers in this SI will encourage new ideas and solutions, helping to ensure that food systems are prepared to face future shocks and support vulnerable populations in uncertain times.

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Further reading

Jagtap, S., Trollman, H., Trollman, F., Garcia-Garcia, G. and Martindale, W. (2024), "Surviving the storm: navigating the quadruple whammy impact on Europe's food supply chain", *International Journal of Food Science and Technology*, Vol. 59 No. 6, pp. 3652-3666, doi: 10.1111/ijfs.17106.