www.foodandfeed.fins.uns.ac.rs
FOOD AND FEED RESEARCH
Journal of the Institute of Food Technology – FINS
University of Novi Sad
ISSN
2217-5369
(print version ceased in 2023)
2217-5660 (online)

UDK 004.896:502.131.1:664
htpps://doi.org/10.5937/ffr0-58161

Review article

EMERGING ROLE OF ARTIFICIAL INTELLIGENCE AND BIG DATA IN DRIVING SUSTAINABLE GROWTH IN THE GLOBAL FOOD INDUSTRY

Aditya[*1], Kumar Rahul[2], Neeraj[*1]

[1]Department of Agriculture and Environmental Sciences, National Institute of Food Technology Entrepreneurship and Management (*Institute of National Importance of India*, NIFTEM-K), Sonipat, Haryana, Kundli-131028, India
[2]Department of Interdisciplinary Sciences, National Institute of Food Technology Entrepreneurship and Management (*Institute of National Importance of India*, NIFTEM-K), Sonipat, Haryana, Kundli-131028, India

Abstract: The integration of artificial intelligence (AI) and Big Data is emerging as a transformative force in the global food industry, driving sustainable growth through enhanced efficiency, productivity, reducing waste, improving resource management and decision-making capabilities. Recent advancements in AI and Big Data technologies, such as predictive analytics and machine learning, are revolutionizing agricultural practices by enabling precision farming, optimizing resource use and improving crop management systems. These technologies facilitate real-time monitoring of crop health, yield predictions and disease detection, thereby addressing critical challenges such as food insecurity and waste reduction. The application of AI and Big Data in the food supply chain enhances traceability and transparency, which are essential for ensuring food safety and quality. These technologies have further accelerated the adoption of digital solutions in the food sector, highlighting the need for resilient supply chains capable of adapting to disruptions. As the food industry grapples with the dual pressures of climate change and a growing global population, the role of AI and Big Data in promoting sustainable practices becomes increasingly vital. In addition to agricultural applications, AI and Big Data are reshaping business models within the food industry by fostering innovative marketing strategies and personalized nutrition solutions. The convergence of these technologies not only supports environmental sustainability but also enhances economic viability, paving the way for a more sustainable food ecosystem. Incorporating AI and Big Data into the global food industry fosters resilience against challenges such as climate change, resource scarcity and population growth. Therefore, by facilitating more sustainable and efficient operations, these technologies are revolutionizing food production, processing, distribution and consumption, thereby aligning the industry with the principles of environmental stewardship and global food security, in accordance with global sustainability objectives.

Keywords: *Artificial Intelligence, Big Data, food industry, sustainable growth, supply chain management*

INTRODUCTION

The food sector is undergoing a revolutionary shift driven by the integration of AI and Big Data technologies, which are crucial for advancing sustainability. As the global population continues to grow, the demand for food escalates, requiring novel strategies to improve

*Corresponding authors:
E-mail address: adityabhatia29@gmail.com; neeraj.niftem@gmail.com

agricultural productivity while reducing environmental effects. Precision agriculture is made possible by artificial intelligence and Big Data, which enable farmers to maximize the use of resources, increase crop yields, and reduce waste, all of which contribute to more environmentally responsible farming methods (Chen, 2024). These technologies make it possible to collect and analyse data in real-time, which might result in decisions that are better informed and more effective management of agricultural resources (Senoo, 2024). Moreover, the application of AI in agriculture extends beyond mere productivity enhancements. It is pivotal in cultivating climate-resilient agricultural techniques, which are vital in confronting climate change and its related issues, including extreme weather events and altering agricultural zones (Sakapaji, 2023).

Farmers may employ predictive analytics and machine learning to foresee and alleviate the effects of climatic unpredictability, thus securing food stability and sustainability (Doggalli et al., 2024). Furthermore, AI technologies can significantly reduce the reliance on chemical inputs, such as pesticides and fertilizers, which are detrimental to ecosystems and biodiversity (Sakapaji, 2023; Adewusi, 2024). The integration of Big Data technologies in the food supply chain also enhances transparency and traceability, which are vital for consumer trust and regulatory compliance (Ding et al., 2023). Monitoring the processes of food production and ensuring that sustainability criteria are followed across the supply chain can be accomplished by stakeholders through the utilization of huge volumes of data derived from a variety of sources, such as Internet of Things (IoT) devices and satellite photography (Chen, 2024).

This data-driven methodology enhances operational efficiency while fostering the advancement of sustainable practices that correspond with global sustainability objectives, including the United Nations Sustainable Development Goals (SDGs) (Vasiliev, Hazlett, Stevens & Bornmalm, 2022). The convergence of AI and Big Data technologies in the food industry is not merely a technological advancement; but it also represents a fundamental shift towards sustainability. By optimizing agricultural practices, enhancing food security and promoting environmental stewardship, these technologies are essential in addressing the pressing challenges of food production in the 21st century. The ongoing development and implementation of AI and Big Data solutions will be crucial in shaping a sustainable future for the food industry (Vatin, 2024). Therefore, this article explores the emerging role of AI and Big Data in driving sustainable growth in the global food industry; additionally, key terms relevant to this topic are presented in Fig. 1.

The food industry is witnessing a significant transition propelled by technology breakthroughs, especially through the use of AI and Big Data. These innovations are transforming industrial and supply chain

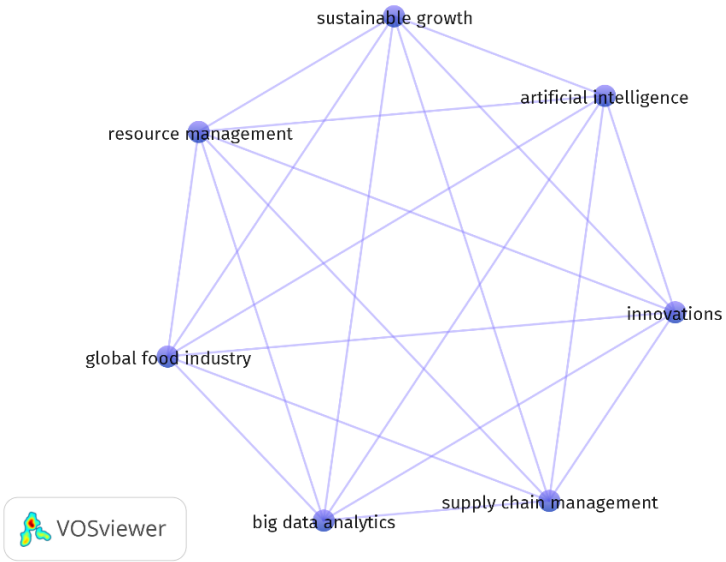

Figure 1. Key terms associated with the article, generated with VOS viewer

processes and are crucial in achieving global sustainability goals. The European Union Bioeconomy Strategy delineates essential objecttives, including the assurance of food security, sustainable management of natural resources and climate change mitigation, all of which increasingly depend on technology solutions.

The food industry is undergoing a change that is improving the traceability, efficiency and sustainability of the supply chain. This transition is being brought about by the utilization of technologies that are a part of Industry 4.0, such as AI, Big Data analytics and IoT (Hassoun et al., 2022). Artificial intelligence and Big Data are essential in enhancing food production and distribution systems, allowing stakeholders to make informed decisions that correspond with sustainability objectives. The deployment of IoT devices produces extensive data that may be examined to optimize agricultural methods, minimize waste and augment food safety. The integration of these technologies facilitates advanced planning and control, leading to more efficient resource management and a reduction in environmental impacts associated with food production (Wojcicki, Gorna & Sikorska, 2024). Moreover, the ability to monitor and analyse consumer behaviour through Big Data allows for the development of products that meet evolving dietary preferences while minimizing waste (Yang, Shen, Foster & Hort, 2020). As a result of the ongoing increase in the world population, the food business is confronted with difficulties that have never been seen before, such as climate change and food security. The application of digital technologies is essential for creating resilient food systems capable of meeting these challenges. Innovations such as blockchain for traceability and AI for predictive analytics are becoming integral to modern food supply chains, ensuring transparency and efficiency (Barile, Secundo & Vecchio, 2022). The COVID-19 pandemic has expedited the integration of these technologies, underscoring their significance in preserving food security and sustainability during crises (Galanakis, Rizou, Aldawoud, Ucak & Rowan, 2021).

The convergence of technological innovations with environmental goals in the food business constitutes a dynamic and developing landscape. The amalgamation of AI and Big Data not only improves operational efficiencies but also bolsters the industry's dedication to sustainable practices, ultimately fostering a more robust global food chain.

BIG DATA AND AI: KEY DRIVERS OF INNOVATION IN THE FOOD INDUSTRY

Big Data and AI are key drivers of innovation in the food industry, optimizing production, enhancing supply chain efficiency and enabling data-driven decision-making for improved food quality, safety and sustainability. The integration of Big Data and AI in the food industry has emerged as a transformative force, driving innovation and enhancing operational efficiencies with many benefits (Fig. 2). This synthesis explores how these technologies are reshaping the food sector, focusing on their applications, benefits and the challenges they present. Big Data analytics has become a cornerstone for innovation in the food industry, enabling companies to harness vast amounts of data generated throughout the supply chain. This data encompasses everything from consumer preferences to production processes and logistics. By analysing this information, businesses can make informed decisions that enhance product quality and streamline operations. For instance, the use of predictive analytics allows companies to forecast demand accurately, thus minimizing waste and optimizing inventory management (Nugroho, 2023). Moreover, the ability to analyse consumer behaviour through data enables food producers to tailor their offerings to meet evolving market demands, thereby increasing competitiveness (Franc & Kujevac, 2021). The AI technologies complement Big Data by providing advanced tools for data processing and analysis. It is feasible for machine learning algorithms to recognize patterns and trends that would be incomprehensible to humans. This can lead to advances in product development and marketing strategies. For example, AI can facilitate the creation of personalized nutrition plans based on individual dietary needs and preferences, which is becoming increasingly important in a health-conscious market (Smykov, 2023). Additionally, AI-driven automation in food processing enhances efficiency and reduces labour costs, allowing companies to focus on innovation rather than routine tasks (Sethi, Tumane & Panghal, 2018). The impact of digital transformation, fuelled by Big Data and AI, extends beyond operational efficiencies. It significantly contributes to the improvement of

food safety and traceability. Technologies like blockchain, combined with AI, offer transparent monitoring of food products from farm to table, guaranteeing adherence to quality and safety requirements (Nugroho, 2023). This transparency is vital in building consumer trust, particularly in an era where food safety concerns are paramount. Moreover, the capacity to swiftly assesses data pertaining to foodborne illnesses might result in expedited response times during crises, thus safeguarding public health (Yao, 2023). Despite the numerous advantages, the adoption of Big Data and AI in the food industry is not without challenges. One significant barrier is the resistance to change within organizations, particularly in traditional sectors of the food industry that may be hesitant to embrace new technologies (Alawamleh, Al-Hussaini & Ismail, 2022). Additionally, the need for skilled personnel to interpret and manage data effectively poses another challenge, as there is often a gap in expertise within the workforce (Kafetzopoulos, Vouzas & Skalkos, 2020). Furthermore, in order to guarantee that the advantages of these technologies are distributed fairly, it is necessary to address the ethical concerns that are associated with data privacy and the possibility of algorithmic bias (Smykov, 2023).

Consequently, Big Data and AI are essential in fostering innovation in the food business, providing solutions that improve efficiency, safety and consumer happiness. As organizations traverse the intricacies of digital transformation, it is imperative to cultivate a culture of innovation and invest in requisite skills and technologies to fully use these break-throughs.

The future of the food business will likely be defined by an increased dependence on data-driven decision-making, resulting in more sustainable and adaptive food systems. The information pertaining to the latest advancements and studies on the integration of Big Data and AI within the food industry is systematically compiled and presented in Table 1.

ROLE OF BIG DATA AND AI IN REVOLUTIONIZING FOOD SUPPLY CHAIN MANAGEMENT

The use of Big Data and AI in transforming food supply chain management is increasingly acknowledged as a crucial element in improving efficiency, transparency and sustainability within the sector. With the increasing complexity of the food supply chain driven by globalization, customer demand for quality and regulatory standards, the incorporation of Big Data and AI technology presents novel solutions to conventional difficulties (Kumar, Rahouti, Ahmad, Al-Fugaha & Guizani, 2021).

These technologies make it possible to perform real-time data analysis, predictive modelling and automated decision-making, all of which are essential for optimizing logistics, improving food safety and preserving traceability from the farm to the table.

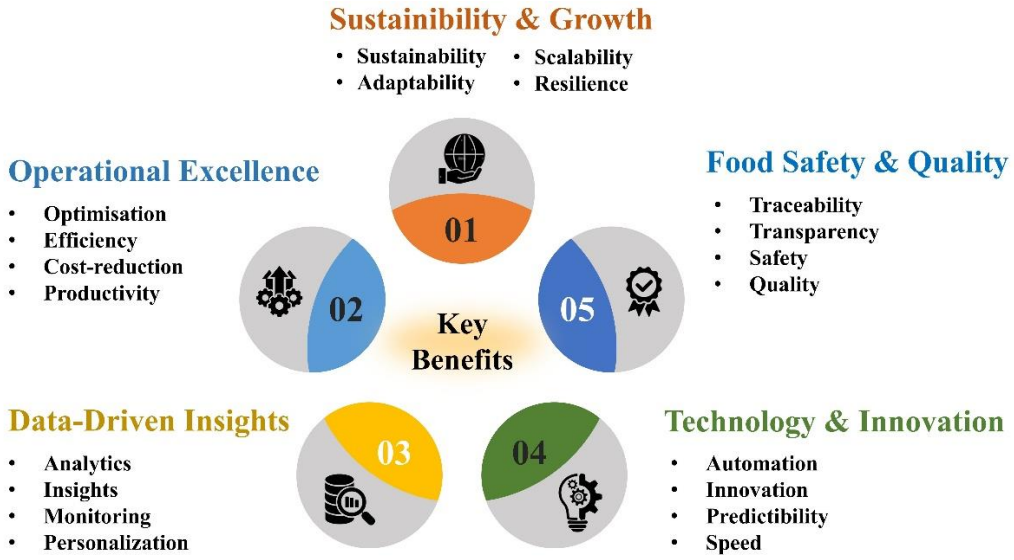

Figure 2. Key benefits of Big Data and AI in the global food industry

Table 1.
Recent studies on the application of Big Data and AI in the food industry

Focus of the study	Methodology	Key findings	Implications	Reference
The application of AI and Big Data in the food industry	Literature review and case studies	Big Data and AI can enhance agricultural production efficiency, improve food quality and create traceable supply chains	Emphasizes the need for data privacy, talent development, and sustainability in implementing these technologies	Ding et al. (2023)
Sustainable innovations in the food industry through AI and Big Data analytics	Empirical analysis using machine learning techniques	Machine learning (ML) applications in crop management, yield prediction and disease detection significantly improve decision-making in the food industry	Highlights the potential for AI to drive sustainable practices in food production and supply chains	Sharma, Gahlawat, Rahul, Mor & Malik (2021)
Artificial intelligence in food safety: A decade review	Bibliometric analysis	Big Data and AI improve food safety, quality and nutrition while reducing waste and resource consumption	Indicates the necessity for ongoing research in AI applications to address dietary issues and chronic diseases	Liu et al. (2023)
Artificial intelligence in postharvest agriculture	Review of recent literature	Application of AI in postharvest processes enhances food safety and quality, contributing to sustainable food systems	Suggests a growing need for AI integration in postharvest management to improve food integrity	Fadiji (2023)
Enhancing food integrity through AI and machine learning	Comprehensive review	Technologies like AI and ML address challenges in food integrity, safety, and supply chain resilience	Encourages the adoption of AI and ML to enhance food safety and quality across the industry	Gbashi (2024)
The fourth industrial revolution in the food industry	Critical review	Big Data and AI are essential components of Industry 4.0, transforming food production through advanced analytics	Calls for the food industry to embrace Industry 4.0 technologies for improved efficiency and innovation	Hassoun et al. (2022)
Net-zero dairy farming with Big Data and AI	Case study analysis	Big Data and AI can significantly reduce greenhouse gas emissions in the dairy sector, promoting environmental sustainability	Highlights the role of technology in achieving climate goals within the agricultural sector	Neethirajan (2024)
Big Data, IoT and AI in the agriculture and food industry	Review of literature	The integration of IoT with Big Data and AI provides new opportunities for monitoring and optimizing food processes	Suggests that these technologies can reshape agri-food systems for better efficiency and sustainability	Misra et al. (2022)
Artificial intelligence in advanced manufacturing	Literature review and case studies	Big Data and AI are crucial for advancing manufacturing processes in the food industry	Emphasizes the need for integrating AI technologies to enhance manufacturing efficiency	Arinez, Chang, Gao, Xu & Zhang (2020)
Big Data in the food industry	Systematic literature review	Big Data analytics improves operational efficiency and customer insights in the food sector	Suggests that leveraging Big Data can lead to better decision-making and service quality in food businesses	Qi, Ding, Wang & Cui (2021)
Big Data analytics in food supply chains	Case study and empirical analysis	Big Data analytics can help understand consumer demand and improve food safety through real-time monitoring	Suggests that effective data analysis can mitigate regulatory challenges in the food supply chain	Chakraborty, Rana, Khorana, Singu & Luthra (2022)

This transformation promotes operational performance and supports sustainable practices by reducing waste and enhancing resource allocation (Zhang, Yu & Zhang, 2020). The data

presented in Table 2 summarizes recent studies that illustrate the diverse applications and impacts of AI and Big Data in food supply chain management. The use of AI and Big Data in the management of the food supply chain have the potential to transform the industry by producing improvements in terms of efficiency, transparency and sustainability. Nevertheless, it also raises a number of obstacles that need to be solved in order to fully grasp the benefits it offers. One of the primary advantages of utilizing Big Data and AI in food supply chains is the significant improvement in decision-making capabilities. Artificial intelligence tools can analyse vast amounts of data to provide insights that enhance the management of fresh and perishable food items, ultimately leading to reduced waste and improved inventory management (Trabelsi, 2023).

Artificial intelligence can facilitate real-time data analysis, allowing stakeholders to make informed decisions quickly, which is crucial in the fast-paced food industry (Obaid, 2024). Additionally, Big Data analytics can improve demand forecasting and production planning, enabling companies to align their supply chain activities more closely with consumer demand (Dora, Kumar, Mangla, Pant & Kamal, 2021). This alignment not only improves operating efficiency but also makes a contribution to sustainability by reducing the amount of waste and excess output occurring (Belaud et al., 2019). Moreover, the adoption of AI and Big Data technologies can enhance traceability and transparency within food supply chains. By leveraging these technologies, companies can track products from farm to fork, ensuring that food safety standards are met and that consumers can trust the origins of their food (Tewary & Go-palakrishnan, 2021).

This increased visibility is particularly important in the context of food recalls, as it allows for swift action to mitigate risks to public health (Atadoga, 2024). Furthermore, the capability to analyse data from a variety of sources can lead to improved governance and risk ma-

Table 2.
Recent studies depicting AI and Big Data impact on food supply chain management

Focus of the study	Methodology	Key findings	Implications	References
Big Data and AI in food supply chain optimization	Literature review and case studies	Big Data and AI enhance decision-making and operational efficiency in food supply chains	Encourages adoption of AI for improved supply chain resilience and performance	Ding et al. (2023)
Big Data analytics and operational performance	Empirical study on manufacturing organizations	Big Data analytics positively impacts operational performance in food supply chains	Indicates the necessity of developing capabilities in Big Data analytics for competitive advantage	Dubey et al. (2020)
Artificial intelligence and machine learning in supply chain management	Review of AI applications in supply chains	The AI applications improve demand forecasting, risk management and inventory control	Suggests further research on the integration of AI in various supply chain functions	Pandey (2023)
Innovations in food supply chains through AI and Big Data	Systematic literature review	Big Data and AI facilitate innovations in demand forecasting and supplier selection	Indicates that utilizing these technologies can result in more sustainable and efficient food supply networks	Sharma et al. (2021)
Big Data and AI for traceability in food supply chains	Case studies and empirical analysis	Artificial intelligence enhances traceability and transparency in food supply chains, improving food safety	Indicates the importance of AI in building consumer trust through enhanced traceability	Misra et al. (2022)
Factors affecting AI adoption in food supply chains	Systematic literature review and quantitative analysis	Identifies barriers to AI adoption in food supply chains, including a lack of awareness and technical skills	Highlights the need for education and training to facilitate AI adoption in the food sector	Jokonya & Bomvana (2024)

management techniques, which is especially important during times of crisis, such as during the COVID-19 epidemic (Modgil, Singh & Hannibal., 2021).

The adoption of Big Data and AI in the management of food supply chains comes with a number of noticeable downsides, despite the fact that these advantages are there. One of the major challenges is the high initial expenditure that is necessary for the adoption of technology, which can be a barrier for small and medium-sized businesses or organizations (Talwar, Kaur, Wamba & Dhir, 2021). Additionally, there is often a lack of expertise and knowledge regarding these technologies within the workforce, which can hinder effective implementation and utilization (Alam, 2023). The complexity of integrating AI and Big Data systems into existing supply chain processes can also lead to operational disruptions if not managed carefully (Pandey, 2023).

The ethical implications of data consumption are another potential source of worry, particularly with regard to the protection of customer privacy and data. As companies collect and analyse more data, they must navigate the challenges of ensuring that consumer information is handled responsibly and in compliance with regulations (Ellaturu, 2024). Moreover, reliance on AI for decision-making raises questions about accountability and the potential for bias in algorithms, which can affect the fairness of supply chain operations. In light of this, the incurporation of AI and Big Data into the management of the food supply chain presents not only enormous opportunities for improvement in terms of efficiency, transparency and sustainability but also significant obstacles that need to be addressed. A balanced approach that considers both the advantages and drawbacks will be essential for stakeholders aiming to leverage these technologies effectively in the food industry.

BIG DATA AND AI IN SUSTAINABLE FOOD INNOVATIONS ALIGNING WITH GLOBAL CLIMATE AND SUSTAINABILITY GOALS

Big Data and AI are rapidly transforming sustainable food production systems, providing innovative solutions that align with global climate and sustainability goals. By leveraging vast datasets, advanced algorithms and real-time analytics, stakeholders in the agriculture sector are now able to monitor crop health, optimize resource allocation and predict environmental impacts in unprecedented ways. These technologies contribute significantly to achieving several United Nations SDGs, including 'Zero Hunger, Climate Action and Responsible Consumption and Production' (UNGA, 2015). Emerging trends in Big Data and AI applications demonstrate a clear shift towards precision farming and climate-resilient agriculture. Farmers and food producers now use satellite imagery, IoT sensors and machine learning models to analyse soil conditions, forecast weather patterns and reduce water waste. This integration not only ensures higher yield outputs but also minimizes environmental footprints by reducing the need for harmful agrochemicals. In addition, such innovations improve supply chain efficiency, help identify vulnerabilities in food distribution networks and promote localized solutions that support community resilience amid climate change disruptions. Practical applications are seen in automated irrigation systems that adjust water usage based on detailed soil moisture analytics and crop management systems that diagnose diseases early with AI-driven predictive maintenance. These advances enable a more sustainable food ecosystem, empower decision-makers with actionable insights and facilitate targeted interventions that are critical for global food security and also align with the global Sustainable Development Goals (Vinuesa et al., 2020). As we continue to leverage the power of AI and Big Data, the future of sustainable agriculture appears to be bright, propelling a communal effort toward environmental stewardship and economic stability on a global scale.

For the purpose of aligning with global climate and sustainability goals, the incorporation of AI and Big Data into sustainable food technologies is absolutely necessary. Through the utilization of Big Data analytics, agricultural practices may be optimized, crop management can be improved, yield outcomes can be predicted, and supply chain efficiency can be improved. These technologies not only mitigate the impact of climate change but also promote resilience in food systems by targeting sustainable productivity increases while reducing greenhouse gas emissions (Doggalli et al., 2024). Climate-Smart Agriculture (CSA) represents a key framework for achieving these objectives by focusing on

Table 3.
The critical role of Big Data and AI in fostering sustainability in agricultural practices and addressing global climate challenges and sustainability goals

Focus of the study	Methodology	Key findings	Implications	References
Role of Big Data in food and agriculture research	Case studies and examples	Big Data analytics, IoT and machine learning optimize crop management, predict yields, and enhance supply chain efficiency, ultimately aiding food security and sustainability efforts	Collaboration, investment and capacity building are crucial for leveraging Big Data to address agricultural challenges and promote environmental sustainability	Doggalli et al. (2024)
Sustainable innovativeness through Big Data in agriculture	Empirical analysis across multiple countries	High levels of Big Data analytics capabilities positively correlate with sustainable innovativeness, thus enabling the design of effective new service products in agriculture	Organizations can harness Big Data to improve market insights and customer understanding, fortifying their capacity for sustainable innovations in product development	Doggalli et al. (2024)
Digital agricultural technologies and their politics in the context of environmental challenges	Literature review	Climate change and environmental issues necessitate innovations in agricultural practices, which can be facilitated by digital technologies such as Big Data and AI	Sustainable food production systems must evolve to confront challenges posed by climate change, making digital agriculture a critical avenue for future innovations in farming approaches	Ahmed & Shakoor (2025)
Integrating Big Data into environmental strategies	Advanced computational techniques	Big Data enhances decision-making related to climate management, biodiversity and agriculture, fostering informed strategies for sustainability	The integration of Big Data into environmental policy can lead to more effective solutions and practices that address climate change and promote agricultural sustainability	Qiu (2024)
Climate Smart Agriculture (CSA) innovations leveraging Big Data	A systematic review of the literature and case analyses	Adoption of Big Data analytics accelerates CSA, leading to enhanced productivity and reduced greenhouse gas emissions, while adapting to climate risks	Policymakers and researchers must prioritize CSA frameworks that incorporate Big Data and AI for sustainable food production, ensuring resilience in agricultural practices under climate constraints	Rao (2018)
Big Data contribution to sustainability in agriculture	Systematic literature review	Analysing large datasets helps understand complex agricultural ecosystems and address issues arising from climate change, such as drought and increased diseases	Effective use of Big Data analytics in agriculture aids in tackling sustainability and food security challenges while promoting adaptive and mitigation strategies	Cravero, Bustamante, Negrier & Galeas (2022)
Enhancing climate resilience through agricultural Big Data	Interdisciplinary review of systems thinking	A CSA framework supports food security and enhances the agricultural system and adaptive capacity through Big Data and technology integration	Emphasizing interdisciplinary approaches assists in creating comprehensive strategies for sustainable agricultural development amidst climate challenges	Sebestyen, Czvetko & Abonyi, (2021)
Big Data applications for sustainable supply chain management	Methodological analysis of supply chain processes and Big Data analytics	Incorporating Big Data into supply chains can optimize resource use, reduce waste and enhance overall sustainability metrics in agricultural sectors	Enhancing supply chain sustainability through Big Data applications is critical for businesses aiming to reduce their carbon footprints and align with climate goals	Belaud, Prioux, Vialle & Sablayrolles (2019)

three pillars: increasing productivity, enhancing adaptation to climate impacts, and lowering emissions (Balasundram, Shamshiri, Sridhara & Rizan, 2023). Moreover, the implementation of Big Data in conjunction with AI enables farmers to make informed decisions about resource allocation, further entrenching sustainable practices that are necessary to meet the challenges of unpredictable climate patterns and resource scarcity. Innovations such as precision agriculture and IoT technologies allow for greater efficiency in resource utilization, aligning agricultural practices with broader sustainability and climate goals (Jena, 2024). Furthermore, CSA initiatives, which prioritize nutrition-sensitive approaches, ensure that the integration of these technologies directly supports food security. As global food systems face increasing pressure from climate change, the convergence of Big Data and AI provides critical tools for transforming agricultural practices, ensuring both environmental sustainability and food security targets are met. By leveraging these technological advancements, it becomes feasible to create resilient agricultural systems that contribute effectively to climate goals outlined in international frameworks such as the United Nations SDGs. The integration of Big Data and AI within the context of sustainable food innovations is paramount, particularly in aligning agricultural practices with global climate and sustainability goals. The data presented in Table 3 encapsulates key studies that elucidate various facets of this topic.

TACKLING GLOBAL CHALLENGES WITH BIG DATA AND AI

Both AI and Big Data are examples of disruptive technologies that play critical roles in tackling global concerns, particularly in the areas of economic resilience, supply chain management and sustainability. The integration of AI with Big Data analytics enables organizations to gain insights from vast quantities of different data, hence improving decision-making processes that address both current and future concerns. For instance, the convergence of these technologies facilitates the development of sustainable practices by optimizing resource usage and reducing environmental impacts, critical factors as the global population expands (Pan, Yang, Liang & Tang, 2024). Moreover, Big Data analytics significantly bolsters supply chain management by fostering improved traceability and transparency across international borders, which are essential in today's globalized economy (Yang, 2024). Companies that leverage Big Data can not only enhance operational efficiency but also gain competitive advantages, thereby driving economic growth and encouraging investment. Additionally, the role of Big Data in combating corruption through transparency and informed policymaking cannot be overstated, utilizing these analytics allows governments and organizations to monitor and evaluate policies effectively (Adebisi & Guermat, 2022). Furthermore, the application of AI and Big Data in predicting environmental changes can guide initiatives aimed at meeting the United Nations SDGs. Such foresight is imperative in creating resilient infrastructures capable of adapting to the impacts of climate change and fostering global health systems, especially in post-pandemic recovery (Azeroual & Fabre, 2021). Therefore, the strategic deployment of AI and Big Data is essential for devising innovative solutions to global challenges, representing a holistic approach toward sustainable development and economic stability.

Big Data, AI and the food industry have all come together to create a landscape that is undergoing a transformation. This landscape is characterized by data-driven insights and automation, which are causing a revolution in the manner in which food is produced, processed, and consumed. AI-driven precision agriculture is optimizing crop yields, reducing resource usage and promoting sustainable farming practices, while Big Data analytics is providing food manufacturers with real-time insights to inform decisions on production planning, quality control, and supply chain management. Moreover, AI-powered predictive analytics is helping food manufacturers reduce food waste by optimizing production planning, inventory management and supply chain operations and AI-driven personalized nutrition systems are providing consumers with tailored nutrition recommendations, enabling food manufacturers to create customized products. Additionally, AI-driven predictive maintenance is reducing downtime and increasing overall equipment effectiveness, while AI-driven quality control systems are detecting defects and contaminants, ensuring higher quality and safety standards (Unlu & Soylemez, 2025). Furthermore, the incorporation of AI and Big Data in the food industry is

promoting sustainable practices, such as lowering the amount of energy consumed, minimizing the amount of water used and optimizing the allocation of resources. This, in turn, is driving sustainable growth, improving efficiency and promoting sustainability in the global food industry.

FUTURE DIRECTIONS AND OPPORTUNITIES FOR BIG DATA AND AI IN THE GLOBAL FOOD INDUSTRY

The application of AI and Big Data in the food business around the world presents a transformative opportunity for generating sustainable growth. At a time when the world is struggling to meet the rising demand for food as a result of population increase, climate change and a lack of resources, these technologies provide novel solutions to improve efficiency, cut down on waste and boost food safety throughout the supply chain. With the use of AI and Big Data, agricultural practices and food production procedures can be optimized. One of the most significant applications of these technologies is predictive analytics, which enables farmers to make informed decisions based on data-driven insights regarding weather patterns, soil conditions and crop health. This is one of the most essential applications of these technologies. This skill not only increases agricultural output but also makes a contribution to the presservation of the environment by minimizing the use of resources and reducing the number of chemical additions. Furthermore, the automation of production processes through AI can lead to more efficient operations, thereby decreasing the carbon footprint associated with food production. The adoption of smart sensors and IoT devices allows for real-time monitoring of agricultural systems, which can significantly enhance the traceability and safety of food products. The concept of a Sustainable Supply Chain 4.0 is gaining traction, emphasizing the need for integrating digital technologies like AI and Big Data into food supply chains. This integration facilitates mass customization and reduces material waste, aligning with sustainability goals. Customers are able to track the origins of their food and ensure that it complies with safety regulations when blockchain technology is integrated with AI and Big Data. This increases the level of transparency and confidence that exists within the food supply chain. It is essential to have this level of transparency to address potential threats to food safety and to boost consumer confidence, particularly in light of recent global difficulties such as the COVID-19 pandemic.

Moreover, the shift towards alternative proteins, driven by consumer demand for sustainable food options, is another area where AI and Big Data can play a significant role. Technologies in cellular agriculture and plant-based food production are being developed to meet this demand while minimizing the environmental impact associated with traditional livestock farming. The attitudes of farmers towards these emerging technologies indicate a growing acceptance and recognition of their potential benefits, which could lead to a more resilient agricultural sector. Taking action to address the issues posed by cybersecurity threats as digitalization continues to develop is another factor that will determine the future of the food business. In order to protect against potential disruptions and to ensure that food supply chains continue to function without interruption, it is essential to ensure the security of both data and systems. As the industry evolves, it will be essential to foster collaboration among stakeholders, including researchers, policymakers and industry leaders, to develop innovative solutions that leverage AI and Big Data while addressing these challenges. The combination of AI, Big Data and emerging technologies presents a significant opportunity for the global food industry to foster sustainable growth. The convergence of these three technologies presents this opportunity. It is possible for these technologies to contribute to the development of a more robust and sustainable food system that can cater to the requirements of a growing global population. This can be accomplished by increasing productivity, strengthening food safety and fostering transparency.

CONCLUSION

The incorporation of AI and Big Data into the food business represents a significant step forward in the transformational process of addressing the complex concerns of climate resilience, food security and sustainability. These technologies enable creative solutions to meet the growing need for food around the world while simultaneously limiting their impact on the environment. They do this by enabling precision agriculture, promoting supply chain transparency, and supporting decision-making that is

driven by data. Big Data and AI facilitate significant advancements in optimizing resource utilization, reducing waste and enhancing productivity across agricultural and supply chain processes. Furthermore, their role in developing climate-resilient practices and alternative protein sources underscores their potential to reshape food production and consumption paradigms. Technologies such as blockchain, IoT and predictive analytics not only improve efficiency but also build consumer trust by ensuring food safety and traceability. However, the journey toward a digitally driven, sustainable food system is not without challenges. High initial investment costs, workforce skill gaps, ethical considerations regarding data privacy and algorithmic biases are critical hurdles that require strategic attention. Overcoming these challenges demands collaborative efforts from industry stakeholders, policymakers and researchers to create robust frameworks for equitable and responsible technology adoption. As the food industry continues to evolve, the convergence of AI, Big Data and emerging digital technologies offers unparalleled opportunities to foster resilience, sustainability and innovation. These advancements are pivotal in shaping a food system that aligns with global sustainability goals, ensuring a secure and sustainable future for the growing global population.

AUTHOR CONTRIBUTIONS

Conceptualization, visualization, writing originnal draft, review and editing, A.; Writing, review and editing, supervision, validation, K.R.; Writing, review and editing, supervision, project administration, validation, N.

DATA AVAILABILITY STATEMENT

The data reviewed and analysed during this study is included in this published article, and the data utilized to support the findings of this review are included in the references at the end of the article.

ACKNOWLEDGEMENTS

The authors express their sincere gratitude to the National Institute of Food Technology Entrepreneurship and Management, Kundli-131028 (*An Institute of National Importance of India*, NIFTEM-K), Sonipat, Haryana, India, for providing essential resources and support for the accomplishment of this review article (NIFTEM-K Publication Number, NIFTEM-P-2025-57).

CONFLICT OF INTEREST

The authors declare no conflict of interest. The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this research paper.

REFERENCES

Adebisi, A., & Guermat, C. (2022). Comparative analysis of the impact of big data on corruption in selected developing and developed countries. *European Journal of Information Technologies and Computer Science*, *2*(3), 1-9. https://doi.org/10.24018/compute.2022.2.3.64

Ahmed, N., & Shakoor, N. (2025). Advancing agriculture through IoT, Big Data and AI: A review of smart technologies enabling sustainability. *Smart Agricultural Technology*, *10*, 100848. https://doi.org/10.1016/j.atech.2025.100848

Alam, M. (2023). Supply chain management techniques using big data for agro-based food products in Bangladesh. *International Journal of Data Science and Big Data Analytics*, *3*(2), 19-34. https://doi.org/10.51483/ijdsbda.3.2.2023.19-34

Adewusi, A. (2024). AI in precision agriculture: A review of technologies for sustainable farming practices. *World Journal of Advanced Research and Reviews*, *1*, 2276-2285. https://doi.org/10.30574/wjarr.2024.21.1.0314

Alawamleh, M., Al-Hussaini, M., & Ismail, L. (2022). Open innovation in the food industry: Trends and barriers — A case of the Jordanian food industry. *Journal of Global Entrepreneurship Research*, *12*(1), 279-290. https://doi.org/10.1007/s40497-022-00312-6

Arinez, J., Chang, Q., Gao, R., Xu, C., & Zhang, J. (2020). Artificial intelligence in advanced manufacturing: Current status and future outlook. *Journal of Manufacturing Science and Engineering*, *142*(11), 1-5. https://doi.org/10.1115/1.4047855

Atadoga, A. (2024). AI in supply chain optimization: A comparative review of USA and African trends. *International Journal of Science and Research Archive*, *11*(1), 896-903. https://doi.org/10.30574/ijsra.2024.11.1.0156

Azeroual, O., & Fabre, R. (2021). Processing big data with Apache Hadoop in the current challenging era of COVID-19. *Big Data and Cognitive Computing*, *5*(1), 12. https://doi.org/10.3390/bdcc5010012

Balasundram, S.K., Shamshiri, R.R., Sridhara, S., & Rizan, N. (2023). The role of digital agriculture in mitigating climate change and ensuring food security: An overview. *Sustainability*, *15*(6), 5325. https://doi.org/10.3390/su15065325

Barile, D., Secundo, G., & Vecchio, P. (2022). Food 4.0 for competing during the COVID-19 pandemic: Experimenting digitalization in family firms. *European Journal of Innovation Management*, *27*(4), 1381-1402. https://doi.org/10.1108/ejim-07-2022-0373

Belaud, J., Prioux, N., Vialle, C., & Sablayrolles, C. (2019). Big Data for agri-food 4.0: Application to sustainability management for by-products supply chain. *Computers in Industry*, *111*, 41-50. https://doi.org/10.1016/j.compind.2019.06.006

Chakraborty, D., Rana, N., Khorana, S., Singu, H., & Luthra, S. (2022). Big data in food: Systematic literature review and future directions. *Journal of Computer Information Systems*, *63*(5), 1243-1263. https://doi.org/10.1080/08874417.2022.2132428

Chen, J. (2024). The role of big data in advancing precision agriculture and ensuring food security. *Bio Web of Conferences*, *121*, 02013. https://doi.org/10.1051/bioconf/202412102013

Cravero, A., Bustamante, A., Negrier, M., & Galeas, P. (2022). Agricultural big data architectures in the context of climate change: A systematic literature review. *Sustainability*, *14*(13), 7855. https://doi.org/10.3390/su14137855

Ding, H., Tian, J., Yu, W., Wilson, D.I., Young, B.R., Cui, X., Xin, X., Wang, Z., & Li, W. (2023). The application of artificial intelligence and big data in the food industry. *Foods*, *12*(24), 4511. https://doi.org/10.3390/foods12244511

Doggalli, G., Kulkarni, S., Meti, S., Pattar, S., Aravind, S., Sankati, J., & Singh, S. (2024). Exploring big data innovations in food and agriculture research: An in-depth analysis. International *Journal of Research in Agronomy*, *7*(3S), 330-336. https://doi.org/10.33545/2618060x.2024.v7.i3se.471

Dora, M., Kumar, A., Mangla, S., Pant, A., & Kamal, M. (2021). Critical success factors influencing artificial intelligence adoption in food supply chains. *International Journal of Production Research*, *60*(14), 4621-4640. https://doi.org/10.1080/00207543.2021.1959665

Dubey, R., Gunasekaran, A., Childe, S., Bryde, D., Giannakis, M., Foropon, C., & Hazen, B. (2020). Big data analytics and artificial intelligence pathway to operational performance under the effects of entrepreneurial orientation and environmental dynamism: A study of manufacturing organisations. *International Journal of Production Economics*, *226*, 107599. https://doi.org/10.1016/j.ijpe.2019.107599

Ellaturu, V. (2024). AI-driven solutions for supply chain management. *Journal of Informatics Education and Research*, *4*(2), 1526-4726. https://doi.org/10.52783/jier.v4i2.849

Fadiji, T. (2023). Artificial intelligence in postharvest agriculture: Mapping a research agenda. *Frontiers in Sustainable Food Systems*, *7*, 1-23. https://doi.org/10.3389/fsufs.2023.1226583

Franc, S., & Kujevac, E. (2021). Global trends and competitiveness of the food industry. *Notitia*, *7*(1), 99-108. https://doi.org/10.32676/n.7.1.8

Galanakis, C., Rizou, M., Aldawoud, T., Ucak, I., & Rowan, N. (2021). Innovations and technology disruptions in the food sector within the COVID-19 pandemic and post-lockdown era. *Trends in Food Science & Technology*, *110*, 193-200. https://doi.org/10.1016/j.tifs.2021.02.002

Gbashi, S. (2024). Enhancing food integrity through artificial intelligence and machine learning: A comprehensive review. *Applied Sciences*, *14*(8), 3421. https://doi.org/10.3390/app14083421

Hassoun, A., Ait-Kaddour, A., Abu-Mahfouz, A., Rathod, N., Bader, F., Barba, F., & Regenstein, J. (2022). The fourth industrial revolution in the food industry—Part I: Industry 4.0 technologies. *Critical Reviews in Food Science and Nutrition*, *63*(23), 6547-6563. https://doi.org/10.1080/10408398.2022.2034735

Jena, P. (2024). Technological solutions for sustainable agriculture. *Ecology Economy and Society–The INSEE Journal*, *7*(1), 171-175. https://doi.org/10.37773/ees.v7i1.910

Jokonya, O., & Bomvana, Z. (2024). Factors affecting the adoption of artificial intelligence in the food supply chain. *Research Square*, *2024*, 1-19. https://doi.org/10.21203/rs.3.rs-4161780/v1

Kafetzopoulos, D., Vouzas, F., & Skalkos, D. (2020). Developing and validating an innovation drivers measurement instrument in the agri-food sector. *British Food Journal*, *122*(4), 1199-1214. https://doi.org/10.1108/bfj-09-2019-0721

Kumar, J., Rahouti, M., Ahmad, K., Al-Fuqaha, A., & Guizani, M. (2021). The duo of artificial intelligence and big data for industry 4.0: Review of applications, techniques, challenges and future research directions. *IEEE Internet of Things Journal*, *9*(15), 1-25. https://doi.org/10.48550/arXiv.2104.02425

Liu, Z., Wang, S., Zhang, Y., Feng, Y., Li, J., & Zhu, H. (2023). Artificial intelligence in food safety: A decade review and bibliometric analysis. *Foods*, *12*(6), 1242. https://doi.org/10.3390/foods12061242

Misra, N., Dixit, Y., Al-Mallahi, A., Bhullar, M., Upadhyay, R., & Martynenko, A. (2022). IoT, big data and artificial intelligence in agriculture and food industry. *IEEE Internet of Things Journal*, *9*(9), 6305-6324. https://doi.org/10.1109/jiot.2020.2998584

Modgil, S., Singh, R., & Hannibal, C. (2021). Artificial intelligence for supply chain resilience: Learning from COVID-19. *The International Journal of Logistics Management*, *33*(4), 1246-1268. https://doi.org/10.1108/ijlm-02-2021-0094

Neethirajan, S. (2024). Net zero dairy farming—Advancing climate goals with big data and artificial intelligence. *Climate*, *12*(2), 15. https://doi.org/10.3390/cli12020015

Nugroho, G. (2023). Review of the application of digital transformation in food industry. *Journal of Current Science and Technology*, *13*(3), 774-790. https://doi.org/10.59796/jcst.v13n3.2023.1285

Obaid, M. (2024). From field to fork: The role of AI and IoT in agriculture. *E3s Web of Conferences*, *491*, 02006. https://doi.org/10.1051/e3sconf/202449102006

Pan, C., Yang, W., Liang, X., & Tang, Z. (2024). Sustainable development, big data, and the economy: Scientometrics Analysis. *ICEMBDA EAI Proceedings*. https://doi.org/10.4108/eai.27-10-2023.2341923

Pandey, V. (2023). Artificial intelligence, machine learning and data science enabled supply chain management. *International Journal of Engineering Applied Sciences and Technology*, *8*(2), 243-247. https://doi.org/10.33564/ijeast.2023.v08i02.036

Qi, T., Ding, H., Wang, H., & Cui, X. (2021). Application research: big data in food industry. *Foods*, *10*(9), 2203. https://doi.org/10.3390/foods10092203

Qiu, K. (2024). Navigating the green future: The transformative role of big data in climate change and environmental sustainability. *Applied and Computational Engineering*, *57*(1), 130-135. https://doi.org/10.54254/2755-2721/57/20241322

Rao, N. (2018). Big data and climate-smart agriculture-status and implications for agricultural research and innovation in India. *Proceedings of the Indian National Science Academy*, *96*, 1-5. https://doi.org/10.16943/ptinsa/2018/49342

Sakapaji, S. (2023). Harnessing AI for climate-resilient agriculture: Opportunities and challenges. *European Journal of Theoretical and Applied Sciences*, *1*(6), 1144-1158. https://doi.org/10.59324/ejtas.2023.1(6).111

Sebestyen, V., Czvetko, T., & Abonyi, J. (2021). The applicability of big data in climate change research: The importance of system of systems thinking. *Frontiers in Environmental Science*, *9*, 1-11. https://doi.org/10.3389/fenvs.2021.619092

Senoo, E. (2024). IoT solutions with artificial intelligence technologies for precision agriculture: Definitions, applications, challenges, and opportunities. *Electronics*, *13*(10), 1894. https://doi.org/10.3390/electronics13101894

Sethi, S., Tumane, R., & Panghal, A. (2018). 3D printing in food processing industries -A pathway to innovations. *Journal of Global Economy*, *14*(4), 61-70. https://doi.org/10.1956/jge.v14i4.498

Sharma, S., Gahlawat, V., Rahul, K., Mor, R., & Malik, M. (2021). Sustainable innovations in the food industry through artificial intelligence and big data analytics. *Logistics*, *5*(4), 66. https://doi.org/10.3390/logistics5040066

Smykov, I. (2023). Neophobia: Socio-ethical problems of innovative technologies of the food industry. *Food Systems*, *5*(4), 308-318. https://doi.org/10.21323/2618-9771-2022-5-4-308-318

Talwar, S., Kaur, P., Wamba, S., & Dhir, A. (2021). Big Data in operations and supply chain management: A systematic literature review and future research agenda. *International Journal of Production Research*, *59*(11), 3509-3534. https://doi.org/10.1080/00207543.2020.1868599

Tewary, T., & Gopalakrishnan, B. (2021). Unlocking technology adoption for a robust food supply chain: Evidence from Indian food processing sector. *Higher School of Economics Economic Journal*, *25*(1), 147-164. https://doi.org/10.17323/1813-8691-2021-25-1-147-164

Trabelsi, M. (2023). Unleashing the value of artificial intelligence in the agri-food sector: Where are we? *British Food Journal*, *125*(13), 482-515. https://doi.org/10.1108/bfj-11-2022-1014

(UNGA) United Nations General Assembly. (2015). Transforming our world: The 2030 Agenda for Sustainable Development. *Resolut*, *25*, 1–35.

Unlu, R., & Soylemez, I. (2025). AI-Driven predictive maintenance. In X. S.Yang, (Ed.), *Engineering applications of AI and swarm intelligence* (pp. 207-233). Singapore: Springer. https://doi.org/10.1007/978-981-97-5979-8_10

Vasiliev, D., Hazlett, R., Stevens, R., & Bornmalm, L. (2022). Sustainable agriculture, GIS and artificial intelligence. *SGEM Proceedings*, *22*, 441-448. https://doi.org/10.5593/sgem2022/5.1/s20.056

Vatin, N. (2024). Sustainability measures: An experimental analysis of AI and big data insights in Industry 5.0. *Bio Web of Conferences*, *86*, 01072. https://doi.org/10.1051/bioconf/20248601072

Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., & Fuso Nerini, F. (2020). The role of artificial intelligence in achieving the Sustainable Development Goals. *Nature Communications*, *11*(1), 233. https://doi.org/10.1038/s41467-019-14108-y

Wojcicki, K., Gorna, J., & Sikorska, E. (2024). Digitalisation in agri-food sector. In K. Pawlak-Lemanska, B. Borusiak & E. Sikorska (Eds.), *Sustainable food: Production and consumption perspectives* (pp. 41–53). Poland: Poznan University of Economics and Business Press. https://doi.org/10.18559/978-83-8211-209-2/3

Yang, C. (2024). Innovation in cross-border supply chain inventory management driven by big data. *Advances in Economics Management and Political Sciences*, *76*(1), 66-73. https://doi.org/10.54254/2754-1169/76/20241882

Yang, Q., Shen, Y., Foster, T., & Hort, J. (2020). Measuring consumer emotional response and acceptance to sustainable food products. *Food Research International*, *131*, 108992. https://doi.org/10.1016/j.foodres.2020.108992

Yao, S. (2023). Can digital transformation promote the improvement of regional food security? Empirical findings from China. *Agribusiness*, *41*(1), 184-216. https://doi.org/10.1002/agr.21881

Zhang, X., Yu, Y., & Zhang, N. (2020). Sustainable supply chain management under big data: A bibliometric analysis. *Journal of Enterprise Information Management*, *34*(1), 427-445. http://dx.doi.org/10.1108/JEIM-12-2019-0381

NOVA ULOGA VEŠTAČKE INTELIGENCIJE I VELIKIH PODATAKA U POMOĆU ODRŽIVOG RASTA U GLOBALNOJ PREHRAMBENOJ INDUSTRIJI

Aditya[*1], Kumar Rahul[2], Neeraj[*1]

[1]Nacionalni institut za preduzetništvo i menadžment prehrambene tehnologije (Institut od nacionalnog značaja Indije, NIFTEM-K), Odeljenje za poljoprivredu i nauke o životnoj sredini, Sonipat, Haryana, Kundli-131028, Indija
[2] Nacionalni institut za preduzetništvo i menadžment prehrambene tehnologije, (Institut od nacionalnog značaja Indije, NIFTEM-K), Odjel za interdisciplinarne nauke, Sonipat, Haryana, Kundli-131028, Indija

Sažetak: Integracija veštačke inteligencije (AI) i velikih setova podataka (Big Data) postaje transformacijska sila u globalnoj prehrambenoj industriji, podstičući održivi rast kroz povećanje efikasnosti i produktivnosti, smanjenje otpada, unapređenje upravljanja resursima i donošenja odluka. Nedavni napredak u tehnologijama AI i Big Data, kao što su predikciona analiza i mašinsko učenje, revolucioniraju poljoprivrednu praksu omogućavajući preciznu poljoprivredu, optimizaciju korištenja resursa i unapređenje sistema upravljanja usevima. Ove tehnologije omogućuju praćenje stanja useva na polju u realnom vremenu, predviđanje prinosa i otkrivanje bolesti, čime se odgovara na ključne izazove poput nesigurnosti u snabdevanju hranom i smanjenja otpada. Primjena AI i Big Data u lancu snabdevanja hranom poboljšava sledljivost i transparentnost, što je ključno za osiguranje bezbednosti i kvaliteta hrane. Ove tehnologije dodatno ubrzavaju implementaciju digitalnih rešenja u prehrambenom sektoru, naglašavajući potrebu za robusnim lancima snabdevanja sposobnim za adaptaciju viška. Kako se prehrambena industrija suočava s dvostrukim pritiscima klimatskih promena i rastuće globalne populacije, uloga AI i Big Data u promociji održivih praksi postaje sve značajnija. Osim u poljoprivredi, AI i Big Data oblikuju nove poslovne modele u prehrambenoj industriji, podstičući inovativne marketinške strategije i personalizovana prehrambena rešenja. Konvergencija ovih tehnologija ne samo da podržava ekološku održivost, već i jača ekonomsku održivost, otvarajući put ka održivijem prehrambenom ekosistemu. Uključivanje AI i Big Data u globalnu prehrambenu industriju jača otpornost na izazove kao što su klimatske promene, nestašica resursa i rast populacije. Dakle, olakšavanjem održivijih i efikasnijih operacija, ove tehnologije revolucioniraju proizvodnju, preradu, distribuciju i potrošnju hrane, usklađujući industriju s principima očuvanja životne okoline i globalne sigurnosti hrane, u skladu s globalnim ciljevima održivosti.

Ključne reči: *AI, Big Data, prehrambena industrija, održivi rast, upravljanje lancem snabdevanja*

Received: *12 April 2025/* ***Received in revised form:*** *26 May 2025/23 June 2025/* ***Accepted:*** *24 June 2025*

Available online: *July 2025*