Innovative approaches to improving the agricultural sector in the era of digitalization of the economy

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Abstract. Conducting a study on this topic is becoming relevant due to the rapid introduction of digital technologies in the agricultural sector, which requires urgent study to effectively address current challenges in agriculture. The purpose of this paper is to analyse innovative approaches to improving the efficiency of economic activity in the agri-food sector. The methods used include the analytical method, classification method, functional method, statistical method, synthesis method, and

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others. The study found that the use of innovative approaches has significantly improved the productivity and sustainability of the agricultural sector. The use of blockchain technologies has increased trust in the supply chain by providing verified and transparent information on product quality. The analysis of large volumes of data has made it possible to develop specialized solutions and strategies tailored to specific business conditions in different regions. The results show an increase in the resilience of the agricultural sector to changes in economic and climate conditions. The findings of the study highlight the potential of digital transformation as a strategic tool for innovative and sustainable development of the agricultural sector. The study identified key strategies for the future implementation of digital technologies, taking into account the needs of the agricultural sector. The conclusion emphasizes the importance of introducing digital technologies to increase efficiency, improve management and ensure the sustainability of the industry in today's digital economy. The practical significance of the paper is to analyse and highlight the factors that affect productivity and resource management in agriculture, which serves as a basis for further research and development of specific strategies and recommendations to improve the efficiency of the sector

Keywords: productivity improvement; implementation strategies; industry; resource management; efficiency

INTRODUCTION

In an era of rapidly developing digital transformation of the economy, the agricultural sector is recognized as one of the key industries that can benefit from innovative approaches and the introduction of digital technologies. This topic is important due to the need to increase productivity, adapt to climate change, ensure food security and competitiveness of the agricultural sector. Digital technologies will optimize production processes, make farms less vulnerable to extreme weather conditions, and contribute to sustainable development. In addition, they will allow farmers to be competitive on the global market and contribute to the development of new markets and jobs. The study is driven by existing and potential problems in the agricultural sector. These challenges include uneven adoption of digital technologies, data security and privacy issues, financial barriers to innovation on certain farms, the need to train qualified personnel, and ethical issues related to the use of digital technologies. Failure to study these aspects can lead to serious challenges for the development of the agricultural sector in the new digital economy.

In their work, V.V. Havrylyshyn *et al.* (2022) analyse the prospects and identify strategies for the digital transformation of cooperative entrepreneurship in Ukraine to promote sustainable economic recovery. As a result, the study uncovered and identified specific areas where digital transformation is most effective in promoting the development of cooperative entrepreneurship. However, it lacked an additional detailed overview of current digital technologies and their potential for application in the cooperative sector to allow for a more precise identification of specific opportunities and challenges. The aim of the study by B. Khakhula (2022) was to identify and analyse the economic factors that influence the development of innovation in agricultural enterprises in Ukraine, focusing on aspects of food resource use. As a result, a deep understanding of the economic problems that hinder innovation in Ukrainian agriculture, focusing on the use of food

resources, was obtained. The recommendations and strategies developed on the basis of the results contributed to increasing the competitiveness and sustainability of the sector in a challenging economic environment. However, the author did not take into account the impact of the external environment, such as climate change, geopolitical factors, national and international economic policies on the development of innovations in agriculture.

M. Rudenko's (2020) study aims to reveal the impact of digitalization on the functioning of agricultural enterprises, in particular, to identify the benefits, challenges, and specific aspects of this process. The results serve as a basis for further research and strategic planning in the field of agricultural digitalization. However, there was a lack of analysis and recommendations on cybersecurity measures to protect agricultural systems in the context of digital transformation. In their work, L. Kononenko and D. Prykhodko (2023) analyse the process of forming strategies for agricultural enterprises in the context of digitalization, identify key aspects and define strategic directions that will contribute to sustainable development in the digital environment. As a result, the advantages provided by digital transformation for the development of competitive strategies were identified. However, the authors did not take into account global trends and challenges affecting the agricultural sector in the context of digitalization, such as international standards, market competition and international cooperation.

The paper by A. Shestakova *et al.* (2022) assesses the potential of digital technologies to support Ukraine's agricultural economy during the military conflict, identifies opportunities and develops strategies to increase resilience and productivity. As a result, strategies were created that contributed to increasing the resilience of the agricultural sector and reducing the impact of the conflict. However, the study lacked a detailed analysis of the military conflict and its possible impact on the

agricultural sector, including supply disruptions, changes in operating conditions, and access to technical solutions. The aim of the research by A. Cherep and L. Sarbey (2023) was to study and identify key aspects of digital transformation as a means of rebuilding Ukraine's economy, to identify the benefits and ways to optimally use digital innovations. As a result, the paper focuses on the role of digitalization in rebuilding Ukraine's economy, in particular, on identifying ways to optimally use digital innovations for sustainable and effective economic development in the post-war period. However, it does not address the issues of inclusiveness and ensuring that the benefits of digitalization are enjoyed by all segments of society (Matsybora, 2023).

The purpose of the paper was to identify and analyse innovative approaches aimed at improving the efficiency of agriculture in the digital economy.

MATERIALS AND METHODS

This study was carried out using methods that reveal the theoretical and practical content of the object, providing a comprehensive view of innovative approaches to improving the agricultural sector in the context of the digital transformation of the economy. The analytical method helped to structure the economic and technological aspects of introducing digital innovations in agriculture, and identified effective strategies to improve productivity, efficiency, and competitiveness. This method identified how digital technologies affect domestic and foreign agricultural markets and the competitiveness of agricultural businesses.

The classification method allowed for the identification of groups of innovative approaches based on their impact on aspects of production, resource management, and market interaction, providing a more structured approach to formulating strategies for improving the agricultural sector in the digital age. It helped to identify different categories of innovations, their importance, and interrelationships, which opens up opportunities for accurate prioritization and improvement of strategies for implementing digital solutions in the agricultural sector. The functional method allowed considering in detail the interaction of various practical elements of the agricultural sector with digital technologies, identifying their interaction and determining the best strategies for achieving the goals of digital transformation in the economy. This method took into account the various functional aspects of the agricultural sector, systemizing them to better understand the impact of digital transformation on production and management processes, which contributes to the development of effective strategies to increase the productivity and competitiveness of the industry.

The statistical method allowed quantifying key indicators of the agricultural sector, identifying trends and relationships between digital transformation factors and business performance, contributing to an objective study of the impact of digital innovations on agriculture. The method also made it possible to identify structural changes and resource allocation in the agricultural sector, to establish correlations between the introduction of digital technologies and changes in productivity and profitability, which contributes to informed strategic decision-making in the context of the digital economy. The synthesis method in this study was used to comprehensively combine information from various sources, analyse the interaction of various aspects of the digital transformation of the agricultural sector, in order to develop a holistic view of innovative approaches and their consequences in the digital economy.

To evaluate the effectiveness and usability of innovative approaches, surveys were conducted for target groups, including agricultural professionals, technology experts, farmers, and other industry stakeholders. The surveys were conducted at agricultural enterprises and research centres that have modern infrastructure for implementing digital innovations. The survey involved 40 representatives of the agricultural sector, including farmers, technical staff and management, aged 36 to 57 years. They were asked to answer the following questions:

1. Do you perceive digital transformation as necessary to improve agricultural efficiency?

2. Have you noticed any improvement in productivity as a result of digital innovations?

3. Do you intend to expand the use of digital technologies in your business?

4. Do you use digital technologies in your agribusiness?

The research was conducted in accordance with the rules of the Declaration of Helsinki (2013).

RESULTS

Digital innovations in agriculture have proven to be a key factor in eliminating gaps and inconsistencies in production. The introduction of modern data monitoring and analysis systems allows producers to effectively interact with business processes and identify potential problems at an early stage (Pavlishyna & Kharin, 2023). One of the key aspects of digital transformation is the use of automated monitoring systems that continuously collect data on production parameters (Verbivska *et al.*, 2022).

This data includes information on soil quality, moisture, yield, and other parameters. This allows farmers and agronomists to have regular updates on the state of their farmland. Data analytics technologies are used to identify and predict potential problems, such as plant diseases or inefficient use of resources. Analytical tools allow for an in-depth analysis of the data and the development of optimal strategies for solving problems. In addition, digital technologies help to improve the management of resources such as water, fertilizer, and energy (Wrzecińska *et al.*, 2023). Thanks to precise control and automation, farmers are able to optimize

the use of these resources, ensuring optimal conditions for plant growth and development.

The introduction of IoT devices in the agricultural sector is a promising area for effective monitoring and optimization of production processes (Umarov *et al.*, 2022). This innovative approach is important and powerful for ensuring a high level of efficiency in agriculture. The IoT system involves the interconnection and exchange of data between physical objects equipped with sensors, data collection tools, and other devices via the Internet. In the context of agriculture, this means the possibility of real-time monitoring of various parameters of production processes. One of the key aspects of implementing IoT in the agricultural sector is real-time monitoring of production processes. Sensors located on equipment, machinery, and infrastructure collect and transmit data on the operation of facilities. This data can relate to temperature, humidity, resource levels (such as water or fuel), and the condition of machinery and equipment. Thanks to the IoT system, farmers are able to monitor production processes in real time. This not only allows them to respond quickly to changes in the production environment, but also creates opportunities to optimize equipment performance and resource use.

The integration of artificial intelligence (AI) into agriculture has proven to be very effective as a tool for accurately predicting crop yields and adapting to changes in the environment (MacPherson *et al.*, 2022). The results of this innovative approach provide information on its significance and power in the context of optimal agricultural management. AI is used to process a large amount of data related to soil, weather conditions, plants, and other factors that affect crop production (Mondejar *et al.*, 2021). Analysing this data using artificial intelligence algorithms allows for accurate and reliable forecasts of expected yields. One of the key elements is the interaction with data from sensors located in different parts of the agricultural area. These sensors collect data on humidity, temperature, soil agrochemical composition, and other indicators that affect plant growth. The collected data is used to train AI models, which allows taking into account a variety of factors and their interrelationships. The introduction of AI allows accurately predicting yields based on the real conditions prevailing in a particular agricultural area. Such an accurate forecast allows farmers not only to ensure an optimal agricultural process, but also to respond quickly to any changes in the environment.

The introduction of blockchain technology in the agricultural sector has proved to be an effective means of ensuring the reliability of data in the supply chain. The results of this innovative approach reveal in detail the advantages and opportunities of using blockchain technology to ensure the reliability and integrity of information in agricultural production. The Blockchain is a technology that uses cryptographic methods to ensure the integrity and security of data (Gunay *et al.*, 2023). Each block in this data system has its own unique identifier, which is formed using a hash function. The hash includes information from the previous block, forming an insurmountable link between them. One of the key features of the blockchain is the formation of a chain of blocks, where each block is linked to the previous one. Each block contains its own data and the hash code of the previous block, making any attempt to change the information in the blocks extremely difficult. This approach ensures that if the data in one block is changed, it will change the hash code that includes that data, and therefore break the chain. Such a system provides a reliable and insurmountable structure for storing and transmitting data in a decentralized environment. This means that data about every stage of the supply chain (from growing plants to delivering products) is recorded and stored in blocks that cannot be manipulated or removed. The advantages of using blockchain to ensure data integrity include: irresistibility, reliability, decentralization, accuracy, and unity of data.

In a blockchain, data is validated by the entire network, making it extremely accountable and reliable. Every node in the network can check the history of the data stored in the blocks. The confirmation process ensures the reliability and inevitability of the information, as any attempt to change the data in a particular block will lead to incompatibility of the hash codes and trigger a warning to the entire network. The information in it is distributed and stored on different network nodes, which makes the system less vulnerable to attacks and unforeseen situations. This structure creates a robust system that can withstand explosions or data loss due to problems in specific parts of the network. In a blockchain, all network participants have equal access to data, which eliminates the possibility of information discrepancies and makes the data more accurate and unified. The use of drones and satellite sensing in agriculture has proven to be an effective tool for high-precision field monitoring, which helps to identify problems early and use resources efficiently (Taishykov *et al.*, 2024). They allow for regular monitoring of fields, detecting signs of disease, plant stress or other problems in real time. This approach allows agricultural producers to respond quickly and take measures to preserve their crops. Data collected from drones and satellites provides detailed information on plant health, soil moisture and other parameters. This helps to optimize the use of resources such as water, fertilizers and pesticides, reducing costs and minimizing environmental impact. Drones and satellites provide high accuracy and granularity of data, enabling differential application of inputs and accurate field mapping for production planning. Receiving regular and accurate data enables agricultural producers to make informed management decisions, leading to increased production efficiency and sustainable development.

Automation and robotisation of processes in the agricultural sector have brought about significant positive changes aimed at optimizing and improving production efficiency (Baierle *et al.*, 2022). The introduction of robots and automated systems has been a key factor in simplifying and accelerating various aspects of the agricultural process, leading to increased productivity (Abbasi *et al.*, 2022). One of the main benefits of automation is the increased efficiency of production processes. Robots and automated systems allow tasks to be performed faster and more accurately, which in turn reduces the time required for production cycles and contributes to an increase in overall farm productivity. In addition, automation ensures the stability and reliability of processes. Robots can work continuously and without losing productivity, which is especially important in the agricultural sector where time is a critical factor, especially during crop rotation and processing. An additional advantage is the reduced dependence on manual labour and the human factor. Robots can perform routine and time-consuming tasks, eliminating the possibility of human error. This increases the accuracy and consistency of tasks, reducing the likelihood of losses and improving product quality.

The use of 5G technologies in the agricultural sector opens up new perspectives and significant opportunities, especially in remote areas, where a stable Internet connection is identified as a key factor for the implementation of precision technologies (Tomble & Smuts, 2023). One of the key benefits of 5G is the provision of a stable and fast Internet connection anywhere, including remote agricultural areas, opening up access to a large amount of data and resources critical to the implementation of a number of precision technologies in agricultural production. The use of 5G technologies facilitates the implementation of precision agriculture. Fast and stable Internet connections enable the use of drones and sensors to collect data from fields in real time. These capabilities make it possible to analyse the condition of crops, identify problems and make prompt decisions to optimize production processes.

The introduction of 5G also helps to develop automation and IoT systems in the agricultural sector. A stable and high-speed connection allows for the connection of numerous devices and sensors, which enables monitoring and control of various aspects of agricultural activities. For example, automated irrigation systems or monitoring the condition of machinery. Additionally, 5G expands the possibilities for implementing artificial intelligence technologies in the agricultural sector. By providing high data transfer speeds, 5G creates the conditions for the implementation of advanced analytical systems, predictive models and other AI solutions that contribute to more accurate and efficient management of agricultural production. The use of precision farming systems, in particular the Global Positioning System (GPS) and related technologies, opens up great opportunities for optimizing the allocation and use of resources in the agricultural sector (Sridhar *et al.*, 2023). Technology has become a key tool for improving the efficiency and sustainability of agriculture.

The use of GPS allows accurately determining the geographical coordinates of each point on the field, which allows creating detailed mapping materials, including maps of soil and planted crops. This approach provides farmers with important information for making field management decisions. Precision farming systems allow adjusting the supply of resources, such as water, fertilizers and pesticides, depending on the actual needs of the plants. Optimizing the use of resources, reducing costs and increasing production efficiency. Using GPS, farmers can precisely control irrigation and spraying systems, directing them to where they are needed. This approach allows for efficient use of water and chemicals, providing an optimal environment for plant growth. GPS and precision farming systems allow for the creation of automated navigation systems for agricultural machinery. Tractors, combines and other machines can automatically control their movement on the field, ensuring precision and uniformity of work. Precision farming systems provide the ability to collect a large amount of field data in real time. This includes data on soil moisture, plant health, uniformity of resource distribution, and much more. This data is important for analysing and making detailed management decisions.

A survey was conducted among target groups to assess the usability of innovative approaches. Based on the results, a histogram was drawn up and the results of the survey are shown in Figure 1.
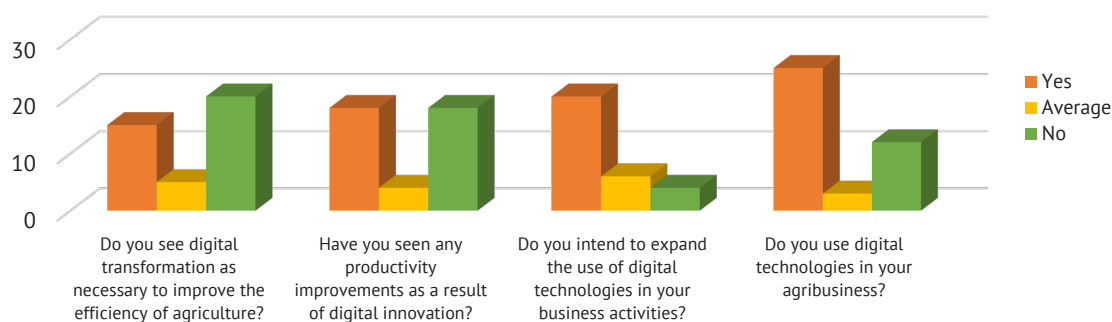

Figure 1. *The results of the survey on target groups*

Source: *compiled by the authors*

The results confirm that there is a diversity of views on digital transformation in the agricultural sector. While a large proportion of participants recognize the importance of digital innovations for improving farm efficiency, there are also those who are cautious or reticent to use digital technologies. In particular, almost half of the respondents confirmed that productivity improvements have been achieved through digital innovation. It is worth noting that most of them express their intention to expand the use of digital technologies in the future. However, there are also those who remain cautious and even reject digital solutions. These findings point to the need to develop flexible strategies for the introduction of digital technologies that take into account the diversity of approaches and readiness of different groups of rural entrepreneurs for digital transformation.

As a result, it was found that the introduction of digital innovations has significantly improved the efficiency and competitiveness of agriculture in the modern digital economy. In particular, automation, robotics, and the use of precision farming systems contribute to increased productivity and optimized resource use. This allows for efficient cultivation and processing of agricultural products, reducing costs and increasing yields.

DISCUSSION

This research work was focused on analysing and studying innovative approaches aimed at increasing the efficiency and improvement of agriculture in the digital economy. The study highlighted the importance of using digital tools to optimize business processes and its positive impact on the productivity and sustainability of agricultural enterprises. The analysis of the results showed that the introduction of modern technologies has the potential to solve a number of problems and improve the overall state of agricultural production in the digital economy.

One of the key advantages of this study is the in-depth consideration of innovative approaches to improving the agricultural sector. The study analyses in detail the impact of digital technologies such as artificial intelligence, data analytics, the Internet of Things, and others on all aspects of agriculture. The focus is on specific tools and methods, such as the use of AI for data analysis, the use of IoT and sensors to collect information, process automation in precision farming, and others. This allowed understanding how these technologies can be used by farmers to improve farm management, increase yields and reduce costs. In addition, the study took into account important aspects such as value chain interactions and environmental sustainability, which demonstrates a comprehensive approach to the topic. The inclusion of environmental aspects and the participation of all links in the value chain underlines the importance of sustainable development and interaction in the agricultural sector. The study also identified the challenges faced by agriculture in the process

of digital transformation, which helped to identify possible limitations and ways to overcome them, making the work practically applicable to farmers whose solutions may include the integration of digital innovations to improve the efficiency and sustainability of their farms. The paper emphasizes its practical approach and relevance to the agricultural sector in the digital age.

In their study, Y.E.L. Doukas *et al.* (2022) identified the current level of digitalization in the EU agricultural sector, key trends, and identified European policy responses to these challenges. The results of this work serve as a basis for further discussions and the development of strategies to improve the digital transformation of agriculture in the European Union. They are also useful for decision-making at the European and national level. The study by these authors analysed specific technological and policy initiatives in the context of the EU and its members. The work on innovation approaches focused on the overall picture of innovation and technology in agriculture. Both studies are important for understanding and supporting digital transformation in the agricultural sector.

The study by A. Devaux *et al.* (2018) was aimed at examining the role of agricultural innovation in creating an inclusive value chain that takes into account the needs of all actors and promotes sustainable development. As a result, recommendations were formulated for governmental and non-profit organizations, agricultural enterprises and other stakeholders on further actions for inclusive agricultural value chain development. This paper aims to explore the relationship between agricultural innovation and inclusive value chain development, with a focus on the inclusion of all actors. This study focuses on a general approach to improving the agricultural sector in the digital economy, incorporating a wide range of digital technologies. Both studies reflect different aspects and approaches to the problem, but together they aim to contribute to the sustainable and inclusive development of the agricultural sector.

In their study, M.H. Ehlers *et al.* (2022) identified and analysed possible scenarios for the development of agricultural policy in Europe in the context of active digitalization, taking into account current trends, technological innovations and challenges facing agriculture. The study provides sound recommendations for shaping European agricultural policy in the digital economy, contributing to the sustainable development and competitiveness of the agricultural sector. As a result, the findings of the study identified optimal scenarios for the introduction of digital technologies in the European agricultural sector, which contributed to the further development and modernization of this industry in the digital age. This work was aimed at developing recommendations for the formation of agricultural policy in the context of digital transformation. The study focused on innovative approaches, with a focus on specific practical recommendations and strategies

for the effective implementation of innovations in the sector. Both studies include a state-of-the-art review, technology study, identification of key challenges, scenario development, and performance evaluation. Both aim to provide evidence-based recommendations for improving the agricultural sector in the digital age.

The aim of the study by S. Abbate *et al.* (2023) was to unlock the potential of digital and sustainable transitions in the agri-food sector, as well as to identify the best strategies for their successful implementation. The study provided and identified insights on how digitalization has contributed to the achievement of sustainable development goals in the agri-food sector. The research findings are useful for developing strategies aimed at ensuring the sustainable development of the agri-food sector in the context of digital transformation and will contribute to the understanding and implementation of innovations in this area. Both studies make an important contribution to understanding the interaction between the agri-food sector and digital transformation. The Digital and Sustainable Transition additionally addresses sustainability issues, providing more comprehensive information on the transition to digital agriculture in the context of sustainable development, and additionally uses trend analysis, Strengths Weaknesses Opportunities Threats (SWOT) analysis and scenario modelling. This study focuses on general innovation approaches.

The study by V. Farace and A. Tarabella (2024) aims to study the role of digitalization as a driving force for the implementation of circular economy principles in the agri-food sector of small and medium-sized enterprises (SMEs). The study aimed to determine how these two trends can interact to promote sustainable development and optimize resources in the agricultural sector. The study found that digitalization and the circular economy can interact synergistically to provide agri-food SMEs with more efficient, resilient and sustainable production. Considering the interaction of these two approaches provides opportunities for further research and innovation in agriculture in the digital economy. This paper focuses on the interplay between digitalization and the circular economy to improve sustainability and efficiency in agri-food production. It emphasizes the opportunities and challenges of implementing digital and circular approaches at the level of agricultural SMEs. And this study presents specific tools and methods that can be used in practice by farmers. Both studies have made a valuable contribution to understanding how to improve the agricultural sector in the context of digital transformation.

An analysis of various studies on innovative approaches to improving the agricultural sector points to several key findings and trends. The use of innovative technologies, such as artificial intelligence and data analytics, is an important factor in improving the agricultural sector (Radchenko *et al.*, 2023). Intensive analysis of large amounts of data has allowed farmers to make more accurate and informed decisions to optimize production and resources. The use of precision farming technologies has made it possible to use land resources more efficiently and reduce environmental impact. Digital technologies allow for more efficient management of water, fertilizers, and other agricultural resources (Yatsiv *et al.*, 2022). Interaction in the value chain is also becoming important, where the introduction of digital technologies has facilitated cooperation between different participants. The importance of innovations in the agricultural sector is also underlined by their positive impact on the environmental sustainability of the industry. Digital innovations help reduce negative environmental impacts and promote sustainable production.

CONCLUSIONS

The study found that the introduction of digital technologies in the agricultural sector has great potential for transforming and optimizing production processes. One of the key trends was the active use of artificial intelligence and data analytics to process large amounts of information. This has enabled farmers to conduct detailed analysis, make informed decisions and optimize production. In particular, automated systems based on data analysis have enabled accurate decision-making in real time. This is important for the effective management of various aspects of agriculture, such as irrigation, fertilization, and machinery management.

The study also highlighted the importance of using IoT and sensors to collect real data from fields and livestock farms. This made it possible to monitor the condition of crops, track growing parameters and ensure optimal conditions for crop development. However, along with the benefits of digitalization, challenges have also been identified. Cybersecurity is becoming an increasingly important issue as the amount of digital data and its importance for agricultural production grows.

In summary, the study underlined that digital technologies have played a key role in increasing the efficiency, resilience, and competitiveness of the agricultural sector in the digital economy. The transition to digital production has become a strategic step for farmers and agricultural enterprises to achieve optimal results. The findings suggest that digital transformation in the agricultural sector has great potential to improve farm management, increase production efficiency, and create more resilient and sustainable agricultural production systems. Future research in the area of innovative approaches in agriculture could focus on the development of integrated digital platforms. These platforms could be designed to bring together different technologies to ensure efficient and coordinated use by farmers.

CONFLICT OF INTEREST

None.

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Інноваційні підходи до вдосконалення аграрного сектору в епоху цифровізації економіки

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Анотація. Проведення дослідження на цю тему стає актуальним через стрімке впровадження цифрових технологій в аграрний сектор, що вимагає термінового вивчення для ефективного розв'язання сучасних викликів у сфері сільського господарства. Мета даної роботи полягала в аналізі інноваційних підходів для вдосконалення ефективності господарської діяльності в агропродовольчому секторі. Серед використаних методів слід зазначити аналітичний метод, метод класифікації, функціональний метод, статистичний метод, метод синтезу та інші. У процесі дослідження виявлено, що робота із застосуванням інноваційних підходів значно покращила продуктивність та стійкість аграрного сектору. Використання блокчейн-технологій підвищило довіру в ланцюгу постачання, забезпечивши перевірену та прозору інформацію про якість продукції. Аналіз великих обсягів даних дав можливість розробити спеціалізовані рішення та стратегії, підлаштовані до конкретних умов господарювання в різних регіонах. Отримані результати свідчать про збільшення стійкості аграрного сектору до змін економічних та кліматичних умов. Висновки дослідження підкреслюють потенціал цифрової трансформації як стратегічного інструменту для інноваційного та сталого розвитку сільськогосподарського сектору. Робота визначила ключові стратегії для майбутнього впровадження цифрових технологій, враховуючи потреби аграрного сектору. Висновок акцентує на важливості впровадження цифрових технологій для підвищення ефективності, удосконалення управління та забезпечення стійкості галузі в умовах сучасної цифрової економіки. Практичне значення роботи полягає в аналізі та висвітленні факторів, що впливають на продуктивність та управління ресурсами в сільському господарстві, що служить основою для подальших досліджень та розробки конкретних стратегій та рекомендацій для підвищення ефективності галузі

Ключові слова: підвищення продуктивності; стратегії впровадження; галузь; управління ресурсами; ефективність