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Editorial

Artificial Intelligence, Digital Platforms and the Metaverse in Sustainable Food Systems

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Abstract. The digital transformation of agriculture and food systems is becoming an important component of broader structural changes associated with the development of the digital and virtual economy. Rapid advances in artificial intelligence, digital platforms and immersive virtual technologies are reshaping agricultural production, food supply chains and mechanisms of coordination within global food systems. Although previous studies have examined precision agriculture, digital farming and platform-based food markets, the combined role of artificial intelligence, digital platforms and emerging virtual environments in the transformation of sustainable food systems remains insufficiently conceptualised. The aim of this editorial is to analyse how artificial intelligence, digital platforms and metaverse-related technologies contribute to the development of sustainable food systems within the broader framework of the virtual economy and the Sustainable Development Goals. The analysis is based on a conceptual synthesis of recent academic literature on digital agriculture, artificial intelligence, platform economies and sustainability transitions in agri-food systems. The article highlights that artificial intelligence supports data-driven agricultural decision-making and resource optimisation, while digital platforms increasingly restructure agricultural supply chains and coordination mechanisms between producers, intermediaries and consumers. Emerging metaverse-based virtual environments and digital twin technologies also create new opportunities for modelling and managing complex agricultural ecosystems. At the same time, the diffusion of digital technologies raises important governance challenges related to data management, platform regulation and digital inequalities in rural areas. The editorial concludes by outlining directions for future interdisciplinary research on the economic, technological and institutional dimensions of digital transformation in sustainable food systems.

Keywords: digital agriculture, artificial intelligence, digital platforms, sustainable food systems, virtual economy, metaverse.

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1. Introduction

Global food systems are undergoing profound transformations driven by technological innovation, environmental pressures and the growing demand for sustainable development. Increasing population growth, climate change and resource constraints have intensified the need for more efficient, resilient and sustainable agricultural production systems. According to projections by the United Nations, global food production will need to increase significantly in the coming decades in order to meet the demands of a growing population while simultaneously reducing environmental impacts and ensuring long-term food security [1]. These challenges have accelerated the search for innovative technological solutions capable of improving productivity, sustainability and governance within agri-food systems.

In recent years, digital technologies have become one of the most significant drivers of transformation in agriculture and food production. The rapid development of artificial intelligence, big data analytics, cloud computing, the Internet of Things and satellite monitoring systems has created new opportunities for data-driven agricultural management. These technologies enable precision farming, predictive modelling of crop yields, improved monitoring of environmental conditions and optimisation of resource use in agricultural production. As a result, agriculture is increasingly evolving from a resource-based sector into a data-driven economic system in which digital information becomes a key production factor [2–3].

Alongside technological innovation, the growing role of digital platforms is reshaping the organisational structure of agricultural markets and food supply chains. Platform-based business models have transformed many sectors of the digital economy by enabling new forms of coordination between producers, consumers and service providers. In the agri-food sector, digital platforms facilitate the integration of farmers, logistics providers, financial institutions and food distributors into interconnected digital ecosystems that improve market access, reduce transaction costs and increase transparency in supply chains [4]. Through digital marketplaces, farmers can access broader markets, obtain real-time information on prices and demand, and participate more effectively in global value chains.

At the same time, artificial intelligence technologies are playing an increasingly important role in supporting decision-making processes across the entire agricultural value chain. Machine learning algorithms are now used to analyse satellite imagery, predict weather conditions, optimise irrigation and fertiliser use, detect crop diseases and forecast market trends. Such developments contribute to the emergence of algorithmic governance mechanisms in agricultural systems, where decision-making processes are increasingly supported by data analytics and automated systems [5]. These transformations illustrate the growing importance of data governance, digital infrastructure and algorithmic coordination in shaping the future of sustainable food systems.

Beyond the adoption of artificial intelligence and digital platforms, recent technological developments are opening new possibilities through the emergence of immersive virtual environments and metaverse technologies. The concept of the metaverse refers to interconnected digital environments that integrate virtual reality, augmented reality and digital platforms into persistent virtual ecosystems in which users can interact, exchange digital assets

and simulate real-world processes [6]. In the context of agriculture, such technologies may support the development of digital twins of farms, enabling the simulation of agricultural processes, climate conditions and production strategies in virtual environments. These virtual models can help farmers and policymakers test different management scenarios, optimise production systems and improve sustainability outcomes.

The integration of artificial intelligence, digital platforms and metaverse technologies is therefore contributing to the emergence of new digital ecosystems in agriculture and food production. These developments can be interpreted within the broader paradigm of the virtual economy, where economic interactions increasingly occur within digital environments mediated by information technologies. In such systems, data flows, digital platforms and algorithmic decision-making become central mechanisms coordinating economic activities and social interactions.

Importantly, the digital transformation of agriculture also has significant implications for the achievement of the Sustainable Development Goals (SDGs). Technologies supporting precision agriculture, resource optimisation and transparent supply chains can contribute directly to several SDGs, particularly *SDG 2 – Zero Hunger, SDG 9 – Industry, Innovation and Infrastructure, SDG 12 – Responsible Consumption and Production, and SDG 13 – Climate Action* [1]. By improving productivity while reducing environmental impacts, digital technologies may help reconcile economic development with ecological sustainability in global food systems.

Against this background, the objective of this editorial is to explore how artificial intelligence, digital platforms and metaverse technologies are transforming sustainable food systems and to outline emerging research directions within the framework of the virtual economy and the Sustainable Development Goals. The editorial highlights the growing role of digital ecosystems in agriculture and emphasises the need for interdisciplinary research integrating insights from economics, digital technologies, sustainability studies and governance research.

This editorial is structured as follows. The next section examines the digital transformation of contemporary food systems and the growing role of data-driven technologies in agriculture. The subsequent section analyses the influence of artificial intelligence and digital platforms on the emergence of virtual food ecosystems. The editorial then explores the potential of metaverse technologies and digital twins for sustainable agricultural management. Finally, the relationship between digital food systems and the Sustainable Development Goals is discussed, and key directions for future research are outlined.

2. Digital Transformation of Food Systems

The global agri-food sector is undergoing a profound transformation driven by the rapid expansion of digital technologies and the increasing availability of data. Traditionally, agriculture has been characterised by resource-intensive production systems heavily dependent on land, water and labour. However, the growing integration of digital technologies into agricultural processes is gradually transforming food production into a knowledge- and data-intensive sector. This transformation reflects broader changes associated with the emergence of

the digital economy, where information and data have become strategic resources shaping productivity, efficiency and sustainability across economic sectors [7].

One of the most significant developments in this transformation is the rise of precision agriculture, which utilises digital technologies to monitor, analyse and manage agricultural production processes with a high degree of spatial and temporal accuracy. Precision agriculture relies on the integration of satellite monitoring, sensors, drones, geographic information systems and data analytics to optimise the use of inputs such as fertilisers, water and pesticides. These technologies enable farmers to make more informed decisions, reduce production costs and minimise environmental impacts. As a result, precision agriculture is increasingly viewed as a key component of sustainable agricultural intensification [8].

Another important dimension of digital transformation in agriculture is the growing role of data-driven decision-making. Agricultural production generates vast amounts of data related to soil conditions, weather patterns, crop health, machinery performance and supply chain logistics. Advances in big data analytics and cloud computing have made it possible to process and analyse these data streams in real time, enabling more effective management of agricultural systems. Data-driven farming systems allow producers to anticipate risks, optimise production strategies and respond more effectively to environmental variability and market fluctuations [2].

The increasing use of digital technologies is also contributing to the development of smart farming systems, in which interconnected devices and information platforms support automated and semi-automated management of agricultural operations. Smart farming integrates the Internet of Things, machine learning algorithms and remote sensing technologies to create adaptive agricultural systems capable of responding dynamically to environmental conditions. For example, smart irrigation systems can automatically adjust water usage based on real-time data on soil moisture and weather forecasts, while AI-based monitoring systems can detect early signs of crop diseases or pest infestations [3].

Digital transformation is not limited to agricultural production processes but extends across the entire agri-food value chain. Digital technologies are increasingly used to improve logistics, traceability and transparency in food supply chains. Blockchain technologies, for example, enable secure recording and verification of transactions across supply networks, allowing consumers and regulators to trace the origin of food products and monitor compliance with sustainability standards. Such innovations contribute to improving food safety, reducing information asymmetries and strengthening trust between market participants [9].

In addition to technological innovation, digital transformation is reshaping the organisational structure of food markets through the emergence of digital platforms that connect producers, processors, distributors and consumers within integrated digital ecosystems. These platforms enable more efficient coordination of supply and demand by facilitating access to information, reducing transaction costs and improving market transparency. Platform-based agricultural marketplaces allow farmers to access new markets, obtain financial services and interact directly with buyers, thereby strengthening their participation in global value chains [4].

The digitalisation of food systems is also closely linked to the development of agricultural data ecosystems, in which data generated by farms, agricultural machinery, satellites and sensors are integrated into shared information infrastructures. These ecosystems enable the creation of large-scale datasets that can be used to improve agricultural productivity, monitor environmental impacts and support sustainable land management. However, the expansion of agricultural data systems also raises important questions regarding data ownership, data governance and the equitable distribution of benefits derived from digital technologies [10].

Importantly, the digital transformation of agriculture is taking place within the broader context of global sustainability challenges. Climate change, land degradation and water scarcity are placing increasing pressure on agricultural production systems, requiring the development of innovative solutions that reconcile productivity with environmental sustainability. Digital technologies can contribute to addressing these challenges by enabling more efficient resource management, improving environmental monitoring and supporting climate-resilient agricultural practices [11].

Taken together, these developments indicate that agriculture is gradually evolving from a traditionally resource-based sector into a digitally mediated food system in which data, algorithms and digital infrastructures play an increasingly central role. Within this emerging paradigm, digital technologies not only enhance production efficiency but also reshape governance structures, market coordination mechanisms and the institutional foundations of food systems.

This transformation provides the foundation for the emergence of virtual food ecosystems, where economic interactions within agri-food systems are increasingly mediated by digital platforms, data infrastructures and algorithmic decision-making systems. In this context, artificial intelligence and digital platforms become key mechanisms for coordinating economic activities within complex agricultural networks. The next section therefore examines the growing role of artificial intelligence and platform-based systems in shaping these emerging digital ecosystems in agriculture.

3. Artificial Intelligence, Digital Platforms and the Emergence of Virtual Food Ecosystems

The ongoing digital transformation of agriculture is closely connected with the rapid development of artificial intelligence technologies and the growing influence of digital platforms in organising economic interactions within agri-food systems. These technological developments are gradually reshaping traditional agricultural production models and contributing to the emergence of new digitally mediated ecosystems in which data, algorithms and platforms play an increasingly central role.

Artificial intelligence has become one of the most influential technologies driving the transformation of agricultural production and food systems. Advances in machine learning, computer vision and predictive analytics allow the processing of large volumes of agricultural data generated by satellites, sensors, drones and farm management systems. These analytical capabilities enable more precise monitoring of crop health, soil conditions and weather patterns, supporting more efficient and sustainable agricultural decision-making processes. In practice, AI technologies are increasingly used to forecast crop yields, optimise fertiliser and irrigation

regimes, detect plant diseases and analyse market dynamics within agricultural commodity markets [12].

The increasing integration of artificial intelligence into agricultural processes contributes to the development of algorithmic decision-support systems that assist farmers and agricultural managers in optimising production strategies. Such systems are capable of analysing complex datasets and identifying patterns that may not be immediately observable through traditional analytical methods. As a result, AI-driven agricultural management systems are gradually transforming decision-making processes within agriculture from experience-based approaches to data-driven and predictive models of management.

At the same time, the rapid expansion of digital platforms is reshaping the organisational architecture of food systems. Digital platforms function as intermediaries that connect farmers, agricultural suppliers, logistics providers, retailers and consumers within integrated digital ecosystems. These platforms facilitate the exchange of information, coordinate supply chains and reduce transaction costs associated with market participation. Platform-based food marketplaces allow producers to reach wider markets, improve price transparency and enhance coordination between production and consumption within global food systems [4].

The growing role of platforms also contributes to the formation of platform ecosystems in agriculture, where economic interactions are organised through digital infrastructures rather than traditional hierarchical market structures. Within these ecosystems, agricultural actors become participants in interconnected digital networks in which data flows, algorithmic pricing mechanisms and digital services shape market dynamics. This transformation reflects broader developments associated with the platformisation of economic activity across multiple sectors of the digital economy.

Another important dimension of this transformation is the emergence of agricultural data ecosystems in which data generated by farms, agricultural machinery, supply chains and environmental monitoring systems are integrated into shared digital infrastructures. These data ecosystems enable new forms of collaboration between agricultural producers, technology providers and research institutions. At the same time, they raise important questions concerning data governance, data ownership and the distribution of economic value generated by agricultural data [10].

The integration of artificial intelligence and digital platforms is gradually contributing to the emergence of what can be described as virtual food ecosystems. In such ecosystems, a significant share of economic interactions related to food production, distribution and consumption occurs within digitally mediated environments. Data platforms, digital marketplaces and algorithmic decision-support systems become key mechanisms for coordinating complex interactions among multiple actors within agri-food systems.

Within these emerging ecosystems, agricultural production is no longer limited to physical farming activities but increasingly incorporates digital infrastructures that enable simulation, forecasting and optimisation of agricultural processes. In this context, agricultural systems begin to exhibit characteristics similar to those observed in other areas of the digital economy, where platform-based coordination and data-driven governance mechanisms play a central role.

Importantly, the development of virtual food ecosystems also creates the technological foundations for more advanced digital environments in agriculture, including the use of virtual simulations, digital twins and immersive virtual environments for agricultural planning and management. These technologies allow the modelling of agricultural systems in virtual space, enabling farmers, researchers and policymakers to test alternative production strategies and evaluate the potential impacts of climate variability, technological innovation and market changes.

Consequently, artificial intelligence and digital platforms are not only improving the efficiency of agricultural production but are also contributing to a broader transformation of agri-food systems into digitally interconnected ecosystems. These developments create the structural and technological conditions for the emergence of new virtual environments in agriculture, where digital simulations and immersive technologies may play an increasingly important role.

Against this background, the concept of the metaverse is gaining attention as a potential technological framework capable of integrating data infrastructures, digital platforms and virtual simulations into immersive digital environments. The following section therefore explores the role of metaverse technologies and digital twins in the development of sustainable and data-driven food systems.

4. Metaverse and Digital Twins in Sustainable Food Systems

The continued advancement of digital technologies is opening new possibilities for the development of immersive virtual environments capable of transforming the management and governance of complex socio-economic systems. One of the most discussed technological paradigms in recent years is the concept of the metaverse, which refers to interconnected digital environments integrating virtual reality, augmented reality, data platforms and digital infrastructures into persistent virtual ecosystems. Within these environments, users can interact, simulate real-world processes and exchange digital assets through networked digital systems [6].

Although the concept of the metaverse initially emerged in the context of digital entertainment and virtual communities, its potential applications increasingly extend to economic systems, education, healthcare and industrial production. In the context of agriculture and food systems, metaverse technologies may support the development of advanced digital infrastructures capable of integrating real-world agricultural data with immersive virtual environments. Such integration can enable new forms of modelling, simulation and collaborative decision-making in the management of agricultural systems.

One of the most promising technological concepts associated with the metaverse is the development of digital twins. Digital twins represent virtual replicas of physical systems that are continuously updated through real-time data streams collected from sensors, satellites and monitoring technologies. By integrating physical and digital systems, digital twins allow users to simulate complex processes, analyse system performance and test alternative management scenarios in virtual environments [13].

In agricultural systems, digital twins can be used to model farms, agricultural landscapes and entire food supply chains. These virtual models allow farmers, agronomists and policymakers to simulate crop growth, analyse the impacts of climate variability and evaluate the consequences of different agricultural management strategies before implementing them in real-world conditions. Such simulations may contribute to more informed decision-making and support the development of climate-resilient agricultural systems.

Digital twins also provide opportunities for improving sustainability management within food systems. By combining environmental monitoring data with predictive modelling tools, digital twins can help identify optimal resource allocation strategies, reduce water and fertiliser consumption and minimise environmental impacts associated with agricultural production. These capabilities are particularly important in the context of global sustainability challenges such as climate change, biodiversity loss and soil degradation.

Another important application of immersive digital technologies in agriculture concerns virtual training and knowledge transfer. Agricultural education and training increasingly rely on digital platforms and remote learning environments. Metaverse-based learning systems could enable farmers and agricultural specialists to interact with virtual models of farms, machinery and ecosystems, providing experiential learning opportunities that may improve knowledge dissemination and capacity building in rural areas.

In addition, immersive digital environments may facilitate new forms of collaboration between researchers, policymakers and industry stakeholders involved in agricultural innovation. Virtual environments can serve as collaborative platforms where experts from different regions can jointly analyse agricultural data, test technological solutions and develop sustainable management strategies. Such collaborative infrastructures may enhance knowledge exchange and accelerate the diffusion of technological innovations in agriculture.

The emergence of virtual agricultural environments also has important implications for the evolution of digital markets and economic interactions within food systems. As digital platforms and data infrastructures expand, agricultural markets may increasingly incorporate virtual trading environments, data marketplaces and digitally mediated supply chain coordination systems. These developments contribute to the gradual formation of virtual food economies, where economic interactions related to food production and distribution are increasingly mediated through digital technologies and online platforms.

Despite the promising opportunities associated with metaverse technologies and digital twins, their large-scale implementation in agriculture also raises several challenges. Issues related to digital infrastructure, data governance, technological accessibility and the digital divide may influence the distribution of benefits generated by digital transformation. Rural regions with limited access to digital infrastructure may face barriers in adopting advanced technologies, potentially reinforcing existing inequalities within agricultural systems.

Furthermore, the increasing reliance on digital infrastructures for agricultural management raises important questions regarding cybersecurity, data protection and institutional governance of digital agricultural systems. As agricultural production becomes more dependent on digital

technologies, ensuring the resilience and security of digital infrastructures will become a key priority for policymakers and technology providers.

Overall, the integration of metaverse technologies, digital twins and advanced data infrastructures has the potential to significantly enhance the capacity of agricultural systems to respond to sustainability challenges. By enabling advanced simulation, data integration and collaborative decision-making, immersive digital environments may become important tools for supporting sustainable food production and resilient agricultural ecosystems.

At the same time, the development of these technologies should be considered within the broader context of global sustainability agendas. Digital innovations in agriculture must contribute not only to productivity improvements but also to the achievement of broader social and environmental objectives. The next section therefore examines the relationship between digital transformation in food systems and the Sustainable Development Goals, highlighting the potential contribution of artificial intelligence, digital platforms and virtual environments to sustainable development.

5. Digital Food Systems and the Sustainable Development Goals

The transformation of food systems through digital technologies should be considered not only as a technological shift but also as a key component of the broader global sustainability agenda. The international community has increasingly recognised that addressing challenges such as food insecurity, environmental degradation and climate change requires systemic changes in the way food is produced, distributed and consumed. Within this context, the digitalisation of agriculture and food systems has the potential to contribute significantly to the achievement of several Sustainable Development Goals (SDGs) outlined in the United Nations 2030 Agenda for Sustainable Development [1].

One of the most direct connections between digital agriculture and the SDGs concerns *SDG 2 – Zero Hunger*, which aims to end hunger, achieve food security and promote sustainable agriculture. Digital technologies, including artificial intelligence, remote sensing and data analytics, enable more efficient management of agricultural production systems, helping to increase productivity while reducing resource consumption. Precision agriculture technologies allow farmers to optimise fertiliser application, irrigation and pest control, thereby improving crop yields while minimising environmental impacts. Such innovations can contribute to increasing global food production and improving the resilience of agricultural systems to climate variability [11].

Another important dimension relates to *SDG 9 – Industry, Innovation and Infrastructure*, which emphasises the importance of technological innovation and resilient infrastructure for sustainable development. The digital transformation of food systems relies heavily on the development of digital infrastructures, including broadband connectivity, cloud computing platforms, satellite monitoring systems and agricultural data platforms. These infrastructures enable the collection, processing and dissemination of agricultural data, facilitating innovation in agricultural production, supply chain management and food distribution networks.

The increasing use of digital technologies in agriculture also contributes to the objectives of *SDG 12 – Responsible Consumption and Production*. Digital platforms and data-driven supply chain systems can improve transparency and traceability in food production and distribution processes. Technologies such as blockchain and digital tracking systems enable the monitoring of product origins, production conditions and environmental impacts, allowing consumers and regulators to make more informed decisions regarding sustainable consumption patterns. Greater transparency within food supply chains may also help reduce food waste and improve resource efficiency across agricultural systems.

Furthermore, digital transformation in food systems plays an important role in addressing the challenges associated with *SDG 13 – Climate Action*. Climate change represents one of the most significant threats to global food security, affecting agricultural productivity through increased frequency of extreme weather events, shifting rainfall patterns and rising temperatures. Digital technologies can support climate adaptation strategies by enabling more accurate climate monitoring, predictive modelling of crop yields and early warning systems for extreme weather conditions. These capabilities allow farmers and policymakers to implement more resilient agricultural management strategies in response to climate-related risks.

In addition to environmental and economic dimensions, the digital transformation of agriculture also has important social implications. Digital platforms and agricultural data systems can improve access to information, financial services and markets for smallholder farmers, particularly in developing regions. Mobile-based agricultural advisory services and digital marketplaces allow farmers to access real-time information about weather conditions, market prices and best agricultural practices. Such technologies may contribute to reducing information asymmetries and improving the economic inclusion of rural communities within global food systems.

However, the potential benefits of digital agriculture are accompanied by several challenges that must be addressed in order to ensure inclusive and sustainable development. One of the most widely discussed concerns relates to the digital divide, which may limit the ability of farmers in less developed regions to access digital technologies and participate in digital food systems. Limited digital infrastructure, lack of technological skills and unequal access to financial resources may create barriers to the adoption of advanced digital technologies in agriculture [10].

Another challenge concerns the governance of agricultural data and digital platforms. As data become an increasingly important resource within agricultural production systems, questions related to data ownership, privacy and control over digital infrastructures become more prominent. Ensuring fair and transparent governance of agricultural data ecosystems will be essential for maintaining trust among farmers, technology providers and policymakers.

From the perspective of the virtual economy, these developments illustrate the growing integration of digital infrastructures, data platforms and virtual environments into the organisation of food systems. Economic interactions within agri-food networks are increasingly mediated by digital technologies that enable new forms of coordination, information exchange and market participation. In this sense, digital food systems can be interpreted as emerging

components of the broader virtual economy, where data flows and digital platforms become key mechanisms structuring economic activity.

These transformations highlight the need for interdisciplinary research capable of integrating insights from economics, information technologies, sustainability science and governance studies. Understanding the complex interactions between digital technologies, institutional frameworks and sustainability objectives requires collaboration between scholars from multiple disciplines, as well as closer engagement with policymakers and industry practitioners.

Against this background, further research is needed to explore the economic, institutional and technological implications of digital transformation within food systems. In particular, greater attention should be devoted to analysing how artificial intelligence, digital platforms and immersive technologies may reshape agricultural governance, market coordination and sustainability outcomes within global food systems.

6. Future Research Directions and Call for Contributions

The rapid digital transformation of agriculture and food systems opens a wide range of new research opportunities at the intersection of economics, digital technologies and sustainability studies. As artificial intelligence, digital platforms and immersive virtual environments become increasingly integrated into agricultural production and food supply chains, the need for interdisciplinary research addressing these transformations continues to grow. Scholars, policymakers and industry practitioners are increasingly confronted with complex questions regarding the economic, institutional and social implications of digital food systems.

Future research should pay greater attention to the economic and institutional structures emerging within digitally mediated food ecosystems. In particular, further investigation is needed to understand how digital platforms are reshaping agricultural markets, supply chains and value distribution among actors in agri-food systems. Platform-based coordination mechanisms may alter traditional relationships between producers, intermediaries and consumers, creating new opportunities for market access while simultaneously raising concerns regarding market concentration and governance.

Another important research direction concerns the role of artificial intelligence in agricultural decision-making and resource management. While AI technologies offer significant potential for improving productivity and environmental sustainability, their large-scale adoption also raises questions regarding transparency, algorithmic accountability and the governance of automated decision systems. Understanding how algorithmic tools influence agricultural management practices and market dynamics represents an important area for future economic and policy research.

The emergence of virtual environments and metaverse technologies also opens new possibilities for modelling and managing complex agricultural systems. Future studies may explore the use of digital twins for agricultural planning, climate scenario modelling and supply chain optimisation. Immersive virtual environments may also support new approaches to agricultural training, collaborative research and knowledge exchange among farmers, researchers and policymakers.

In addition, further research is required to analyse the governance of agricultural data ecosystems. As digital technologies generate large volumes of data related to agricultural production, environmental conditions and market transactions, questions regarding data ownership, data sharing and digital governance become increasingly important. Ensuring equitable access to digital infrastructures and preventing the emergence of new digital inequalities within rural communities represent critical challenges for sustainable digital transformation.

The relationship between digital food systems and the Sustainable Development Goals also requires further scholarly attention. While digital technologies can significantly contribute to improving productivity and resource efficiency, their broader social and environmental impacts remain insufficiently understood. Future research may examine how digital innovations influence food security, environmental sustainability and rural development in different regional contexts.

Against this background, *Virtual Economics* invites scholars from diverse disciplinary backgrounds to contribute to the growing body of research on digital transformation in food systems. In particular, the journal welcomes theoretical, empirical and interdisciplinary contributions addressing topics such as:

- Artificial intelligence in precision agriculture and sustainable farming
- Digital platforms and the platformisation of agri-food supply chains
- Blockchain and traceability in food systems
- Data governance and agricultural data ecosystems
- Digital twins and metaverse applications in agriculture
- Algorithmic governance in agri-food systems
- Econometric modelling of digital agriculture and food markets
- Digital transformation and sustainability of global food systems
- Institutional and policy frameworks for digital agriculture

By fostering interdisciplinary dialogue on these issues, the journal seeks to contribute to a deeper understanding of how digital technologies can support the development of more sustainable, resilient and inclusive food systems within the evolving paradigm of the virtual economy.

7. Conclusions

The transformation of agriculture and food systems through digital technologies represents one of the most significant developments shaping contemporary economic and social change. Artificial intelligence, digital platforms and immersive virtual environments are gradually redefining how agricultural production is organised, how markets operate and how food supply chains are coordinated.

This editorial has highlighted the growing importance of digital technologies in shaping the future of sustainable food systems. The analysis demonstrates that the integration of artificial

intelligence, platform-based coordination mechanisms and emerging virtual environments is contributing to the formation of digitally mediated food ecosystems within the broader framework of the virtual economy.

These developments also underline the importance of aligning technological innovation with the objectives of sustainable development. Digital transformation in agriculture has the potential to improve productivity, enhance resource efficiency and strengthen resilience to environmental challenges. At the same time, the successful implementation of digital technologies requires careful attention to issues such as data governance, digital infrastructure and equitable access to technological innovation.

Ultimately, the emergence of digital food ecosystems reflects broader transformations associated with the evolution of the digital and virtual economy. Understanding these processes requires interdisciplinary research that bridges economics, digital technologies, sustainability science and governance studies.

By bringing together diverse perspectives on the role of artificial intelligence, digital platforms and metaverse technologies in food systems, this editorial aims to stimulate further research and scholarly discussion on the future of sustainable agriculture within the digital economy.

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