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Editorial Board

Editorial Board

Зміст

Contents

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Monitoring and assessment of the competitiveness of products, goods, and services in the context of innovative entrepreneurship development

Abstract. Innovative entrepreneurship is key to economic stability and competitiveness, requiring improved decision-making tools through enhanced monitoring and evaluation of product competitiveness. The purpose of this study was to theoretically and methodologically substantiate and characterise institutional capabilities for monitoring the competitiveness of products, goods, and services in the development of innovative entrepreneurship structures. The research proposed

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conceptual foundations for a system of competitiveness monitoring, analytical tools for evaluating and forecasting enterprise positions, and an assessment framework that considered both internal and external influencing factors. Special emphasis was placed on understanding how these factors affected market positioning and the functional development of innovative structures. The study improved methodological foundations for competitiveness monitoring, particularly in light of institutional transformations in the market exchange environment. A key contribution was the introduction of a comprehensive approach that incorporated production costs, human resources, innovation potential, financial stability, market supply, and managerial efficiency. This approach went beyond static measurements to capture structural dynamics over time, revealing interrelations between various competitiveness factors across different periods and contexts. Combining quantitative and qualitative assessment tools enabled a more holistic analysis of how internal and external influences impacted the performance of innovation-oriented enterprises and overall entrepreneurial effectiveness. Key assessment dimensions included production efficiency, human capital, innovation input, financial soundness, product and service quality, and their synergetic effects. These insights were essential for enhancing strategic and managerial decision-making in a rapidly evolving market environment. The practical significance of the study was positioned in proposing an improved mechanism for monitoring and evaluating the competitiveness of products, goods, and services in the context of the development of innovative entrepreneurship

Keywords: economic growth; evaluation of goods and services; sustainable development; entrepreneur

INTRODUCTION

In the context of the entrepreneurship development, the competitiveness of products, goods and services in enterprises has a causal relationship and is subject to the diverse risks of the destructive impact of the military factor. In addition to the classical institutionalisation to market conditions, the development of competitiveness in wartime is subject to atypical, unpredictable risks that determine the decline in economic capacity, innovation, and vice versa – de-innovation and possible physical loss of business. In practice, in particular, the structure of innovative entrepreneurship, and a priori, all other entrepreneurial formations, institutionally and economically face numerous challenges of a high-risk market environment. A managerial response to such multiple challenges is possible as a result of the use of effective methods of monitoring the evaluation of goods and services and their positioning in the market for the implementation of decisions in the business practice of transactions.

L. Sas *et al.* (2022) asserted that the creation of a competitive business was impossible without the systematic implementation of technological innovations, as they served as a catalyst for increasing the efficiency of production processes and contributed to the long-term sustainability of the enterprise. H.A. Al-Ababneh *et al.* (2021) emphasised that organisational and managerial changes should encompass not only individual business processes but also be integrated into the overall management system. Under a holistic approach to managerial innovations, it was possible to ensure the growth of enterprise competitiveness. N. Pylypiv & S. Sologub (2024) highlighted the importance of developing a comprehensive and adaptive enterprise development strategy that integrated all components of innovative activity. The strategy they proposed was intended to cover the entire life cycle of innovations, ensuring their systematic implementation and orientation toward long-term sustainable growth.

The development of a systematic approach to the evaluation of goods and services was expected to consider several key aspects identified by D. Shelenko *et al.* (2024), including the methodology of integrated assessment, optimisation of logistics processes, adaptability of logistics structures, advancement of local logistics hubs, and enhancement of risk resilience. According to the researchers, selecting an optimal logistics route enabled the most effective delivery of raw

materials, goods, packaging, transportation, and storage. Logistic solutions not only determined the transactional dynamics of goods and services movement but also significantly affected the spatial organisation of economic activity of enterprises and the quality of life of the population. O. Priss *et al.* (2023) emphasised that the development of a comfortable urban environment directly depended on the level of accessibility of basic goods, in particular food products. Restricted access to environmentally safe goods in cities can lead to socio-economic imbalance and a decline in quality of life. Ensuring broad access to environmentally friendly products is a key factor for the sustainable development of urban areas, where cultural ecosystem services (CES) play a motivational role in harmoniously combining economic and social aspects through thoughtful planning of commercial communities and ecological infrastructure (Kozak *et al.*, 2024).

The problem on the way to a correct assessment of the competitiveness of products, goods and services was financial support, and the main factors in the development of competition policy as proven by I.V. Babii *et al.* (2022), were intellectual resources, a flexible management system, motivation, and a key sustainable element that, despite uncertainty, maintained stability and served as the basis for development. The researchers emphasised the following key aspects of the success of entrepreneurial structures: provision of finance and building an effective competition policy. Monitoring and evaluation of product competitiveness are key tools for adapting the agricultural sector to challenges in wartime conditions. The development trends of agricultural enterprises projected T. Kuzmin *et al.* (2024) by 2030 indicated the necessity of implementing a systematic approach to resource utilisation, labour productivity development, and the implementation of enterprises' innovation potential. I.F. Balaniuk & T.L. Ivaniuk (2020) emphasised that improving soil fertility and optimising land use required advanced monitoring methods to assess both production and resource management outcomes.

In the context of ensuring the competitiveness of products, goods, and services of innovative entrepreneurship, attention is focused on state price regulation as a factor that, on the one hand, restrains the development of business entities, and on the other, ensures market stability. Competitiveness is formed based on a complex interconnection between the qualitative characteristics of products, their compliance with international standards, innovativeness, pricing, logistical and marketing decisions, and adherence to regulatory requirements. The research problem considered a set of economic factors: production costs, human and innovation potential, financial stability, management efficiency, and adaptability to market changes. In this context, the purpose of the study was realised through the theoretical and methodological definition of how institutional capabilities were used to monitor the competitiveness of products, goods, and services during the development of innovative entrepreneurship structures.

MATERIALS AND METHODS

The study of the system for monitoring the development and economic assessment of the competitiveness of products, goods, and services in the development of business structures in 2018-2022 was based on an integrated approach that combined conceptual, methodological, and analytical approaches to assessing the competitive position of enterprises in a dynamic market environment. The period of 2018-2022 was chosen by the authors due to the availability and completeness of statistical data that had undergone official verification, whereas the data for 2023-2024 have not yet been published, which limited the possibility of using them in the study. The limitation of the research period ensured the reliability and representativeness of the analytical conclusions. The informational basis of the study was formed based on statistical data (State Statistics Service of Ukraine, n.d.), official strategic planning documents (Development Strategy..., 2020), analytical reports of the Organisation for Economic Co-operation and Development (OECD) (used for the analysis of enterprises' innovation activity (OECD & Eurostat, 2018)), informational resources (the PDCA cycle approach was applied as a tool of managerial control and continuous improvement (PDCA cycle explained, 2025)), publications of international organisations, and the results of the analysis of

studies in the field of monitoring and evaluation of the competitiveness of products, goods, and services in the context of the development of innovative entrepreneurship. The combination of quantitative and qualitative analysis methods provided a comprehensive vision of the dynamics of competitiveness of products, goods, and services under the conditions of institutional changes in the market environment.

The study used theoretical substantiation (a study of the main scientific approaches to assessing the competitiveness of products, goods and services); identification of the main factors and influencing factors (a scheme of influence of factors and factors of competitiveness of products, goods and services). System analysis was applied by the researchers to understand the relationships between competitiveness factors and to assess their impact on business entities. The structural and functional approach was used to identify the key components of the monitoring system for assessing each of the factors of enterprise competitiveness. The choice of these methods was driven by the need to combine quantitative and qualitative analysis, which allowed for a deeper understanding of the priority criteria for assessing goods and services and the areas of development of business structures, their adaptation to crisis conditions, and the introduction of innovative management approaches. Economic and statistical analysis helped to identify key trends in the structure of small businesses, while a systematic approach allowed for the integration of this data into the broader context of sustainable development. The use of integrated methods of analysis and evaluation was aimed at increasing the competitive position of entrepreneurship through the optimal combination of internal resources and external market factors.

The study of the subject matter was focused on the general economic assessment of the trends in the development of product competitiveness with a projection onto the roles of the innovatisation of entrepreneurship, and on outlining the capacity of institutional innovations to ensure effectiveness. The applied methodology of institutional analysis was developed within the framework of consolidating the identification of the results of interaction between economic, social, political, and regulatory factors that influenced the competitiveness of goods on the market in alignment with the statuses of innovative entrepreneurship.

RESULTS AND DISCUSSION

Assessment of the competitiveness of products, goods, and services is a key condition for achieving success in the market. This state of affairs in industry can be achieved only through the active implementation of innovative technologies and by entering the market with products that meet the requirements of knowledge intensity and competitiveness. These characteristics should be integrated into all industries, especially those that determine technological progress (production of technological equipment, computer equipment, communications equipment, and other products that form the basis for innovative economic development) (Development Strategy..., 2020). O. Stakhiv & T. Adamchuk (2017) suggest that product competitiveness determines the competitiveness of an organisation in any short period of time – it is a necessary but not sufficient condition for its achievement. V. Nechyporenko (2018) proved that the ability of commodity producers to produce certain advantages for themselves in a competitive market environment to achieve competitiveness is formed by the use of scientific and technological progress in the system of labour organisation, production, and management. That is, competition is a powerful incentive, and the means of forming business competitiveness is the introduction of innovative solutions to improve labour organisation and management, which contributes to improving product quality, reducing costs and ensuring their competitiveness in the market.

The modernisation of enterprises covers several levels of management (institutional: the enterprise, a specific type of product/service; functional: by areas of modernisation of individual economic sectors and the organisation of market transactions, at the level of the structural units of the enterprise), ensuring the effective use of resources and the transformation of innovations into concrete competitive advantages (Tulchynska *et al*., 2021). The outlined vision helped to define areas for ensuring the effective use of resources and the

transformation of innovations into specific competitive advantages. The strategy for the development of agriculture and rural areas in Ukraine identified areas for assessing the competitiveness of goods, considering several key aspects: restoration and improvement of agriculture focused on the production of high value-added goods; increasing the competitiveness of Ukrainian agricultural products; increasing the role of food systems; fair distribution of income for all producers, regardless of their scale; inclusive access to finance (Order of the Cabinet of Ministers of Ukraine No. 1163-p, 2024). The selected steps are necessary for the development of sustainable competitive advantages in the agricultural sector. The key areas for analysing the competitiveness of products and goods can be: product quality, pricing, cost, innovation potential, marketing and branding; logistics and accessibility, market share, social and environmental responsibility, competitors, demand and consumers. That is, competitiveness can be assessed by comparing competitors' products with each other (Slyvinska & Bodnar, 2019).

Assessment of product quality means compliance with standards, consumer characteristics, and innovation. Methods of quality control of goods and services should outline spot checks that will be carried out in the absence of economic or technical grounds for the main inspection. The European HACCP system has been implemented at 49 food and processing companies in the Ivano-Frankivsk Oblast, including 6 companies that are authorised to export products to the EU and the Customs Union. Due to investment attraction, the region has implemented projects to create new and reconstruct existing production facilities of agro-industrial enterprises (Development Strategy..., 2020).

The SWOT analysis of the Ivano-Frankivsk Oblast Development Strategy for 2021-2027 (Development Strategy..., 2020) and the scenario-based approaches to spatial planning through 2027 indicate an aspiration for the balanced use of the region's natural resource potential, the strengthening of infrastructure development, and the reduction of intra-regional disparities. The results of the SWOT analysis, developed by the regional working group and the coordination council of Ivano-Frankivsk Oblast, allowed the authors to reconsider and generalise the conclusions of the official strategic document that influenced the potential of the region. In the context of Ivano-Frankivsk Oblast, the SWOT analysis considered the dynamics of socio-economic development, the state of infrastructure, human resources potential, available natural resources, and investment attractiveness. The identified threats, in particular trade restrictions imposed by key international partners, were assessed as one of the potentially restraining external factors that may affect the effectiveness and innovativeness of the implementation of regional economic policy in the context of European integration. The main areas of development of Ivano-Frankivsk Oblast include the modernisation of traditional industries (mining and chemical, oil and gas, wood processing), ecological rehabilitation of industry, development of interregional cooperation due to the cross-border location, and social integration of rural and mountain areas. The comprehensive analysis of existing economic and social preconditions, carried out based on the study (Development Strategy..., 2020), did not allow the authors to define a single strategic development path. This caused the need for multi-directional planning, considering three possible scenarios – inertial, innovative, and intermediate. These scenarios reflect the need for flexible institutional responses to internal challenges and external changes to ensure the stability of regional innovative entrepreneurship.

In 2021, according to the Order of the Cabinet of Ministers of Ukraine No. 1163-p (2024), the majority of food products sold by retailers were produced in Ukraine, including more than 92% of meat and meat products, bakery and flour confectionery, more than 85% of edible oils and fats, soft drinks, more than 73% of sugar confectionery, tobacco products, more than 67% of processed fruits and vegetables, and alcoholic beverages. Exploring the areas of quality assessment of goods and services based on the example of the PDCA cycle (plan-do-check-act) in the food industry (PDCA cycle explained, 2025): set product safety goals (reduce the risk of infection); implement changes (modify sanitary procedures); monitor product safety indicators and verify their compliance; standardise effective sanitary

practices and include them in product safety protocols. This approach ensures continuous improvement of processes and vouches for the compliance of products with established quality and safety standards. However, the competitiveness of products, goods, and services is formed under the influence of various factors and factors, the interaction of which is shown in Figure 1.

The scheme described in Figure 1 will provide a basis for analysing the factors that influence competitiveness and those that contribute to the development of effective strategies for improving the competitive position of enterprises. To create and coordinate effective strategies for increasing the competitive position of enterprises, innovation and technological level will play a decisive role, due to the introduction of advanced technologies, automation and diversification in production processes, digitalisation of business processes, Blockchain, the use of online marketing, e-commerce platforms, feedback systems for forming a strong connection with end users and active use of scientific research, innovative entrepreneurship entities.

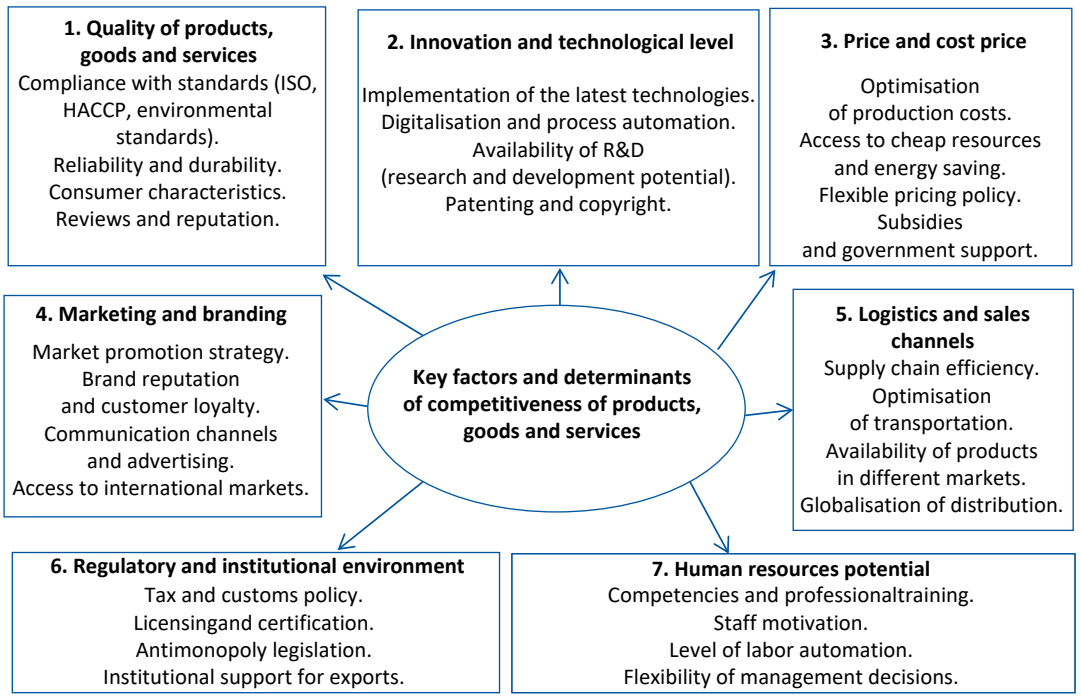

Figure 1. Scheme of influence of factors and factors of competitiveness of products, goods and services

Source: developed by the authors based on M. Ivanova *et al.* (2018), K. Decyk (2020), H.A. Al-Ababneh *et al.* (2021), I.V. Babii *et al.* (2022), I.O. Korchynskyi & M.I. Shchadylo (2022), V. Kovalchuk (2023)

Analysing Figure 1, a correlation is observed between product quality, compliance with international standards, innovativeness, pricing, marketing, logistics, and regulatory requirements due to their synergistic impact on enterprise competitiveness. High quality and certification according to international standards (ISO, HACCP) enhance consumer trust and facilitate entry into foreign markets, while innovativeness ensures technological advantage and production efficiency. Optimal pricing, a well-developed marketing strategy, and logistics allow for cost reduction and stable demand. The regulatory environment and wartime conditions define the general framework for enterprises' operations, particularly for innovative entrepreneurship, highlighting factors of state support and institutional conditions for market

accessibility. The overall effect of these factors determines enterprises' market position, financial stability, and ability to achieve balanced development. It follows that enterprises take a comprehensive approach to assessing and strengthening their competitiveness, gaining the ability not only to maintain their market positions but also to expand their presence, thereby increasing their resilience in conditions of economic uncertainty and turbulence.

Innovative activity contributes to the creation of competitive advantages, ensuring that business structures are sustainable in the face of market changes and resume their activities after the end of the war. With this in mind, the paper identifies opportunities for assessing goods and services in terms of their compliance with market conditions and adaptation to crisis situations. Innovations play a key role in improving living standards, affecting different economic levels – from individuals to entire sectors and countries, which allows the contribution to socio-economic development to be assessed and increases the effectiveness of public policy by adapting to dynamic changes (OECD & Eurostat, 2018). An innovation, as defined in the "Oslo Manual" methodological document, is a new or improved product or process that differs significantly from previous products or processes of the unit and that has been made available to potential users (product) or put into use by the unit (process), product innovation is a new or improved product or service that differs significantly from the enterprise's previous products or services and has been introduced to the market (OECD & Eurostat, 2018).

Innovations allow creating unique products, goods, and services with high added value, which, in turn, ensures competitive advantages in the EU market. The experience of leading companies such as Apple, Google (Alphabet), and Pfizer has demonstrated that enterprises that systematically invest significant funds in research and development (R&D) exhibit greater adaptability to changes in the market environment. For example, in 2023, Apple allocated approximately 29.9 billion USD to R&D (YB Case, 2024). Alphabet invested 45.4 billion USD in this area in 2023. The experience of Alphabet (the parent company of Google) in 2023 demonstrated a strategic focus on the development of artificial intelligence as a key factor of competitiveness. In the fourth quarter of 2023, total advertising revenue increased by 11% year-over-year, although it did not meet analysts' expectations. The company introduced a new generative AI model – Gemini, which is integrated into all Google products, including the Bard search system and advertising tools. Gemini reduced search latency by 40% and improved the quality of the customer experience. Artificial intelligence plays a key role in marketing campaigns, potentially reaching more than 3 billion users with an increase in conversion rates for retailers. In the context of monitoring and evaluating the competitiveness of products in the digital services market, the example of Google Corporation (Alphabet Inc.) is illustrative of the effective implementation of innovations in strategic business models. In the fourth quarter of 2023, profit from the Google Cloud segment reached 9.1 billion USD, which exceeded the figure of the corresponding period of the previous year by 26% (George, 2024). The synergistic interaction between information technologies, creative content, and innovative infrastructure contributed to the creation of high value-added products, which had a positive impact on their competitiveness assessment.

Awareness of these processes is important for assessing the factors of enterprise competitiveness. To evaluate each of the factors of competitiveness of business structures, Figure 2 was constructed by the authors. Monitoring of the assessment of each of the factors of enterprise competitiveness allows adapting the assessment to the specifics of particular sectors of the economy, which enhances the possibilities of practical application of this methodology. The innovativeness of this approach can be seen in the combination of conventional assessment methods with advanced analytical tools, including econometric modelling and the Stella computer programme, which will allow innovative businesses not only to identify their weaknesses but also to develop a forecast, work out possible scenarios for the development of the competitive environment and ways to adapt the developed strategy to strengthen their market positions.

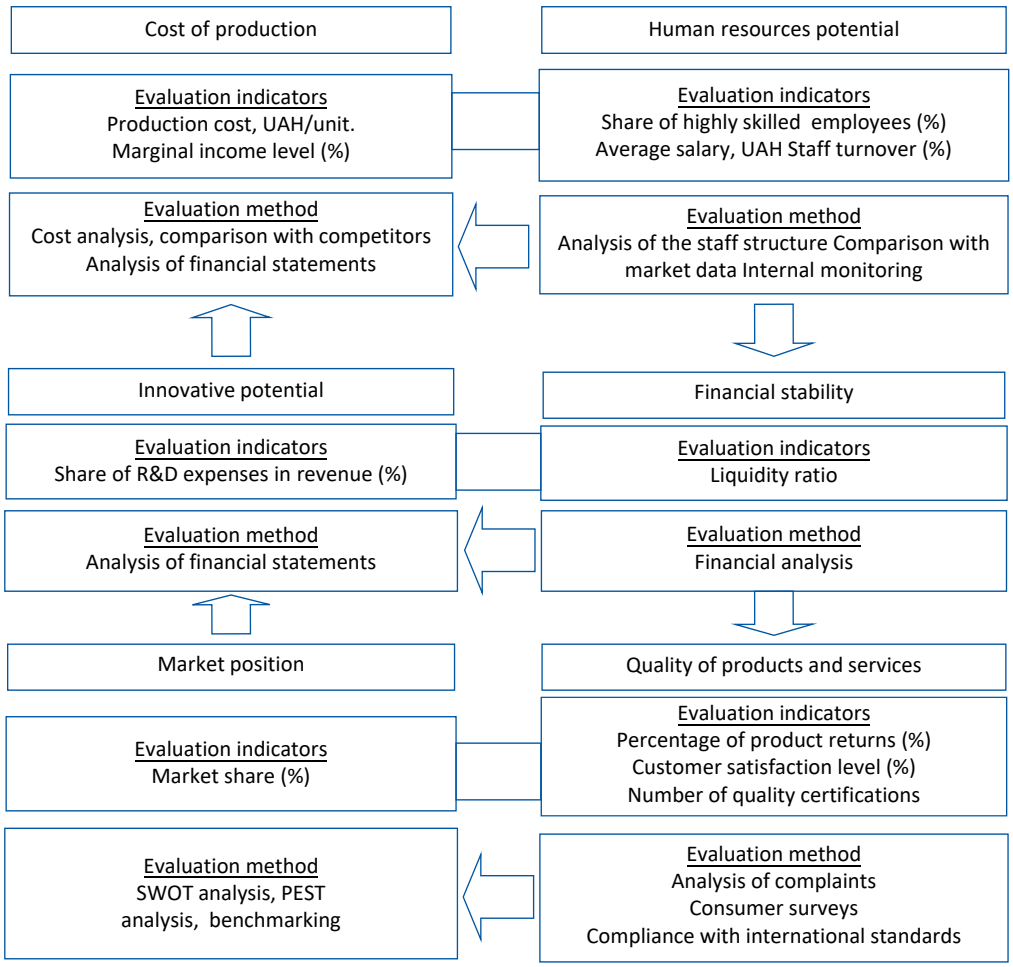

Figure 2. Monitoring of the evaluation of competitiveness factors of business structures
Source: authors' research

Marketing and branding are important factors in the competitiveness of products, goods and services, and even high-quality products require proper promotion. Marketing with a projection to the future will involve the development of strong market positions, the acquisition of new skills, and combining them with previously acquired ones, acclimatisation to changes in demand and the creation of unique value propositions for consumers by innovative enterprises. The introduction of branding of innovative enterprises increases customer loyalty and reduces sensitivity to price competition, and the use of digital marketing elements, social networks and personalised offers increases the reach of a new target audience, thereby expanding markets. Focusing on the evaluation of marketing tools will not only assess the competitiveness of goods and services, but also promote the development of entrepreneurial activity through the development of long-term relationships with the market, emphasising the importance of human resources.

The implementation of branding is an innovative practice for enhancing the competitiveness of products and business entities. This practice is implemented through measures aimed at ensuring the uniqueness of product design, forming an emotional connection between the product and the consumer, and creating a

stable motivation for purchase through a high level of trust in the product. The functionality of branding, being a priority in ensuring enterprise competitiveness, is implemented through achieving increased sales, customer loyalty, brand recognition, and adaptive pricing policy. A practical example was the introduction of the national brand Ukraine NOW, which influenced Ukraine's competitiveness by contributing to its positive perception on the international stage, attracting investment, and developing tourism potential, in particular: improving its international image (Ukraine ranked 44th, indicating the growth of its soft power and recognition on the global stage according to the Global Soft Power Index 2024 by Brand Finance) (Ukraine – country..., 2024); the official Ukraine.ua page on Instagram reached 1 million followers, entering the TOP-5 national profiles in the world (Brand Ukraine, 2022). These practices influence competitiveness by creating the potential for Ukrainian-produced goods and services to enter and establish themselves in international markets.

In the Ukrainian market, the platforms Rozetka and Monobank actively use behavioural analytics and dynamic offers, which allow them to remain among the TOP-5 most well-known brands in Ukraine according to MMR (2023). Rozetka actively uses behavioural analytics and dynamic offers to personalise the user experience, which enabled it to become the leader in online commerce in Ukraine with revenue of 45 billion UAH in 2023, exceeding pre-war figures (The Ukrainian retail..., 2024). Monobank implements personalised financial products and communications, which contributed to the growth of its client base to 10 million users as of 2025. The bank received numerous awards for innovation and customer orientation (Monobank – chronicles..., 2023).

In the global market, branding is implemented by Netflix, Amazon, and YouTube, which use algorithmic models to generate personalixed recommendations that contribute to increasing viewing time and enhancing user satisfaction, and are based on users' behavioural patterns. According to statistics, 75% of the content viewed on Netflix comes through personalised recommendations (Personalized recommendations..., 2023). The company Chewy, which supplies pet products, has implemented deep customer orientation: if a customer stops making purchases due to the loss of a pet, the brand sends personalised letters with words of sympathy, which increases emotional engagement, long-term customer loyalty, and strengthens the emotional connection with the brand (What does..., 2023).

The effectiveness of any strategy depends on the professionalism and motivation of the staff, including young people. Young and creative professionals can generate new ideas, implement innovations and dynamically adapt to changes in the business environment. Investing in employee training, participation of employees in international congresses and industry forums, and organising a corporate culture that supports initiative are positive factors that contribute to increased productivity and reduced staff turnover. In view of this, human capital development is a long-term strategy that ensures a steady increase in the competitiveness of innovative enterprises. Thus, investments in the development of labour potential contribute not only to increasing labour productivity but also to optimising business processes. In turn, the ability to control and manage costs is of key importance and opens up opportunities for effective influence on the level of competitiveness of enterprises. Considering the mentioned trends, it is advisable to conduct a comprehensive assessment of the impact of monitoring mechanisms and economic evaluation of competitiveness on the resilience and adaptability of entrepreneurial structures. The generalised organisational and economic aspects of this process are presented in Table 1.

The analysis of organisational and economic trends in innovation activity in Ukraine indicates certain structural changes in entrepreneurial dynamics in 2020-2022 compared to 2018-2020. The total number of enterprises across all economic sectors decreased by 2,216 units due to factors such as the COVID-19 pandemic, changes in the business environment, and increasing entrepreneurial risks. Simultaneously, the number of innovative enterprises increased by 306 units, indicating the growing role of innovation strategies in ensuring business competitiveness.

Table 1. Organisational and economic trends of innovation activity in the development of entrepreneurship in Ukraine, 2018-2022

Indicators	Total economy		Including:			
			Industry		Manufacture of food products, beverages, and tobacco products	
	Period – Years					
	2018-2020	2020-2022	2018-2020	2020-2022	2018-2020	2020-2022
Number of enterprises (innovative and non-innovative), units	26,904	24,688	12,072	11,459	2,096	1,876
Number of innovative enterprises, units	2,283	2,589	1,552	1,611	317	305
Structural changes by indicators:						
	Number of enterprises (innovative and non-innovative)				Number of innovative enterprises	
2020-2022 vs. 2018-2020 – *total economy*	-2,216 – (*decrease*)				+306 – (*increase*)	
2020-2022 vs. 2018-2020 – *industry*	- 613 – (*decrease*)				+52 – (*increase*)	
2020-2022 vs. 2018-2020 – *manufacture of food products, beverages, and tobacco products*	-220 – (*decrease*)				- 12 – (*decrease*)	

Source: State Statistics Service of Ukraine (n.d.) and authors' calculations

A similar trend is observed in the industrial sector, reflecting the transformation of the manufacturing sector towards technological modernisation and the implementation of innovative approaches to improve efficiency. The most negative dynamics were recorded in the manufacture of food products, beverages, and tobacco products. The total number of enterprises decreased by 220 units, while the number of innovative enterprises declined by 12 units, suggesting a decrease in innovation activity in this segment. Changes in the enterprise structure highlight the need to improve the monitoring system for product, goods, and service competitiveness. Thus, monitoring mechanisms and economic evaluation of competitiveness directly influence the adaptability and resilience of entrepreneurial structures.

Conceptual assessments of the implementation of capabilities and the achievement of competitiveness effects of products by business entities based on innovativeness have shown the following. Firstly, enterprises that are actively involved in the innovation diffusion ecosystem generally demonstrate stronger competitive advantages in their manufactured products. Secondly, effective competitive strategies for enhancing the competitiveness of products of innovative enterprises are based on the application of a wide range of innovative practices (organisational and economic integration into new markets, diversification of production and distribution channels). Thirdly, examples of innovativeness can be observed in various business models and sectors (for example, the development of enterprises through integration and promotion of products to European markets, and the innovative transformation of food production along the "from farm to fork" chain), with a focus on optimising value creation, improving value redistribution, and reducing transaction costs. Fourthly, there are clear practical results of the institutional diffusion of innovations.

This is especially evident in areas where institutional consolidation of innovations takes place and interaction between participants of the innovation ecosystem is supported. Among the manifestations of innovation activity and the results of institutionalisation of innovative development, the following can be noted:

- construction of high-tech livestock farms;
- creation of grain storage and transportation systems, especially under conditions of radical transformation of product distribution channels due to reorientation to the European market;
- development of cluster and cooperative organisations that have improved market integration of small producers, in particular the onion cluster, which represents institutional consolidation of small onion producers (Agroportal, n.d.a);
- creation of water user organisations, which contribute to increased yields of agricultural crops (Agroportal, n.d.b);
- a specialised cooperative for bean processing – the "Stryiskyi Yas" cooperative, which has entered the processing stage (Agroportal, 2025a);
- development of the organic sector and the biofuel production sector, including newly built biomethane plants (Agroportal, 2025b), and the industrial park "Bio-Lan", specialising in bioethanol and biogas processing (Ukrainian truth, 2025).

The conducted analysis allows stating that innovations in the field of entrepreneurship, particularly in the most resilient sectors of Ukraine's economy under wartime conditions, play a key role in strengthening market survival potential. Innovation strategies implemented at all levels of the value chain, and within the interaction infrastructure between business entities, have a strong impact on ensuring business success and profitability. When assessing the effectiveness of innovation activity, including the performance of innovative entrepreneurship in Ukraine, it should be noted that according to various estimates – in 2023: Ukraine ranked 55th in the Global Innovation Index (Kovalchuk, 2023); state support for innovation activity is imperfect (Yehorov *et al*., 2023); the process of transforming innovation policy, in particular its adaptation to EU requirements, is ongoing.

The most effective mechanisms for implementing innovations in entrepreneurial activity in Ukraine were identified through the application of an institutional approach, which helped to analyse the effectiveness of existing practices and to outline the potential for their evolution under the conditions of structural changes in the economy. In particular, based on the example of the agricultural sector of the economy, it was determined that the most effective were innovative practices and competitive strategies based on the principles of diversification and cooperation for the implementation of institutional innovations. The evaluation results identified the most effective approaches to strengthening enterprises' competitive advantages and ensuring their long-term market sustainability. Primarily, this concerns adaptive cost management strategies that optimise production processes and increase profitability. Investing in the development of human and innovation potential played a crucial role, as did the existing institutional capacity for implementing cutting-edge technologies. Financial stability is ensured through effective risk management and flexible pricing policies. At the same time, product and service quality, consumer-oriented approaches, and adherence to environmental standards have become key factors in maintaining competitive advantages in a dynamic market environment.

The assessment of goods and services involves analysing brand awareness, the effectiveness of advertising campaigns, the level of consumer loyalty, and the compliance of agricultural products with modern market trends, such as organic production, green business, and environmental friendliness. Particular attention should be paid to the development of unique regional brands and craftsmanship. Craft agricultural products can be represented by honey, hutsul cheese, chocolate, drinks, jams, sausages, etc. Recognition of craft products or goods will popularise Ukraine in international markets and contribute to the development of rural areas. The growing interest in unique and authentic products is also generating demand for craft products, which allows them to integrate into global retail chains. In this context, consumer loyalty is determined by the level of trust in products based on quality, environmental responsibility of producers, and social orientation of agricultural enterprises.

Market share research will help to analyse the position of a product, analyse the position of a product on the market and the dynamics of its changes. Securing a product's place in the market will allow manufacturers to maintain their position in the global market through innovation, sustainability, and uniqueness of their offer. In general, effective strategic positioning

is based on a comprehensive approach to competitive analysis, which allows for assessing current market trends and adapting business models in line with industry dynamics. Competitor assessment will include an analysis of the strengths and weaknesses of the main competitors. By working together, producers of goods and services can create a platform for creating high-quality competitive products backed by geographical indications, which will provide not only economic benefits but also cultural and social uniqueness of products.

The results are consistent with the study by M. Ivanova *et al.* (2018), which proposes an integral approach to assessing competitiveness, including the analysis of three main types of economic activity: supply, production, and sales. Evaluating each of these aspects using independent indicators allows for a comprehensive identification of a company's strengths and weaknesses. This study highlights the need to expand this approach, particularly by considering factors of innovation activity and digital transformation, which significantly impact the competitive resilience of modern enterprises. The obtained results are consistent with the findings of O.M. Mukan & A.M. Sharuk (2021), who emphasise the importance of an industry-specific approach to assessing the competitiveness of enterprises. However, the conducted study indicates the need to supplement their approach with empirical data that quantitatively determine the effectiveness of different assessment methods in specific economic sectors.

Similarly, the conclusions of I. Korchynskyi & M. Shchadylo (2022) regarding the dynamics of competition and the impact of economic changes on business structures are confirmed by the results of the present study. However, in the context of digital transformation and the growing importance of environmental sustainability, their study requires an expanded analysis that considers new challenges in enterprises' adaptation to rapid changes in the business environment. The comparison of the findings of the present study with the paper by K. Decyk (2020), which emphasises the relationship between innovation activity and enterprise competitiveness, confirms the importance of strategic innovation management. The research highlights that the impact of innovations on competitive advantages largely depends on the level of investment profitability and the ability of enterprises to effectively integrate new technologies into their business processes, which requires a deeper empirical analysis.

The results of the present study correlate with the findings of R.P. Pradhan *et al.* (2020), which demonstrate the interconnection between entrepreneurship, innovation, and economic growth. The analysis confirms that enterprises contribute to economic development through investments in technology, job creation, and the expansion of market competition. However, unlike the generalised conclusions of R.P. Pradhan *et al.*, the present study reveals that the impact of innovation activity on enterprise competitiveness varies significantly depending on industry specifics and regional conditions, requiring further refinement of innovation entrepreneurship development strategies. The results are consistent with the findings of a number of recent scientific studies on the state of innovative entrepreneurship in Ukraine. V. Kovalchuk (2023), in his paper, stated that despite the existence of certain innovation potential, the institutional environment in Ukraine remains ineffective for its full realisation. This was confirmed by Ukraine's position in the Global Innovation Index, where in 2023 it ranked 55th among 132 countries. The results obtained by the researchers partially support these conclusions, especially regarding the insufficient systemic support for innovation from institutions.

Contextually significant for the study of the competitiveness of products, goods, and services of innovative entrepreneurship was the approach of B. Milward (2025), who emphasised the importance of creativity in management, organisation, and production technologies as key factors of competitiveness. The researcher highlighted the role of asymmetric strategies and tactics at all levels of economic system positioning, which aligned with the operational practices of innovation-active enterprises. H. Kapinos & K. Larionova (2025) emphasised the importance of strategic management of the innovative development of an enterprise as a way to implement innovation policy, which agrees with the belief in the importance of the systematic

diffusion of innovations. In the development of innovative entrepreneurship, the processes of continuous implementation of innovations and their diffusion as both a product and a tool for their creation play a key role. These processes form the basis for achieving not only competitiveness but also the resilience of enterprises in a dynamic market environment.

In academic literature, special attention was paid to the adaptability of specific sectors of the national economy to both external and internal challenges. Based on the analysis proposed by A. Yakymchuk *et al*. (2021), an assessment was conducted of the methods for calculating integral indicators of Ukraine's economic security. The study revealed mostly medium and low values of the integral indicator and pointed to the need for stronger institutional support. This finding is consistent with the conclusions of the current study, particularly concerning the limited effectiveness of national policies in stimulating innovation-driven development. According to the study by V. Hotra (2024), state regulation of the limits of retail price growth and the timing of their official publication shapes institutional conditions that simultaneously influence both market stability and the adaptability of innovative enterprises.

The obtained results complement the existing research and show that the influence of state price regulation, on the one hand, ensures transparency in pricing policy, while on the other hand, it may limit the flexibility of business entities under changing market conditions. In this context, a critical discussion of existing methodologies is essential to develop a more dynamic and adaptable approach to competitiveness assessment – one that not only reflects past trends but also anticipates future shifts in the economic landscape. The proposed areas for assessing the competitiveness of products, goods and services provide a systematic approach to assessing competitiveness and forming an effective strategy for the development of economic structures.

CONCLUSIONS

In a turbulent market environment, the effectiveness of methods for assessing the competitiveness of products, goods and services in the development of innovative entrepreneurship structures depends on the flexibility of their adaptation to a rapidly changing economic environment. The active combination of conventional assessment methods with advanced digital analytical tools allows innovative enterprises to obtain more accurate and reasonable results and is a key factor in making effective management decisions. The findings became the basis for identifying priority criteria for evaluating goods and services that will help to support the competitiveness of business structures in Ukraine in the face of current challenges, in particular, the study showed that digitalisation and the introduction of innovative tools are important in the evaluation of goods and services, as they help to increase their competitiveness in various ecosystems.

Assessment of the competitiveness of goods and services is based on a comprehensive analysis of both internal factors (quality, innovation, costs) and external factors (consumer demand, market dynamics, social and environmental trends). Strategic marketing allows companies to adapt their products to changing market conditions and increase their value in the eyes of consumers. Monitoring the assessment of each of the factors of competitiveness of business structures is an important strategic management tool that allows identification the strengths and weaknesses of the business model in a timely manner, adjust production processes to changes in the market, and increase efficiency in making management decisions. The analysis of the dynamics of indicators showed a general decrease in the number of enterprises in the Ukrainian economy during 2020-2022 compared to 2018-2020, particularly in the food industry, where the number of both total and innovative enterprises declined (by 220 and 12 units, respectively). A positive aspect was that, despite the overall reduction in the number of enterprises, the industrial sector as a whole recorded an increase in the number of innovation-active units (+52), indicating a concentration of innovation efforts in more resilient industries.

The obtained results have certain limitations: the analysis was conducted based on available statistical data, which does not always fully reflect the actual level of enterprises' innovation activity, especially in the context of the

shadow economy; the impact of external factors such as government policies supporting innovative entrepreneurship, the regulatory environment, and macroeconomic fluctuations requires further in-depth analysis, as they can have a decisive influence on the competitiveness of enterprises. Additionally, the role of digital transformation and business process automation should be considered, as these aspects were not sufficiently covered within this study. The prospect for further research is to investigate the impact of long-term planning of innovation activities on the level of competitiveness of business structures. Attention will be paid to assessing the effectiveness of strategic management of innovations in small and medium-sized enterprises, a study that directly affects their competitive advantages and market share growth, their ability to adapt to crisis situations and maintain a stable market position.

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CONFLICT OF INTEREST

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Моніторинг і оцінка конкурентоспроможності продукції, товарів і послуг у контексті розвитку інноваційного підприємництва

Анотація. Інноваційне підприємництво є ключовим чинником економічної стабільності та конкурентоспроможності, що потребує вдосконалення інструментів прийняття рішень шляхом покращеного моніторингу та оцінки конкурентоспроможності продукції. Метою цього дослідження було теоретично та методологічно обґрунтувати й охарактеризувати інституційні можливості моніторингу конкурентоспроможності продукції, товарів і послуг у процесі розвитку структур інноваційного підприємництва. У межах дослідження були запропоновані концептуальні засади системи моніторингу конкурентоспроможності, аналітичні інструменти для оцінювання та прогнозування позицій підприємств, а також оціночна система, що враховує як внутрішні, так і зовнішні фактори впливу. Особливу увагу було приділено аналізу впливу цих чинників на ринкове позиціонування та функціональний розвиток інноваційних структур. У дослідженні вдосконалено методологічні основи моніторингу конкурентоспроможності, особливо в умовах інституційних трансформацій у середовищі ринкового обміну. Ключовим внеском стало впровадження комплексного підходу, який охоплює виробничі витрати, людські ресурси, інноваційний потенціал, фінансову стабільність, ринкову пропозицію та ефективність управління. Цей підхід вийшов за межі статичних вимірів і дав змогу врахувати структурну динаміку в часі, розкриваючи взаємозв'язки між різними чинниками конкурентоспроможності в різні

періоди та контексти. Поєднання кількісних і якісних інструментів оцінки забезпечило більш цілісний аналіз впливу внутрішніх і зовнішніх факторів на результати діяльності інноваційно орієнтованих підприємств і загальну ефективність підприємницької діяльності. Ключові виміри оцінки включали виробничу ефективність, людський капітал, інноваційні вкладення, фінансову стійкість, якість продукції та послуг, а також їхні синергічні ефекти. Отримані висновки є важливими для підвищення ефективності стратегічного та управлінського прийняття рішень в умовах стрімко змінюваного ринкового середовища. Практична значущість дослідження полягає у запропонуванні вдосконаленого механізму моніторингу та оцінювання конкурентоспроможності продукції, товарів і послуг у контексті розвитку інноваційного підприємництва

Ключові слова: економічне зростання; оцінка товарів і послуг; сталий розвиток; підприємець

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Adaptation of business structures of wholesale and retail trade in food products to crisis phenomena using logistics mechanisms

Abstract. Logistics adaptation mechanisms in food trade provide a flexible response to market changes through supply optimisation, interaction between wholesale and retail, digitalisation, and cost reduction while maintaining quality. The paper examined the adaptation of wholesale and retail trade structures to economic and social instability caused by war, inflation, changes in

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demand and digital transformation through the use of logistics mechanisms. The purpose of the study was to improve logistics strategies, considering the specifics of the functioning of various types of commercial enterprises. The methodological basis was the structural and functional approach, comparative typological analysis, and the construction of economic and mathematical models. Analysis of the dynamics of retail enterprises in 2010-2023 revealed a significant reduction in their number in all segments, which indicates a structural transformation of retail and wholesale trade in the context of digitalisation and changes in consumer practices. The paper systematised participants in wholesale and retail trade in food products in Ukraine, considering specialisation, scale, and logistics functions. The features of the market, the level of logistics integration, and the adaptability of operators to external changes were determined. Based on statistical data for 2014-2023, an analysis of the volume of sales of food products and the dynamics of value added in the wholesale and retail trade sectors was carried out. In 2023, the volume of sales in retail trade in food products amounted to: in non-specialised stores – 594.0 billion UAH; in specialised stores – 28.0 billion UAH; from stalls and markets – 0.3 billion UAH, while in wholesale: in specialised stores – 670.0 billion UAH; in non-specialised stores – 107.7 billion UAH. The highest relative change in value added in terms of production costs from 2023 to 2014 can be traced in specialised wholesale enterprises and amounted to 747.4%. Two mathematical models were proposed: for wholesale enterprises – with the priority of supply stability, effective inventory management and minimisation of logistics costs; for retail enterprises – with a focus on rapid rotation of the range, flexible response to demand, and maximisation of profitability. A flowchart of the adaptive decision-making algorithm in logistics was constructed. The practical significance of the study was to develop tools for improving the sustainability of commercial enterprises in the face of external threats

Keywords: market turbulence; changes in the business environment; forms of trade; flexibility of commercial structures; sales models; logistics management

INTRODUCTION

In the conditions of market turbulence caused by war, economic fluctuations and rapid technological development, enterprises of wholesale and retail trade in food products face the need for prompt adaptation to changes in the business environment. Logistics plays a key role in ensuring the sustainability of such enterprises, allowing them to quickly respond to external challenges, optimise supply chains, reduce costs, and ensure continuity of trade turnover. In this context, the study of logistics mechanisms as adaptation tools that allow commercial enterprises to remain competitive and function effectively even in times of crisis is particularly relevant.

The study by N. Zhao *et al.* (2023) highlighted the different roles of three supply chain sustainability capabilities: absorption capacity (before failures), reactivity (during failures), and recovery capacity (after failures), which have different effects on supply chain efficiency. The efficiency of the supply chain is particularly important in the light of the transformations taking place in the agri-food markets of Ukraine as a result of the full-scale invasion of Russia. According to N. Kutsmus *et al.* (2024), the war caused not only direct physical losses in the agricultural sector, but also profound disruptions in the supply chains of food and processed products. In response to restrictions on sea transportation, rising logistics costs, loss of storage facilities and transport capacity, the market began to reorient to new logistics corridors (in particular, land routes to the EU and alternative routes through the Danube Region). As indicated by O. Bodnar *et al.* (2024), due to international initiatives, pressure on the domestic food market was significantly reduced, which allowed retail chains to maintain stable supplies and mitigate risks to food security. However, doubling the cost of logistics due to limited access to sea and alternative land routes has created additional barriers for small and medium-sized enterprises, forcing them to look for flexible domestic solutions. In this context, wholesale and retail food companies are not only consumers of

new logistics formats, but also active participants in the transformation of agri-food logistics. Adaptation to new conditions involves, in particular, diversification of supply sources, investment in multi-channel transport systems, development of our own logistics centres, and the use of digital technologies to optimise operations. Special attention is paid to the development of sustainable partnerships with Ukrainian agricultural producers, which allows maintaining local supply chains even in times of crisis. Thus, logistics mechanisms become not only a tool for survival, but also a lever of strategic development for enterprises that seek to maintain market positions, respond to challenges of instability and participate in the restoration of national agri-food potential.

It should be noted that problems in the activities of wholesale and retail enterprises in the food sector arose not only as a result of a full-scale invasion – they occurred earlier. In particular, based on the results of analysis, V. Lukianova & M. Kyryliuk (2024) identified the following key difficulties: lack of a clearly formulated development strategy for wholesale enterprises; insufficient development of warehouse infrastructure and existing infrastructure restrictions; excessive concentration of logistics centres; imperfect services of resellers that do not always meet the needs of certain categories of consumers; and weak information support for business processes and insufficient level of customer support.

S. Bolila (2024) agreed that the war in Ukraine created a number of challenges for retail, but simultaneously opened up a chance for those players who decide to innovate. Her review of the retail market indicates a large-scale transformation, which will only increase under the influence of digitalisation and changing consumer preferences. These processes force retailers to switch to more efficient and technologically advanced business models that meet current trends and can quickly respond to an unstable external environment.

The study by S. Tereshchenko & N. Dehtiar (2025), which focused on the functioning of wholesale food trade in a competitive environment, found that in order to effectively implement the chosen strategy, wholesale enterprises should focus on several key areas. In particular, this refers to the introduction of digital transformation tools – such as CRM, ERP, warehouse management systems, etc. – which allows automating operational processes, minimising the number of errors, and increasing overall productivity. It is also important to improve logistics processes, in particular, delivery, storage and processing systems for goods, which helps to reduce costs and shorten delivery times. In addition, the strategic task is to expand the product range and improve the quality of customer service. As noted by M.M. Mamchyn & V.V. Naida (2025), given the difficult situation facing the Ukrainian retail sector, companies must implement a comprehensive approach to adaptation and ensuring sustainable operations. Among the priority areas of development, they highlighted customer orientation through a high level of service and flexible assortment formation; intensive expansion of online sales channels and optimisation of logistics to meet the needs of the digital buyer; establishing partnerships with local manufacturers to strengthen supply chains and reduce costs; rationalisation of costs, in particular, through logistics efficiency.

The purpose of the study was to substantiate and improve the logistics mechanisms of adaptation of wholesale and retail trade enterprises with food products to crisis phenomena and transformations of the business environment by analysing their interaction, the effectiveness of sales of goods, and the development of applied adaptation models. The objectives of the study were to investigate the features of the functioning of wholesale and retail enterprises with food products in the context of crisis changes, in particular, to analyse the volume of sales of food products and created added value; to determine the logistics relationships between wholesale and retail trade, and to identify differences in the mechanisms of their adaptation to an unstable environment; to develop economic and mathematical models of logistics adaptation for wholesale and retail enterprises and to build an algorithm for making logistics decisions in accordance with the specifics of each type of trade.

MATERIALS AND METHODS

The structural and functional method was used to study the logistics interaction between

wholesale and retail trade enterprises in the field of food sales. This method allowed considering the trade logistics system as a set of interrelated links (wholesale, retail, and logistics support between them), each of which performs separate functions aimed at achieving a common goal – efficient and continuous delivery of products to the end user. Within the framework of the method, the following tasks were carried out: identification of structural components of the logistics chain (wholesale, logistics, and retail links); determination of the functional load of each link in creating added value; analysis of methods of logistics support for enterprises' activities; identification of relationships and consistency of actions between system elements. The result of applying the method was the generalisation of the functional roles of each link in the table, which allowed systematically assessing the effectiveness of logistics solutions, identifying potential optimisation points, and formulating recommendations for improving the adaptability of trade logistics in the context of business environment transformations.

The study used official statistical data of the State Statistics Service of Ukraine (n.d.) for the period 2014-2023 As of the beginning of 2025, the summary statistical indicators for 2024 were not fully published, so they were not included in the analytical array. This determined the time frame of the study and served as a methodological constraint that was taken into consideration when interpreting the results. When applying the grouping method, food wholesale enterprises were grouped into groups: non-specialised and specialised enterprises, and retail: non-specialised stores, speciality stores, and businesses that sell from stalls in markets. Methods of absolute and relative values were used to analyse the activities of wholesale and retail trade enterprises with food products. The following indicators were investigated: the number of retail and wholesale enterprises divided into groups; the volume of food products sold by wholesale and retail enterprises; value added by production costs of wholesale and retail enterprises. The analysis of time series in the study was a methodological approach that allowed investigating trends in the development of wholesale and retail food trade enterprises based on data for 2014-2023. This method included analysis of changes in the number of retail and wholesale enterprises divided into groups; in the volume of food products sold by wholesale and retail enterprises; in value added by the production costs of wholesale and retail enterprises.

In the course of the study, the method of comparative typological analysis was applied, which allowed systematically characterising the key participants in wholesale and retail trade in food products in Ukraine. The sources of information were open data on enterprises, in particular, the official websites of key participants in wholesale and retail trade in food products in Ukraine. Information posted on the web resources of the following companies was analysed: ATB-Market (n.d.), Fozzy Group (n.d.), METRO Cash & Carry (n.d.), Flagman (n.d.), Agroprodukt (n.d.), Milkiland (n.d.), MHP (n.d.), Kernel (n.d.), Nibulon (n.d.), Stolychnyi Wholesale Market (n.d.), Shuvar Wholesale Market (n.d.), and online trading platforms: Rozetka (n.d.), Zakaz.ua (n.d.), Prom.ua (n.d.), Allbiz (n.d.), Agrotorg (n.d.), Biologic.ua (n.d.), Lavka Tradiciy (n.d.). Not all companies analysed in the study have official websites with up-to-date information on logistics processes, business scales or distribution channels (TEDIS Ukraine, Fruitline, Nezhdana, Novus, Varus, ECO-Market, Tavria-V, Klass, Rukavychka, Nash Krai, LotOK, OKKO mini-market, WOG market, Good Wine, Eco-Lavka). In such cases, information from aggregated platforms (B2B catalogues, news resources, public registers) was used or a descriptive presentation was stored based on the author's expert analysis, without reference to the corporate source. These sources allowed getting up-to-date information about the specialisation of enterprises, the scale of their activities, logistics infrastructure, availability of IT solutions, and channels of interaction with B2B or B2C segments. The method included: a comparative assessment of market entities according to the criteria of specialisation, scale of activity, logistics functions and security features; typologisation of enterprises by functional roles in the logistics chain: large distributors, specialised suppliers, agro-industrial holdings, wholesale markets, electronic platforms (for the wholesale segment); national networks, regional operators, convenience stores, specialised

retail outlets, online retailers and farmers' cooperatives (for the retail segment). The application of this method allowed forming generalised tables reflecting the structural diversity and logistics specialisation of enterprises, and outlining their role in ensuring the effective functioning of the food supply chain.

To build effective models of adaptation of logistics systems to the conditions of unstable external environment, an integrated approach was applied, which provides: comparative typological analysis of the functioning of wholesale and retail food trade enterprises; economic and mathematical modelling of adaptive behaviour considering industry specifics, risks and resource constraints; formalisation of the logic of managerial decision-making in the form of a flowchart describing the sequence of adaptive actions. The highlighted differences in the adaptation mechanisms of wholesale and retail enterprises led to the need for separate modelling of logistics solutions for each type of enterprise. For wholesale enterprises, the logistics adaptation model was aimed at minimising costs, provided that a guaranteed level of supply was ensured. The following factors were considered: number of suppliers, planning periods; projected demand, inventory volumes; logistics costs and supplier reliability level; inventory balance and service level requirements. For retail enterprises, a model has been built that focused on maximising demand satisfaction with limited supplies and flexible assortment management. It considered: the dynamics of product availability; demand forecast and profitability of categories; supply restrictions, the number of items in the range, and the presence of key products. Based on the constructed models, an algorithm for adapting logistics solutions has been developed, which demonstrates the stages of assessing demand, resources, risks, and substantiating the choice of management actions for wholesale and retail trade in food products.

The bibliographic method in the study of enterprises of wholesale and retail trade in food products consisted in the systematisation and analysis of scientific sources (Kutsmus *et al.*, 2024; Kovalenko & Yashchenko, 2024; Tereshchenko & Dehtiar, 2025), and analysis of statistical data (State Statistics Service of Ukraine, n.d.). The use of logical generalisation allowed, based on empirical data and real observations, forming general theoretical and applied conclusions that can be extended to wider groups of objects or situations.

RESULTS AND DISCUSSION

Logistics adaptation mechanisms include a system of measures that allow food trading enterprises to respond effectively to changes in the business environment. These are complex processes that ensure rapid adaptation to new conditions by optimising supplies, reallocating resources, and changing logistics strategies. Logistics adaptation may include changing suppliers, delivery routes, changing the composition of products or packaging options depending on market requirements or market conditions. Logistics in crisis situations is characterised by the need to respond quickly to unpredictable changes. During periods of economic and political crises or transformations of the business environment, the requirements for flexibility and speed of change in logistics chains increase. In such conditions, it is important to ensure the stability of supply, minimise transportation and storage costs, and control the quality of goods, which is especially important in the food trade. Innovative technologies and automation are often used for adaptation, which allows enterprises to adapt to new conditions without significant financial losses. Logistics is an integral part of the strategy of adapting food trading enterprises, as it determines how the product gets from the supplier to the end user, and is crucial for maintaining competitiveness. In a changing market, the adaptation strategy requires adjusting logistics processes to the most effective management of supply, distribution of goods, and communications with suppliers and consumers. Logistics strategies should be flexible and include measures to quickly change or optimise existing supply chains, ensuring a prompt response to market changes.

The practice of Ukrainian enterprises confirms the effectiveness of applying adaptive logistics strategies. Fozzy Group (n.d.) in response to the destabilisation of supplies from certain regions, optimised delivery routes through western hubs, and increased the use of

its own warehouses and transport to ensure the sustainability of the supply chain. MHP (Nasha Ryaba) (MHP, n.d.) implemented automated demand forecasting systems considering regional changes in consumer activity, which reduced logistics costs. Online platform Zakaz.ua (n.d.) adapted logistics through dynamic routing and integration of omni-channel services, which provided flexibility of delivery even in unstable conditions. The Shuvar Wholesale Market has activated electronic orders and distribution of local products, reducing dependence on interregional supplies (Shuvar Wholesale Market, n.d.). The interaction of wholesale and retail trade in food products in the logistics aspect, as shown in Table 1, is a critical component of the effective functioning of the supply chain. Each link in the chain has its own functions, but the interaction between them ensures optimisation of the movement of goods and reduces costs.

Table 1. Logistics interaction between enterprises of wholesale and retail trade in food products

Link	Role in the trade chain	How it generates added value	Logistics support
Wholesale trade	Buys large quantities from manufacturers and resells them to retailers or sellers.	Warehousing and sorting of goods; breaking down batches; ensuring regular deliveries; accumulation of demand from different customers; risk management (prices, balances, demand); granting payment deferrals.	Distribution centres; warehouse management systems; systems for accounting for goods; own or outsourced transport; centralised supply planning.
Logistics support (between wholesale and retail)	Provides continuous, optimised movement of goods between wholesale suppliers and retail outlets.	Ensuring timely deliveries; minimising logistics costs; reduction of losses and damage; acceleration of inventory turnover; quality control at all stages; flexibility of supply according to demand.	Cold chain; cross-docking; GPS, tracking systems; electronic data exchange; IT systems; dynamic route planning; control of deadlines and refunds.
Retail trade	Sells food products to the end user in stores, online, or through other channels.	Providing services and consultations; creating a customer experience; packaging, placement, showcase; providing easy access 24/7; marketing campaigns; flexible pricing; sale in convenient packaging.	Delivery from distribution centres or local warehouses; systems with sales analytics; automatic replenishment of inventory; systems for personalisation; balance control; shelf planning; omni-channel solutions (couriers, pickup).

Source: developed on the basis of research conducted by the authors

Interaction between these links ensures continuous and optimised movement of goods, reducing costs, increasing the speed of circulation of goods and ensuring a high quality of service to end users. This is an important aspect in the successful functioning of food trade in the face of constant changes in demand and market conditions. The effectiveness of logistics cooperation is confirmed by the positive dynamics of the volume of goods sold and added value in both segments – wholesale and retail trade. According to the State Statistics Service of Ukraine (n.d.) in 2023, specialised wholesale enterprises sold products worth 670.0 billion UAH, which is 301.9% more than in 2014, and value added increased by 747.4%.

METRO Cash & Carry (n.d.) implements a B2B model with wholesale service for more

than 300 thousand enterprises, using a delivery planning system with an accuracy of up to an hour. This reduces storage costs and reduces the share of losses of perishable goods to less than 1.5% – against 3-5% in individual networks without an integrated chain (Agrotorg, n.d.). The effectiveness of logistics interaction is demonstrated by large trade groups that combine wholesale and retail functions. In particular, Fozzy Group (n.d.) provides more than 40% of its own retail turnover at the expense of centralised wholesale depots and distribution centres. ATB-Market company (n.d.) has its own logistics infrastructure of more than 10 warehouse complexes with a total area of more than 250 thousand m², which ensures daily delivery of goods to more than 1,300 stores throughout Ukraine.

In retail trade, non-specialised stores also recorded an increase in sales volumes from 170.6 billion UAH (2014) to 594.0 billion UAH (2023), and value added increased almost 5 times. This indicates an increase in logistics efficiency, scaling of operations and adaptive capabilities of trading structures. However, the volume of trade from stalls and markets declined rapidly (-92.3%), which confirms the gradual optimisation of supply chains in favour of organised forms of logistics interaction.

Logistics in the field of food trade largely depends on the effective activities of key players in both the wholesale and retail segments. The efficiency of their operations depends on the stability of supply, timely delivery, preservation of product quality, the level of logistics costs, and the speed of response to fluctuations in demand. Wholesale enterprises play a leading role in centralising purchases, consolidating commodity flows, optimising storage and managing large volumes of goods (Didukh & Artiukh, 2023; Holovchak *et al*., 2023). Their logistics solutions, such as the introduction of cross-docking, zonal distribution, or digital tracking systems, significantly affect the efficiency of subsequent delivery steps (Mamchyn & Naida, 2025). Retailers, in turn, determine the rhythm and frequency of deliveries, form stocks in accordance with changes in demand, implement omni-channel service strategies and introduce innovations in interaction with the end user (for example, automated replenishment of stocks, last-mile delivery, click&collect, etc.) (Fedorenko, 2020; Kovalenko & Yashchenko, 2024). Close interaction between these segments creates end-to-end logistics processes, where solutions at one stage significantly affect the efficiency of the entire supply chain. As a result, it is the logistical consistency between wholesale and retail enterprises that ensures the minimisation of losses, high speed of trade turnover, and stability of consumer support even in conditions of crises or market transformations (Dankeieva, 2023). The role of these enterprises is not only to move products from the manufacturer to the consumer, but also to form logistics standards, innovative solutions and adaptive models for responding to market changes, in particular, in times of crisis or digital transformation.

The wholesale market is represented by both large distributors and specialised suppliers, agro-industrial holdings, wholesale markets, and electronic platforms. In particular, the largest distributors include Fozzy Group (one of the leading trade and logistics groups with their own networks and logistics hubs), METRO Cash & Carry (wholesale trade for small businesses and HoReCa), MHP (Meat, Agro- and Export Logistics), Kernel and Nibulon (cereals, oilseeds, with integrated logistics complexes). Specialised operators include agricultural products (meat, fish, dairy products), Flagman (seafood), and Dairy Alliance (dairy products). Among the wholesale markets, the key ones are Shuvar (Lviv) and Stolychnyi (Kyiv), which provide a physical platform for wholesale trade. In the electronic space, wholesale interaction is implemented by platforms Prom.ua, Agrotorg.net, All.biz, Zakaz.ua. These entities ensure large-scale movement of goods, support regional diversification, and integrate logistics technologies (Kuzo & Kosar, 2022; Tereshchenko & Dehtiar, 2025).

The retail segment, in turn, covers a wide range of participants – from nationwide chains to regional and niche operators, online stores and cooperative initiatives. The largest national chains are ATB-Market (more than 1,000 stores in Ukraine, a discount format model), Silpo (premium segment of Fozzy Group), VARUS, ECO-Market, Novus, Fora, and Tavria V. Regional and specialised operators include

Kopiyka (south of Ukraine), Nash Krai, LotOK, Lavka Tradiciy (eco- and farm goods). Online channels are dominated by Rozetka (with a growing FMCG segment), Zakaz.ua (delivery of goods from supermarkets), and Prom.ua, which unites small commercial enterprises. Cooperative initiatives, such as online farm stores or local supply communities, are also being developed. They play a key role in ensuring consumers' access to food products through convenient trade formats, personalised service, and logistically efficient delivery channels (Shcherbak, 2022; Pepchuk & Palonna, 2023). Table 2 shows significant changes in the dynamics of the number of operating business entities engaged in wholesale and retail trade in food products during 2010-2023.

Table 2. Dynamics of the number of enterprises of wholesale and retail trade in food products in Ukraine in 2010-2023, units

Indicator	Year						Absolute change from 2023 to 2010	Relative change from 2023 to 2010, %
	2010	2015	2020	2021	2022	2023		
Wholesale trade								
Non-specialised enterprises	6,454	4,446	3,474	3,113	2,535	2,806	-3,648	-56.52
Specialised enterprises	21,832	19,707	17,285	16,177	13,659	15,676	-6,156	-28.20
Retail trade								
Non-specialised stores	173,900	130,922	112,324	107,111	86,642	92,013	-81,887	-47.09
Speciality stores	41,724	38,041	36,203	35,428	30,731	34,819	-6,905	-16.55
Businesses that trade from stalls in markets	63,319	39,228	29,953	27,163	22,847	23,296	-40,023	-63.21

Source: developed by the authors based on the number of active economic entities by types of economic activity in 2010-2023 (n.d.)

Table 2 shows indicators for 2010, 2015, 2020-2023. The choice of intervals was determined by the availability of official statistical data: 2010 was chosen as the base for displaying long-term dynamics, then the values are presented at intervals of five years (2015 and 2020), which allows tracing medium-term trends without overloading the table. The details for recent years (2021-2023) reflect current changes in the context of crisis transformations caused by the pandemic and war in Ukraine. This approach provides a balance between representativeness of data and compactness of presentation.

The analysis of the dynamics of wholesale and retail trade development for the period 2010-2023 shows a steady trend of reducing the number of enterprises in most segments, which may indicate structural transformations in the trade industry of Ukraine. In particular, among non-specialised wholesale enterprises, there is a significant decrease – from 6,454 in 2010 to 2,806 in 2023, that is, by 3,648 units or almost 57%. A similar trend is typical for specialised wholesale enterprises: a decrease from 21,832 to 15,676 units (by 6,156 or 28%). The decline in the retail segment is particularly pronounced: non-specialised stores lost 81,887 units (-47.1%), which may be due to both the digitalisation of trade and the growth of e-commerce, and a decrease in the purchasing power of the population. Speciality stores show a moderate decline of 6,905 units (-16.6%), which indicates a relatively stable niche of these entities. The largest decrease is observed among enterprises that trade from stalls and markets: from 63,319 to 23,296 units (-63.2%), which confirms the trend of replacing the informal sector with network and digital trading. In general, these tables

illustrate the process of reducing the number of traditional retail outlets, which is likely accompanied by market concentration, the development of e-commerce and changing consumer habits.

The following tables (Tables 3 and 4) summarise the main participants of wholesale and retail trade in Ukraine, with an emphasis on their specialisation, scope of activity, and logistics features. The wholesale market of food products in Ukraine is formed with the participation of a wide range of players: from large distribution companies to specialised suppliers, agro-industrial holdings, wholesale markets, and electronic platforms. These participants perform critical logistics mediation functions – purchasing from manufacturers, consolidating and distributing goods, managing inventory, transportation, and IT systems. Due to the scale, technological equipment and logistics infrastructure, it is wholesale that ensures the stability of supplies, the regional presence of products and adaptability to market fluctuations (Table 3).

Table 3. System of business structures of wholesale trade in food products in Ukraine

Company / market name	Scope of specialisation	Notes
Major distributors		
ATB-Market (wholesale division)	Wide range of food products	Own logistics, all-Ukrainian coverage
METRO Cash & Carry	HoReCa and business products	Wholesale store format
Fozzy Group (Silpo, wholesale depots)	Groceries, beverages, and food products	Own wholesale logistics
TEDIS Ukraine	Beverages, partially food	Powerful distribution network
Specialised suppliers		
Flagman	Fish products	Import, processing, wholesale
Agroproduct	Meat, sausages	Retail supply
Frutline	Vegetables, fruits	Import, wholesale distribution
Dairy Alliance	Dairy products	Own production
Agro-industrial complex – holdings with wholesale		
MHP (Nasha Ryaba)	Chicken, semi-finished products	Own wholesale network
Kernel	Vegetable oil, cereals	Domestic market and exports
Nibulon	Grain, agricultural products	Logistics, grain elevators, ports
Wholesale markets		
Stolychnyi Market (Kyiv)	All types of products	One of the largest in Ukraine
Shuvar (Lviv)	Vegetables, fruits, meat	Has an electronic procurement system
Nezhdana (Kherson Oblast)	Vegetables, melons	The largest in the south of Ukraine (now under occupation)
Electronic platforms		
Prom.ua	Food products wholesale	B2B marketplace
Zakaz.ua (business version)	Online grocery delivery service	For small and medium-sized businesses
Allbiz, Agrotorg	Food products	Electronic advertisements and transactions

Source: developed on the basis of research conducted by the authors

The retail sector is the final link in the logistics chain, directly in contact with the end user. This segment includes both nationwide supermarket chains and regional companies, convenience stores, specialised points of sale, online platforms, and farmers' cooperatives. They provide convenient shopping, a wide range of products, marketing support, and adaptive service formats. The logistics efficiency of retail trade depends on automated inventory replenishment systems, CRM solutions, an omni-channel approach to delivery, and digital technologies that allow quickly responding to changes in consumer demand (Zhao *et al.*, 2023; Bolila, 2024; Kovalenko & Yashchenko, 2024) (Table. 4).

Table 4. System of business structures of retail trade in food products in Ukraine

Company name	Trademarks / specialisation	Notes / features
Nationwide retail chains		
Fozzy Group	Silpo, Le Silpo, Fozzy Cash & Carry	Market leader, premium and mass segment
ATB-Market	ATB	The largest chain by the number of stores
Novus	Novus	Medium and premium segment
METRO Cash & Carry	METRO	Wholesale + retail format
Varus	Varus	Centre and south of Ukraine
ECO-Market	ECO	Average price segment
Regional retail chains		
Tavria-V	Tavria-V	South of Ukraine, own logistics centre
CLASS	CLASS	Kharkiv, hypermarkets + online
Rukavychka	Rukavychka	Lviv, western Ukraine
Nash Kray	Nash Kray	West and centre, "near home" formats
Furshet (before merging)	Furshet	Kyiv, partially integrated into Novus
Convenience stores / minimarkets		
Thrash!	Thrash!	Discounter format
LotOK	LotOK	Mini format from Fozzy Group
OKKO mini-market	OKKO mini	Format near gas stations
WOG market	WOG market	Format near gas stations
Speciality food stores		
Good Wine	Wine, delicacies, imports	Premium format
Eco-Lavka	Organic products	Focus on eco-products
Le Silpo (Delicatessen)	Gourmet products	Premium, Fozzy Group
Biologic.ua	Eco- and bio-products	Online and physical presence
Online food trading		
Rozetka	Food, groceries, beverages	Large online retailer
Zakaz.ua	Delivery from Metro, Auchan, Novus	Works with physical networks
Foodex24 / Foody	Online supermarkets	Without physical stores
Glovo / Bolt Food	Grocery delivery from supermarkets	Courier delivery
Cooperatives and farm shops		
Lavka Tradiciy	Products from local manufacturers	Focus on regional authenticity
Family farms	Meat, dairy, vegetables	Farmers' direct sales
Cooperative stores	Products from local manufacturers	Work with communities

Source: developed on the basis of research conducted by the authors

Retail trade in food products requires updating business processes. The use of innovations in retail can reduce business risks. The development of Ukrainian retail trade is accompanied by the following features: the process of consolidation continues: competition displaces small retailers, strengthening the positions of large network retailers; the processes of centralisation of procurement activities are being improved; the development of own brands of network retailers continues; the number of mergers and acquisitions of various brands is growing; retail networks are expanding to regions and remote localities (Fedorenko, 2020).

During 2014-2023, food wholesale and retail enterprises in Ukraine underwent significant transformations due to both internal economic crises and external shocks, in particular, the COVID-19 pandemic and a full-scale war. Under these conditions, the ability to quickly adapt and ensure the continuity of commodity supply becomes of strategic importance (Ilchuk *et al.*, 2023; Ilchuk *et al.*, 2025). It is logistics mechanisms that have become a key tool for ensuring

the sustainability of trade processes, maintaining competitiveness, and increasing added value. That is why the analysis of the dynamics of sales volumes and added value in the wholesale and retail sectors of food trade in 2014-2023 was carried out to identify effective logistics practices and directions for their further improvement in the context of crisis phenomena and structural changes in the business environment.

Analysis of the dynamics of volumes of food products sold and added value of wholesale and retail enterprises in 2014-2023 (Table 5) demonstrates significant changes in adaptive approaches to logistics support for businesses in a turbulent environment. During the study period, there is a general tendency to strengthen the positions of structured and specialised forms of trade, which confirms the effectiveness of implemented logistics mechanisms in response to crisis phenomena – in particular, political instability, the COVID-19 pandemic, military operations, and the transformation of consumer behavioural models.

Table 5. Volume of food products sold and value added by production costs of wholesale and retail enterprises in 2014-2023, billion UAH

Indicator	Year						Absolute change from 2023 to 2014	Relative change from 2023 to 2014, %
	2014	2019	2020	2021	2022	2023		
Specialised wholesale enterprises of trade in food products, beverages, and tobacco products								
Volume of goods sold	166.7	392.8	441.3	509.2	461.7	670.0	503.3	301.9
Value added by production costs	21.5	65.7	90.0	86.0	117.2	181.9	160.5	747.4
Non-specialised wholesale enterprises of trade in food products, beverages, and tobacco products								
Volume of goods sold	54.7	90.9	88.1	90.2	81.4	107.7	53.0	96.9
Value added by production costs	8.9	13.0	14.8	13.6	17.0	18.3	9.4	105.6
Retail businesses in non-specialised stores sell food, beverages, and tobacco products								
Volume of goods sold	170.6	410.8	459.8	524.6	465.6	594.0	423.5	248.3
Value added by production costs	20.8	72.2	69.0	152.0	75.5	103.7	82.9	398.5
Retail enterprises in specialised stores selling food products, beverages, and tobacco products								
Volume of goods sold	13.7	28.4	33.0	46.8	21.8	28.0	14.3	104.3
Value added by production costs	2.1	4.6	6.3	8.3	7.3	9.9	7.9	384.1
Retail businesses sell food, beverages, and tobacco products from stalls and markets								
Volume of goods sold	3.9	c/s	6.5	8.5	0.2	0.3	-3.6	-92.3
Value added by production costs	0.8	c/s	1.4	1.4	0.1	0.2	-0.6	-75.0

Note: c/s – confidential statistics. Indicates that the data is not published by the State Statistics Service of Ukraine for reasons of confidentiality or lack of reliable sampling

Source: developed by the authors based on Turnover of business entities by type of economic activity in regions in 2014-2023 (n.d.), Value added of business entities by type of economic activity in regions in 2014-2023 (n.d.)

The highest growth rates were demonstrated by specialised wholesale enterprises, where the volume of goods sold increased from 166.7 billion UAH to 670.0 billion UAH (+301.9%), and value added – from 21.5 billion UAH to 181.9 billion UAH (+747.4%). Such dynamics indicate a significant logistics restructuring, in particular, the transition to multi-channel supply systems, the introduction of analytics for forecasting demand, and the digitalisation of inventory management (Table 5). A prime example is Metro Cash & Carry (n.d.) that works in a wholesale format and actively uses digital tools to optimise supply chains, implements electronic document management, manages inventory in real time, and uses a centralised purchasing model. Another example is Fozzy Distribution, wholesale division of Fozzy Group, which provides

centralised deliveries to more than 700 retail outlets in Ukraine, including through its own distribution centres operating on the principles of cross-docking and zonal logistics (Fozzy Group, n.d.). Such enterprises have adapted their logistics systems to the conditions of high market turbulence, introducing automation, IT analytics, and flexible supply planning, which allowed them to achieve volume growth and increase efficiency in conditions of instability. This allowed such enterprises not only to maintain operational stability, but also to significantly increase the efficiency of production and sales chains. Indicators of non-specialised wholesale enterprises also show growth, although much slower (sales volume +96.9%, value added +105.6%). This may indicate a relatively lower flexibility of logistics systems in these structures, or that they have implemented innovative logistics approaches to a lesser extent. In crisis conditions, this limited their ability to quickly rebuild commodity flows and adapt to new conditions of supply and demand (Table 5). Some major players in the non-specialised wholesale segment, such as wholesale divisions of ATB-Market, METRO Cash & Carry or logistics depots of Fozzy Group, have demonstrated successful adaptation to new market conditions. In particular, they implement multi-channel supply chains, centralised inventory management, dynamic pricing, and use consumer analytics data to make logistics decisions. This allows such businesses to maintain supply efficiency even in the face of high demand turbulence and supply chain disruptions.

Despite the existing positive trends in the development of food wholesale enterprises, its organisational and functional foundations are still insufficiently coordinated with the needs of related links – production and retail trade. This is primarily due to the imperfection of the internal organisational structure, management system, and economic mechanism of functioning of wholesale enterprises. As a result, such enterprises are not always able to fully meet the needs of the retail segment regarding the range, supply volumes, and price parameters of products (Holovchak *et al*., 2023). During 2014-2023, there was an active concentration in Ukrainian retail trade, as a result of which retail chains have taken a key position. Unlike individual stores, retail chains have significant market power and use it to redistribute in their favour a portion of the added value created in the processing industry (Shcherbak, 2022).

The analysed data of Table 5 give grounds to assert that retail enterprises in non-specialised stores (supermarkets, hypermarkets) retained the leadership in sales volumes, increasing sales from 170.6 to 594.0 billion UAH (+248.3%), and added value – from 20.8 to 103.7 billion UAH (+398.5%). These structures effectively used the logistical advantages of scaling, centralising purchases, and integrating IT solutions into supply and service processes. In addition, flexibility in working with online sales channels and quick setup of product delivery from the nearest warehouse, pick-up point or hub directly to the end user have become key factors for maintaining competitiveness. For example, the Silpo network (Fozzy Group, n.d.) actively develops its own e-commerce area through the platform shop.silpo.ua and a mobile application that provides delivery via its own courier service or partner services. Due to the integration of online orders with the network's logistics systems, delivery routes are automatically generated, and the presence of decentralised hubs allows serving orders as quickly as possible, often on the day of registration. This model significantly reduces the time of the logistics cycle and increases the level of customer satisfaction, which directly affects the competitive position of the retail network. At that time, specialised retail stores (for example, delicatessen, wine, and farm products stores) showed lower absolute volumes, but high rates of value-added growth (+384.1%). This indicates the effectiveness of logistics strategies of narrow specialisation, focused on niche consumers with a higher willingness to pay for the quality, freshness, and origin of goods. The introduction of origin tracking technologies, partnerships with local manufacturers and reduced logistics chains have provided such enterprises with high adaptability even in turbulent conditions. For example, the Good Wine chain is actively implementing a product origin tracking system that allows customers to get detailed information about each product – from the manufacturer to the store shelf. Partnerships with

local farmers and suppliers ensure fast delivery of fresh produce, minimising the time spent on goods in the logistics chain. This approach not only increases consumer confidence, but also reduces logistics costs, which has a positive impact on business profitability. But trading from stalls and markets experienced a catastrophic decline – the volume of sales decreased by 92.3%, and value added – by 75.0% (Table 5). The reasons for this were limited opportunities for logistics modernisation, lack of infrastructure for contactless services, weak integration into digital channels, and regulatory pressures. This segment was the least adaptive to crises, which indicates the exhaustion of its role in the current format of food distribution.

Overall, the above data demonstrate that the effectiveness of logistics mechanisms – including digital transformation, supply chain management automation, inventory optimisation, and the introduction of flexible distribution channels – has directly affected the ability of merchants to adapt to shocks and maintain economic viability. The greatest advantages were given to those entities that were able to combine specialisation with innovations in logistics, choosing a model of flexible adaptation as a strategic response to the challenges of a transformational business environment. For example, specialised wholesale companies such as METRO Cash & Carry (n.d.), actively implemented multi-channel supply chains, which helped to quickly redirect commodity flows in response to changes in demand and supply disruptions. ATB-Market (n.d.) implemented digital demand forecasting systems based on Big Data analytics, which optimised inventory and reduced logistics costs, and launched its own delivery service, which provides fast customer service through local warehouses. Other examples are Fozzy Group (n.d.), which integrated omni-channel approaches, combining conventional stores with online platforms and automated sorting centres for last-mile delivery, and agricultural holding MHP (n.d.), which uses advanced digital batch tracking systems and flexible logistics management to maintain quality and timely delivery. Such practices allow enterprises to quickly respond to external challenges, minimise losses, and increase the level of customer satisfaction, which is the basis of the flexible adaptation model in modern logistics chains.

Since the business environment is characterised by a high level of instability, food trading enterprises are forced to constantly adapt their logistics systems to changes in external and internal conditions. In the context of crisis disturbances – such as inflationary fluctuations, supply chain disruption, resource scarcity – there is a need to model an adaptive logistics system that is able to ensure the effective functioning of the enterprise through the rational use of internal logistics resources. D. Ivanov (2024) argued that supply chain sustainability is now on the agenda for both the academic community and businesses like never before. A powerful catalyst for this phenomenon was the COVID-19 pandemic, which opened an era of global uncertainty and vulnerability, and the outbreak of the Russian-Ukrainian war further disrupted supply chains. The resilience of the latter manifests itself when the network is able to withstand, adapt and recover from failures to meet the needs of customers and ensure operational efficiency (Yang *et al*., 2021). Therefore, the model should consider not only the available inventory, supplier network and costs, but also the dynamics of changes over time – in particular, the transition from a stable pre-war state to a crisis period and further adaptation. In addition, it is necessary to consider the target management function – minimising logistics costs or maximising the level of customer service in conditions of limited resources. Considering the difference in the functional specifics of wholesale and retail enterprises, it is advisable to develop models separately: for the former – with a focus on ensuring the stability and flexibility of logistics links, for the latter – with an emphasis on the speed of circulation of goods and adaptability to changes in consumer demand.

To build effective models for adapting logistics systems to an unstable environment, it is important to consider not only general factors of influence, but also the specifics of the functioning of various types of commercial enterprises. When building models, special attention is paid to the differences in adaptation mechanisms in wholesale and retail trade in food products. This approach helps to more accurately

formulate tasks for modelling and substantiate the choice of relevant management tools. The comparison below (Table 6) demonstrates key differences in goals, resources, time horizons, and technologies underlying the adaptive behaviour of wholesale and retail businesses. This, in turn, determines the structure of the economic and mathematical models that are proposed later.

Table 6. Differences in adaptation mechanisms in wholesale and retail trade in food products

Comparison criteria	Wholesale companies	Retail businesses
Adaptation focus	Supply stability, inventory accumulation	Prompt response, fast turnover of goods
Key resource	Warehouses, contractual relations with suppliers	Store shelf, end-user demand
Response time	Medium- and long-term planning	Short-term, day-to-day management
Product range flexibility	Limited (depends on the terms of contracts and purchases)	High (frequent rotation of goods in accordance with changes in demand)
Target function	Minimising supply and logistics costs	Maximising current demand satisfaction
Technological tools	WMS, TMS, supply management platforms	POS systems, CRM, demand analytics, online sales channels

Note: WMS – Warehouse Management System; TMS – Transportation Management System; POS – Point of Sale; CRM – Customer Relationship Management
Source: developed on the basis of research conducted by the authors

Adaptation mechanisms depend on the type of enterprise and its role in the supply chain. Wholesalers focus on cost optimisation and guaranteed retail network support, while retailers focus on flexibility**,** response to consumer behaviour, and effective assortment management in conditions of variable demand. These features determine the structure of economic and mathematical adaptation models, which should be considered when developing logistics strategies. Therefore, since the model deals with adaptation to an unstable environment, it must consider: external disturbances (crisis, inflation, supply disruptions); internal logistics resources (inventories, suppliers, supply chains, costs); the objective function (minimising costs or maximising customer service with limited resources); time dynamics (transition from pre-war conditions to crisis and further adaptation).

Models should be built separately for: wholesale enterprises – focus on supply stability, warehousing flexibility, adaptation of logistics links; retail enterprises – focus on turnover speed, diversification of supply channels, adaptive assortment management. In the context of an unstable external environment, wholesale enterprises need tools that ensure reliable supply at an optimal level of costs. This need determines the development of a logistics adaptation model that considers the key parameters of internal resources, demand, supplier properties, and time dynamics of changes. The main goal of the model is to minimise the total costs associated with ensuring continuity of supply, considering the risks of supply. The model structure is designed to reflect the balance between the economic feasibility and logistics stability of the system over different time periods. Below are the parameters, target function, and constraint system that characterise the logic of decision-making at the wholesale supply level.

The goal of adapting logistics processes for wholesale enterprises with food products is to minimise the costs of logistics adaptation, provided that a stable volume of supplies is ensured. Model parameters for wholesale food enterprises: I – number of suppliers; t – number of planning periods; i=1...I – supplier index; t=1...T – number of planning periods; D_t – projected demand at time t; S_t – amount of inventory in the warehouse at time t; O_{it} – order from the i-th supplier at the time t; C_{it} – logistics costs for delivery from the supplier and at the time t; R_i – reliability (rating) of the supplier i; α, β – weighting coefficients of cost significance and risk.

Target function for wholesale enterprises with food products:

$$min \sum_{t=1}^{T} \sum_{i=1}^{I} (\alpha C_{it} + \beta \frac{1}{R_i}) O_{it}. \quad (1)$$

Restrictions for wholesale businesses with food products:

Inventory balance:

$$S_{t+1} = S_t \sum_{i=1}^{I} O_{it} - D_t, \forall t. \quad (2)$$

Constraint (2) reflects changes in inventory in each planning period: inventory for the next period is formed as the sum of available inventory, order volumes, and projected demand. Designation ∀t means that the balance is fulfilled for all planning periods.

Guaranteed level of service:

$$S_t \geq D_t^* \gamma, \gamma \in [0.9, 1.1], \quad (3)$$

γ – service level coefficient, which reflects the share of projected demand that must be guaranteed by available inventory at each time point. The parameter value is set within [0,9; 1,1], where: at $\gamma = 1$, the enterprise forms reserves equal to the expected demand; at $\gamma > 1$, an insurance reserve is created in case of demand growth or supply interruptions; at $\gamma < 1$, partial non-fulfilment of demand is allowed due to limited resources or priority of other criteria (for example, cost minimisation).

Restrictions on order volumes:

$$0 \leq O_{it} \leq O_i^{max}, \forall i, t. \quad (4)$$

The order volume limit (4) determines the acceptable purchase limits for each supplier in each period. Orders cannot be negative and must not exceed the maximum allowed volume O_i^{max}, which considers production or logistics restrictions on the part of the supplier. The model of logistics adaptation of wholesale enterprises is aimed at minimising total costs, considering the risks associated with supplier reliability, while ensuring inventory stability and timely satisfaction of projected demand. It combines inventory parameters, order volumes, supplier reliability, and time planning dynamics to make informed decisions for optimal supply chain management in an unstable external environment.

In the face of fluctuations in demand and limited supplies, retail enterprises are forced not only to respond quickly to changes in consumer demand, but also to flexibly adjust their product range. The goal of the model for such enterprises is to maximise total profit (meet demand) due to the optimal selection of product categories with available reserves and resource constraints. To do this, the dynamics of availability by category, projected demand, profitability of each category, and decisions about including it in the assortment at any given moment are considered. Below is a target function and a system of constraints that reflect the logic of adaptive product range and inventory management at the retail level. The goal of the logistics adaptation model for food retail enterprises is to maximise demand satisfaction with limited supplies and adapt the range. Parameters for food retail businesses: A_{jt} – volume of availability of category j at time t; d_{jt} – projected demand for category j at time t; p_j – profitability of a category j product; $x_{jt} \in \{0, 1\}$ – inclusion of product j in the adapted range at time t.

Target function for food retail businesses:

$$max \sum_{t=1}^{T} \sum_{j=1}^{J} p_j * min (A_{jt}, d_{jt}) * x_{jt}. \quad (5)$$

The function maximises the total profit from the volume actually sold min (A_{jt}, d_{jt}) those products that were selected in the range $x_{jt} = 1$.

Restrictions for retail businesses with food products:

The volume of posts does not exceed the limit:

$$\sum_{j=1}^{J} A_{jt} * x_{jt} \leq L_t, \forall t. \quad (6)$$

In each period t, the total volume of goods selected for sale cannot exceed the available supply limit L_t. This reflects restrictions on the area of the trading floor, the speed of replenishment, or logistics capabilities.

Adaptive product range restriction:

$$\sum_{j=1}^{J} x_{jt} \leq N_t, \forall t$$

(maximum number of product items). (7)

The number of product items in the updated product range is limited to N_t. This limit may be conditioned by merchandising opportunities, the number of shelves, or a marketing strategy to focus on key categories.

Guaranteed availability of key products:

$$x_{jt}=1, \text{ for } j \in j_{key}, \forall t. \quad (8)$$

For categories that are defined as critical j_{key}, the model must ensure their presence in the assortment in each period. This ensures that the minimum expectations of customers are met and the image of the retail network is maintained. The adaptive assortment and inventory management model in retail is aimed at maximising total profit by optimally selecting product categories, considering limited supplies and resources. It considers inventory dynamics, projected demand, product profitability, and guarantees the presence of key items in the product range, providing flexibility in responding quickly to changing market conditions and consumer priorities. To generalise the logic of logistics adaptation at the level of wholesale and retail enterprises with food products, a block diagram of decision-making is constructed (Fig. 1).

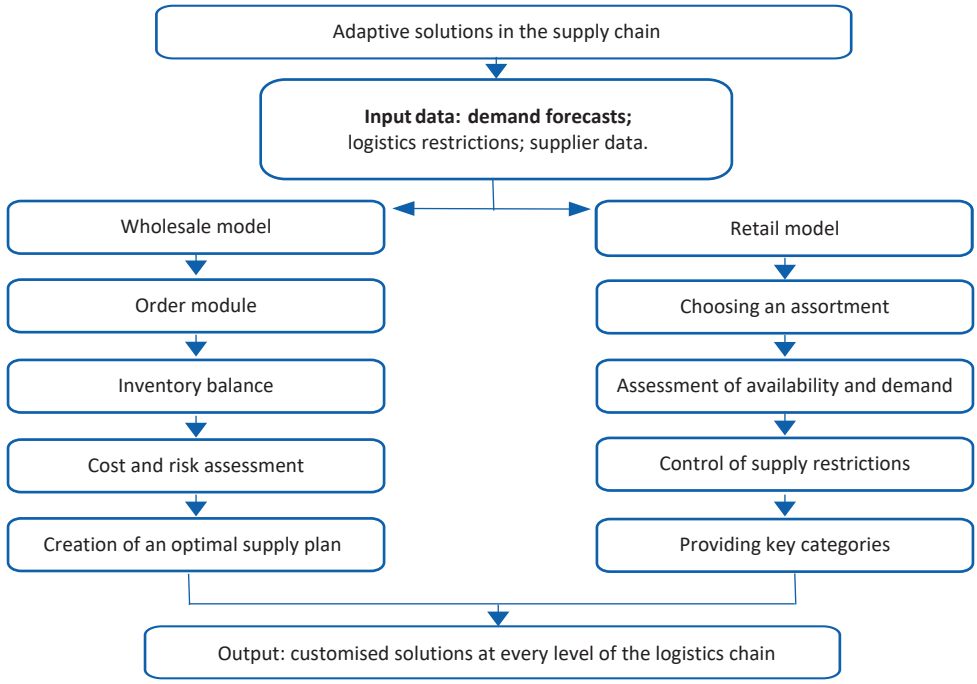

Figure 1. Algorithm for adapting logistics solutions at the level of wholesale and retail enterprises with food products

Source: developed on the basis of research conducted by the authors

The algorithm reflects the sequence of actions related to forming order volumes, selecting suppliers, adapting the product range, and considering restrictions. The flowchart illustrates how solutions are formed based on projected demand, available inventory, logistics constraints, and risk parameters aimed at achieving targets – minimising costs in the wholesale model and maximising profits in the retail one. Thus, the proposed models and structural flowchart allow formalising the process of logistics adaptation at different levels of commodity flow management. Their integration provides a systematic vision of the relationships between supply, demand, resource constraints, and optimisation criteria. This creates an analytical basis for making informed management decisions on adapting logistics processes in a changing environment, considering the specifics of wholesale and retail enterprises with food products.

The proposed model of logistics adaptation is theoretical in nature and is designed to create

an analytical tool for systematic assessment and optimisation of commodity flow management processes at the wholesale and retail levels. At the time of the study, there were no real examples of public application of such a complex model in enterprises, which is due to the high complexity of integrating multi-factor models into practical business processes, and limited access to internal logistics data of companies. However, the scientifically based structure of the model and its parametric nature allow simulating various adaptation scenarios, which potentially allows enterprises to use it in the future as a basis for developing their own solutions, considering the specifics of operational activities and external conditions. This approach is consistent with best practices in applied logistics, where mathematical models are first formed to describe complex systems, after which they are adapted to specific production and commercial contexts. Thus, the proposed model serves as a conceptual platform that can be expanded and tested through further empirical research and practical implementation at wholesale and retail enterprises of food products. This opens up prospects for further research and implementation of innovative logistics strategies, increasing the competitiveness and sustainability of enterprises in an unstable market.

The results of the study were confirmed by N. Valinkevich & M. Kotsenko (2024), who claimed that the pandemic and the war in Ukraine caused significant negative consequences: many commercial enterprises were destroyed, supply and sales chains were disrupted, the number of qualified personnel decreased and trade turnover decreased. However, despite all the difficulties and challenges, wholesale and retail trade enterprises were able to adapt to the crisis phenomena and transformations of the business environment.

The conducted study of logistics mechanisms of adaptation of enterprises of wholesale and retail trade in food products in a crisis and transformational environment has common points of contact with the conclusions of N.O. Didukh & T.M. Artiukh (2023), who focused on developing a commodity strategy for wholesale trade in agricultural products in conditions of uncertainty. Both studies emphasised the need to adapt enterprises to destabilising factors of a military and economic nature, the need to update strategic planning, and increase the flexibility and technological equipment of trade activities. However, the main focus of the study is on logistics adaptation – as a systematic tool for ensuring supply continuity, minimising costs, and maintaining functional interaction between the wholesale and retail segments. Instead, N.O. Didukh & T.M. Artiukh (2023) focused primarily on product policy: product range formation, product management risks, product strategy development algorithms, and implementation methods. The study also contains elements of mathematical modelling of logistics behaviour of enterprises, while the compared paper focuses on the conceptual algorithm for developing a product strategy. Thus, the research complements each other: one – with an emphasis on assortment and strategic planning, the other – on logistics functions that ensure the implementation of these strategies in practice.

Comparison of the results of the conducted study with the approaches outlined by N.E. Kuzo & N.S. Kosar (2022) shows that there is a common vision of the importance of the adaptive role of logistics in the context of crisis and martial law. Both studies focus on the need to introduce relevant approaches to management in wholesale trade and use marketing flexibility tools. The idea of strengthening the role of wholesale enterprises as logistics intermediaries between manufacturers and the retail chain is also common, with an emphasis on ensuring continuity of supply and minimising losses. The difference lies in the focus of the analysis: the study by N.E. Kuzo & N.S. Kosar (2022) focused primarily on the transformation of marketing solutions of wholesale trade entities under martial law, while the author's study considered logistics adaptation more comprehensively – as a systematic mechanism for responding not only to military challenges, but also to structural changes in the market, digitalisation, changes in demand, and the institutional environment.

S. Pepchuk & T. Palonna (2023) claimed that Ukrainian retail companies are characterised by high competition and a variety of formats and channels. Recent events, such as pandemics and war, have accelerated the development of online sales, which requires rapid adaptation and

competition for fast delivery. In times of war, an omni-channel strategy is becoming increasingly popular among retailers, which involves combining online and offline sales channels to meet the needs of consumers. Further growth of the Ukrainian retail market is projected, especially in the e-commerce sector, but the unstable environment will require constant adaptation and innovation for successful operation. In general, the analysed enterprises continue to develop and adapt to new realities, using innovative technologies and strategies to meet the needs of consumers and ensure business success.

Analysis of the approaches presented in the study by O. Dankeieva (2023), allows outlining both general ideas and conceptual differences in views on the development of the trade sector under martial law. The researcher focused on finding possible scenarios for the transformation of food retailers, considering the impact of exogenous shocks, the relocation of retail infrastructure, and changing consumer behaviour. But the author's research focused on logistics as a functional framework that provides flexibility and stability for both wholesale and retail trade links. While O. Dankeieva (2023) based strategic planning on empirical observations of the activities of leading networks, the models proposed in this study are analytical in nature and focused on building universal adaptation algorithms. As a result, both studies highlight different aspects of the same problem – the adaptation of trade in conditions of extreme uncertainty, complementing each other: one – through a macro-strategic vision of retail trade, the other – through micro-level logistics efficiency.

O. Kovalenko & L. Yashko (2024) deeply analysed the transformation of food trade in Ukraine under the influence of a multidimensional crisis, which largely echoes the author's conclusions regarding the logistics adaptation of commercial enterprises. Both studies emphasised that full-scale warfare has become a catalyst for changes in the structure of food distribution, supply chain configuration, and end-user behaviour. The general position is to strengthen the role of logistics as a critical factor of sustainability: both in the macro-system of food security and within individual retail operators. The researchers also emphasised the need for regional diversification of logistics channels, which fully corresponds to the author's conclusions about the need for flexible routes, alternative warehouses and adaptive solutions for resupply. In addition, both papers focus on the growing importance of digital solutions for real-time supply chain management, which allows compensating for infrastructure failures and ensuring prompt response. Thus, what is common to both studies is the understanding of logistics not as an auxiliary function, but as the core of the strategy for the survival and development of enterprises in the context of long-term crisis impacts.

Confirmation of the author's proposals regarding the need to introduce the latest technological tools in logistics is reflected in the study by M. Huseynova *et al.* (2025), who stated that current logistics requires constant development of structural elements of supply chains, which is conditioned by the use of advanced innovative achievements. Innovative logistics is a critical component of logistics activities aimed at assessing the need and opportunities for applying cutting-edge innovations in flow process management. It focuses on identifying and using additional resources by optimising management processes.

Thus, the analysis of contemporary research and the results of this study confirm that logistics adaptation is a key factor in the sustainability and efficiency of commercial enterprises in the context of crisis challenges and a transformational environment. The introduction of innovative technologies, digital solutions, and flexible supply chain management strategies allows wholesale and retail businesses to maintain supply continuity, optimise resources, and respond quickly to market changes. Thus, logistics adaptation is the basis for ensuring the competitiveness and sustainable development of food trade in Ukraine.

CONCLUSIONS

As a result of the study, it was found that the efficiency of functioning of wholesale and retail food trade enterprises in the context of crisis phenomena and transformations of the business environment largely depends on the flexibility and adaptability of their logistics mechanisms. It was revealed that the best results are demonstrated by those enterprises that combine technological

modernisation with adaptation of business models, digitalisation of logistics processes, implementation of multi-channel strategies and optimisation of assortment management. Logistics in such conditions is transformed from an executive function into a strategic tool for maintaining competitiveness, effective risk management and ensuring supply continuity.

The analysis of the dynamics of the number of wholesale and retail enterprises in 2010-2023 showed a significant reduction in traditional retail outlets: the number of non-specialised wholesale enterprises decreased by 56.5% (from 6,454 to 2,806 units), specialised – by 28.2%. In retail, non-specialised stores decreased by 47.1%, specialised stores – by 16.6%, and businesses trading from stalls and markets – by 63.2%. Simultaneously, an active digital transformation of logistics practices was recorded, including automation of warehouse and transport operations, electronic data exchange, and integration of demand forecasting systems. Significant logistical advantages were given to those operators who were able to diversify supply sources, reduce delivery chains, and provide omni-channel customer service. In terms of sales and value added for the period 2014-2023, specialised wholesale enterprises increased sales by 301.9% (from 166.7 billion UAH to 670.0 billion UAH) and value added by 747.4% (from 21.5 billion UAH to 181.9 billion UAH). Non-specialised wholesale enterprises increased their volumes by 96.9%, and added value – by 105.6%. In retail, non-specialised stores increased sales by 248.3% (from 170.6 billion UAH to 594.0 billion UAH) and value added by 398.5% (from 20.8 billion UAH to 103.7 billion UAH), while speciality stores increased sales by 104.3% and 384.1%, respectively. However, enterprises that trade from stalls and markets experienced a catastrophic decline: sales volume decreased by 92.3%, value added – by 75.0%.

A comparative typological analysis of the main participants of the wholesale and retail segments was also carried out, which allowed systematising them by specialisation, scale of activity, functional role in logistics, and level of technological integration. Key logistics tasks for each type of enterprise were identified, which can become the basis for the development of targeted adaptation strategies in conditions of instability. The necessity of a separate approach to building models of logistics adaptation for wholesale and retail enterprises with food products in an unstable external environment was substantiated. Considering the specifics of the functioning of each level of the supply chain, optimisation models were formed, including the corresponding parameters, target functions, and a system of constraints. For wholesale companies, the model aimed to minimise total costs, considering the reliability of suppliers and demand volumes, while the model for the retail level provided for maximising the profitability of an adapted range in conditions of limited throughput. The proposed flowchart visualised the logic of adaptive mechanisms functioning at both levels.

As a result of the study, it was proved that logistics adaptation was not only a response to external challenges, but also a means of long-term strengthening of market positions. The practical significance of the proposed models and algorithms lies in the possibility of using them to form logistics strategies at the level of enterprises, industry or region to increase supply efficiency, reduce costs, ensure sustainability, and meet consumer demand even in turbulent conditions. The prospects for further research are related to the deepening of the analysis of the impact of digital technologies on the adaptability of logistics systems, and the development of recommendations for the integration of Ukrainian logistics systems into European supply chains in the post-war recovery.

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Адаптація підприємницьких структур оптової та роздрібної торгівлі харчовими товарами до кризових явищ з використанням логістичних механізмів

Анотація. Логістичні механізми адаптації в торгівлі харчовими товарами забезпечують гнучке реагування на ринкові зміни через оптимізацію поставок, взаємодію між оптом і роздробом, цифровізацію та скорочення витрат при збереженні якості. У статті досліджено адаптацію оптових і роздрібних торговельних структур до економічної та соціальної нестабільності, зумовленої війною, інфляцією, змінами попиту та цифровою трансформацією, через використання логістичних механізмів. Метою дослідження було удосконалення логістичних стратегій з урахуванням специфіки функціонування різних типів торговельних підприємств. Методологічною основою стали структурно-функціональний підхід, порівняльно-типологічний аналіз, а також побудова економіко-математичних моделей. Аналіз динаміки торговельних підприємств за 2010-2023 рр. виявив суттєве скорочення їх кількості в усіх сегментах, що свідчить про структурну трансформацію роздрібної та оптової торгівлі в умовах цифровізації та зміни споживчих практик. У роботі систематизовано учасників оптової та роздрібної торгівлі харчовими товарами в Україні з урахуванням спеціалізації, масштабів і логістичних функцій. Визначено особливості ринку, рівень логістичної інтеграції та адаптивність операторів до зовнішніх змін. На основі статистичних даних за 2014-2023 рр. проведено аналіз обсягів реалізації харчових товарів та динаміки доданої вартості у секторах оптової та роздрібної торгівлі. У 2023 р. обсяг реалізації у

роздрібній торгівлі харчовими товарами становив: в неспеціалізованих магазинах – 594,0 млрд грн; в спеціалізованих магазинах – 28,0 млрд грн; з лотків і на ринках – 0,3 млрд грн, тоді як у оптовій: в спеціалізованих – 670,0 млрд грн; в неспеціалізованих – 107,7 млрд грн. Найвища відносна зміна доданої вартості за витратами виробництва з 2023 до 2014 р. простежується в спеціалізованих оптових підприємствах та становить 747,4 %. Запропоновано дві математичні моделі: для оптових підприємств – із пріоритетом стабільності поставок, ефективного управління запасами та мінімізації логістичних витрат; для роздрібних – з орієнтацією на швидку ротацію асортименту, гнучке реагування на попит і максимізацію прибутковості. Побудовано блок-схему алгоритму адаптивного прийняття рішень у логістиці. Практичне значення дослідження полягає в розробці інструментів для підвищення стійкості торговельних підприємств в умовах зовнішніх загроз

Ключові слова: турбулентність ринку; зміни у діловому середовищі; форми торгівлі; гнучкість комерційних структур; моделі збуту; логістичне управління

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Developing an institutional environment to stimulate long-term investment in dairy farming

Abstract. The aim of this study was to justify mechanisms for increasing the investment attractiveness of dairy farming in Ukraine by improving institutional support and introducing effective economic incentives. The study analysed the regulatory environment, assessed the dynamics of the industry's development in 2022 – May 2025, and examined examples of investment projects implemented by agricultural holdings, cooperatives and international programmes. As a result, it was established that in 2024, milk production in Ukraine amounted to 7.2 million tonnes, and the profitability of the industry increased from 23% in 2022 to 26% in 2023, with a projected increase to 40% in 2025. Within the framework of the "Family Dairy Farms" project, 240 farms are in operation, and the number of new and modernised commercial dairy farms has reached 125. At the same time, there has been a reduction in the number of cows from 1.58 million in 2022 to 1.155 million in May 2025, due to losses from the war and low attractiveness for investors in the eastern regions. The study identified the main barriers, including difficulty in accessing finance, regional inequality and regulatory instability. A comprehensive analysis of the strengths, weaknesses, opportunities and threats of the institutional environment was conducted, based on which practical recommendations were developed for the implementation of a single investment register, a unified online support platform, expanded cooperation and tax incentives. The proposed solutions are expected to increase the investment attractiveness of agricultural enterprises by 30-35% and the profitability of the dairy business to 25-28% by 2026. The practical significance of the study lies in the development of applied tools for improving institutional support that can be used by public authorities, communities and agricultural enterprises to stimulate long-term investment in dairy farming

Keywords: farms; taxation; mechanism; risk; state programme

INTRODUCTION

The development of the dairy sub-sector is hampered by limited access to capital, outdated production facilities, declining livestock numbers and high investment risks. Despite the strategic importance of the industry, long-term capital investment remains low due to regulatory instability, fragmented support and a lack of systemic incentives. Existing programmes are

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mostly short-term and do not take into account the key needs of investors, such as protection of property rights, access to infrastructure and financing. Against the backdrop of global competition and European integration processes, there is a need to create a stable institutional environment capable of providing the preconditions for modernisation of the industry and the inflow of long-term capital.

The low level of technical base renewal, limited financial resources, and the lack of stable incentive mechanisms hinder the attraction of long-term investments in production. This issue was studied by V. Lavruk *et al.* (2020), who analysed the dependence of production volumes on capital investments, the cost of fixed assets and unit costs per head of livestock. The study found that the main constraints are low profitability, high energy intensity of processes, limited access to bank lending, and the inability of enterprises to carry out innovative modernisation at their own expense. The authors demonstrated the feasibility of intensifying investment activity through the formation of an effective organisational and economic mechanism involving internal and external resources. The challenges associated with insufficient funding, limited access to external resources, and the consequences of martial law were the focus of O. Popova *et al.* (2023), who analysed investment dynamics in 2018-2022, sources of funding, and their impact on the efficiency of agricultural enterprises. They found that own funds dominated, banks and non-residents were not very active, and the investment climate depended on government support and infrastructure.

The low attractiveness of long-term investments, the instability of the economic environment, and the imperfections of government support make it difficult to finance the modernisation of agricultural production. This was considered by D.O. Bochkaryov (2024), who conducted a comprehensive analysis of investment sources, characterised the dynamics of revenues in 2015-2022, identified the main trends in investment activity, and identified factors that hinder the growth of capital investments. The author emphasised the importance of creating a favourable economic climate through tax incentives, improving access to credit and developing state programmes. The lack of institutional coordination, the imbalance of state policy and the fragmentation of strategic planning limit the effectiveness of managing the recovery and development of agricultural production. G. Prusova *et al.* (2024) analysed government approaches to stimulating investment, proposed a structural-functional model of management in conditions of risk, and identified key factors for stabilising the agricultural environment. They emphasised the need for coordination between government institutions, infrastructure development, and analytical support.

The low efficiency of investment resources in animal husbandry, the lack of a unified approach to managing investment processes, and the instability of funding sources limit the development of production. M.R. Hladiy & O. Prosovych (2022) investigated the role of investments in ensuring food security, analysed their dynamics in agriculture, and developed a model for improving management based on the integration of institutional and financial instruments. The study proposes measures to reduce investment risks and stimulate capital attraction in agricultural production. The insufficient level of economic stability of dairy enterprises, limited access to investment resources, and the lack of effective mechanisms to support producers complicate their modernisation and strategic development. These aspects were highlighted in the study by T. Gutsul *et al.* (2023), which analysed the transformation processes in agricultural production, assessed changes in the structure of livestock farming, the impact of state policy and the reduction in livestock numbers. The authors also emphasised the need to introduce regionally adapted models of institutional support and to activate public-private partnerships.

The limited effectiveness of state policy to support livestock farming, the reduction in cattle numbers and the imperfect pricing system are reducing the attractiveness of milk production. These issues were studied by A. Velichko *et al.* (2021), who conducted a comprehensive analysis of milk production dynamics in Ukraine, identified the main factors contributing to its decline, and emphasised the importance of technological modernisation and state regulation. The authors also proposed ways to

stimulate investment activity, in particular through subsidies, improved marketing conditions and ensuring stable demand. The low investment attractiveness of livestock enterprises, the lack of working capital and the uneven distribution of resources between regions are hindering the development of milk production. L. Pronko *et al*. (2020) studied the peculiarities of livestock enterprises, analysed the factors influencing their economic performance, and substantiated ways to improve the efficiency of milk production by improving the financial and economic environment. In particular, the authors highlighted the importance of technical modernisation, improving state financing mechanisms and ensuring access to credit resources.

Despite the existing developments, the studies do not pay enough attention to the formation of long-term institutional guarantees, tax stability, transparent procedures and trust mechanisms, which are critical for attracting long-term private and foreign capital. The question of developing an effective institutional model adapted to the conditions of a war economy, which would simultaneously ensure investment stability, the development of public-private partnerships, and the integration of the dairy subsector into external markets, remains open. The aim of this study was to identify effective ways to attract investment in dairy farming by strengthening institutional support and creating favourable economic conditions for long-term financing. To achieve this goal, the following tasks were set: to analyse the economic mechanisms that influence the activation of investment in the dairy subsector; to evaluate the role of public, private and cooperative institutions in creating a favourable environment for agribusiness; to develop practical recommendations for agribusinesses on increasing investment attractiveness and effective capital raising.

MATERIALS AND METHODS

The study was empirical and covered the period from 2022 to May 2025 inclusive. The study used a descriptive method to develop the theoretical and methodological foundations for forming an institutional environment aimed at attracting long-term investments in dairy farming. In particular, the economic essence and classification of institutional incentives for investment were analysed, as well as methodological approaches to evaluating the investment attractiveness of the industry. Within the framework of the study, empirical data on the functioning of such enterprises as the MHP (n.d.) agricultural holding in Kyiv and the Dobrobut Andriivka (n.d.) agricultural cooperative operating in the Dnipropetrovsk region were collected, systematised and summarised. The experience of the Pokrova (n.d.) cooperative in the Lviv region and the Ekom (n.d.) cooperative in the Ivano-Frankivsk region was analysed separately. These examples were chosen as representative of different organisational models for attracting investment at the local level.

Considerable attention was paid to the analysis of institutional support for investments in dairy farming. The study considered regions with active development of the dairy industry, in particular Khmelnytskyi, Lviv, Poltava, Chernihiv and Mykolaiv regions (AgroBusiness, 2024; AgroPortal, 2022). These regions were selected due to their leadership in terms of investment activity growth rates, the number of newly established or modernised dairy farms, and their significance in the overall milk production structure. In addition, these regions represent different models of industry organisation – from family farming to large-scale production, which allowed for a comprehensive evaluation of the effectiveness of institutional support in different conditions. The activities of the Food and Agriculture Organization (AgroElita, 2025) were also described, which implemented a two-year Emergency Response and Early Recovery Plan (2025-2026) aimed at supporting farmers in the dairy sector.

The study analysed the current preferential taxation and state support programmes in the livestock sector as of 2023-2024. The review covered the following key instruments: subsidies for the maintenance of cattle, goats and sheep; subsidies per hectare of agricultural land; feed and equipment compensation programmes; reduced value added tax rates; and special features of the single tax for farms (Marchenko, 2025). The study also examined the Family Dairy Farms project, which was selected as a representative example of a large-scale

initiative to create a network of small producers, combining institutional support, public funding and private investment. Its implementation made it possible to track the effectiveness of combining the cooperative model and targeted support programmes as factors in increasing the sector's investment attractiveness. Credit and grant programmes were also analysed, in particular "Affordable Loans 5-7-9%" (Privatbank is a participant..., n.d.) and preferential financing for dairy farming equipment in cooperation with banks (Oschadbank).

The analysis also characterised the dynamics of dairy farm development and identified key indicators of the dairy subsector's development, including production volumes, cattle numbers, average productivity and geographical concentration of investments. In addition, the main regulatory and legal acts governing dairy farming in Ukraine were reviewed, in particular Decree of the Cabinet of Ministers of Ukraine No. 76-r (2025), Resolution of the Cabinet of Ministers of Ukraine No. 106 (2018), Law of Ukraine No. 1560-XII (1991). Also, Law of Ukraine No. 1877-IV (2004) and the state programme of preferential lending "5-7-9%". As part of the study, a Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis of the institutional environment was developed, taking into account challenges and barriers, which made it possible to identify the main areas for improving institutional regulation. The study also focused on tax, financial and organisational mechanisms for motivating investors. A separate stage of the work was the formation of practical recommendations for agricultural enterprises, which covered the development of an investment strategy, the implementation of quality standards, participation in certification programmes and the creation of investment passports.

RESULTS

Theoretical and methodological foundations for the formation of an institutional environment for attracting long-term investments

Institutional incentives for investment play a key role in creating a favourable environment for mobilising financial resources and ensuring the sustainable development of economic sectors, particularly dairy farming. Their economic essence lies in the creation of stable formal and informal conditions that regulate relations between participants in the investment process – the state, private investors, agricultural enterprises, financial institutions and cooperatives. Such incentives are formed through mechanisms of legislative regulation, financial and credit support, institutional trust, as well as through transparency of procedures and effective interaction between participants in the agri-food market. In the context of dairy farming, institutional incentives are particularly important, as this sub-sector requires long-term capital investment and depends on the stability of state policy, the availability of specialised infrastructure and an effective system for protecting investors' rights (Bakhur, 2020).

Depending on the source of origin, there are: state (formal), cooperative (sectoral), private (corporate) and mixed institutions. State institutions include legislative norms, budget support programmes, special investment regimes, preferential taxation, and guarantees for domestic and foreign investors. Cooperative institutions function as voluntary associations of commodity producers, creating additional mechanisms for financial interaction, reducing transaction costs and ensuring greater stability of supply. Private institutions include corporate strategies for attracting investors, partnership agreements, internal investment management rules and self-regulation. Mixed institutional forms involve interaction between public and private players within the framework of public-private partnerships or project financing (Hayat, 2019).

Institutional incentives are divided into direct (financial assistance, subsidies, state investment guarantees) and indirect (stability of the legal environment, protection of property rights, trust in the judicial system, transparency of regulatory policy). In addition, short-term and long-term incentives can be distinguished. The former are aimed at responding quickly to the needs of the sector, for example, reimbursement of part of the cost of milking equipment, preferential lending or compensation for the cost of fodder. Long-term incentives include institutional models that ensure investment stability, such as agricultural registries, electronic project management platforms (e.g., Digital

Restoration Ecosystem for Accountable Management (DREAM)), land banks, agricultural risk insurance, agricultural investment fund institutions, etc. Institutional incentives aimed at foreign investors constitute a special group (Hayat, 2019). These include the introduction of special economic zones, investment protection agreements, simplification of business registration procedures, digitisation of licensing procedures, and the inclusion of Ukraine in international investment attractiveness ratings. At the same time, it is equally important to build social capital in the agricultural environment – trust in institutions, the reputation of state bodies, the effectiveness of advisory services, and the ability of local initiatives to implement projects that meet the requirements of sustainable development. Methodological approaches to assessing the investment attractiveness of dairy farming are based on a combination of quantitative and qualitative criteria that allow identifying the potential profitability, risks, and stability of investments in the relevant segment of agricultural production. The assessment of investment attractiveness involves a multifactorial analysis that covers not only the internal production indicators of enterprises, but also the external economic, institutional and infrastructural conditions that influence investment decisions. The methodological toolkit is based on approaches such as comparative analysis, analytical and statistical methods, benchmarking, SWOT and PEST analysis, expert evaluation, scoring methods and integrated assessment. The basic quantitative criteria are production profitability, gross output per cow, the cost of milk, capital intensity per unit of production, the level of mechanisation and energy supply, the structure of feed and veterinary service costs, and the dynamics of investments in production infrastructure (Adamkulova *et al*., 2025).

At the same time, it is important to take into account financial indicators: financial independence ratio, debt-to-equity ratio, level of accounts receivable and accounts payable, payback period of an investment project, internal rate of return, net present value, and profitability index. Qualitative criteria include the level of state support, the availability of cost compensation programmes, access to credit resources, the stability of the regulatory framework, the availability of professional staff, the functioning of the advisory system, as well as institutional conditions: the activity of the cooperative movement, the availability of industry associations, the role of local administrations, and the transparency of procedures for interacting with government agencies. In addition, an important factor is the availability of logistics infrastructure (elevators, milk coolers, laboratories), access to sales markets, and the level of integration into value chains (Dai *et al*., 2022).

For systematic evaluation, an integrated approach is used, combining groups of indicators into a composite index of investment attractiveness. Each criterion is given a weighting coefficient depending on its significance for the investment decision. The data obtained is normalised, compared between enterprises or regions, and then investment attractiveness profiles are formed with corresponding recommendations. In some studies, it is advisable to use expert assessments on the Saaty scale to determine weighting coefficients, as well as multi-criteria analysis methods, such as: Technique for Order Preference by Similarity to Ideal Solution (Madanchian & Taherdoost, 2023), which is based on calculating the distance to the ideal and worst options, Analytic Hierarchy Process, which allows structuring the task in the form of a hierarchy and conducting pairwise comparisons of criteria; ELimination Et Choix Traduisant la REalité (Sartika & Murni, 2023), which is based on the preponderance method and is used to rank alternatives according to several parameters.

In the context of challenges related to climate change, resource scarcity, rising energy costs and product quality requirements, the inclusion of sustainability indicators – the level of environmental responsibility, compliance with quality and safety standards, energy efficiency, and the use of sustainable land use technologies – is particularly relevant. It is also important to take into account the risks associated with military aggression, disruption of logistics chains, inflationary pressure, changes in exchange rates and effective demand. That is why the assessment of investment attractiveness should be dynamic, using up-to-date data adapted to the conditions of a war and post-war

economy (Jones *et al*., 2013). Institutional support for investment activities in the agricultural sector is based on the interaction of public, private and cooperative structures, each of which performs a specific function in ensuring long-term financing, stable development and increased competitiveness of dairy farming. State participation is manifested primarily through strategic planning, programme funding and the implementation of digital platforms that increase transparency and predictability for investors. For example, Resolution of the Cabinet of Ministers of Ukraine No. 179 (2021) sets out guidelines for the transformation of the agricultural sector, including the modernisation of production capacities in dairy farming. The document introduces a number of financial incentives for the modernisation of livestock complexes, including partial compensation for the costs of construction and equipment procurement. In addition, the development of the DREAM digital platform enables the registration, selection and monitoring of investment projects. With its help, investors can apply for state support, track the movement of funds and analyse the results of the implementation of initiatives, creating an open ecosystem for transparent interaction between business and the state (Tetiu, 2025).

Private enterprises are increasingly active in promoting a favourable investment climate in dairy production. The MHP (n.d.) agricultural holding in Kyiv implements programmes to support small producers by providing sales, technical equipment and advisory services. In particular, the company enters into long-term contracts with farmers for the purchase of milk, provides them with refrigeration equipment and organises training seminars on improving product quality. This model allows small farms to gain access to a guaranteed market, stable income and technical support, which contributes to their long-term stability. Cooperative participation is a key element in mobilising investment potential among small and medium-sized producers who do not have access to large-scale financial or logistical resources on their own. For example, the Dobrobut Andriivka (n.d.) agricultural service cooperative in the Dnipropetrovsk region was one of the first to receive milk processing equipment, is actively increasing the volume of raw materials collected, and is creating additional jobs (AgroPortal, 2025c). The development of such cooperatives allows for the diversification of sales channels, increases farmers' incomes, and contributes to the development of the local economy. In addition, the Pokrova (n.d.) agricultural service cooperative in the Lviv region has increased the profitability of local farmers through joint equipment purchases, the organisation of efficient milk collection and the provision of stable sales, setting an example for other regions (Kitral, 2024). The cooperative ensures quality standardisation, joint investment management and paves the way for the introduction of production practices even for small market participants. Another example is the Ekom (n.d.) cooperative in the Ivano-Frankivsk region, which brought together 43 residents, created its own brand of cheese, "Chesnykivsky Cheese", and significantly increased its income through high-quality sales of dairy products (Samosvat, 2020). The combination of production, marketing and branding within a single cooperative has enabled small producers not only to increase sales volumes but also to increase the value of finished products, which is an important element in the formation of added value within local production. Thus, state strategic support, the active role of private business and the potential of cooperative associations form a complementary system of institutional support for investment activities in dairy farming. Such a system provides conditions for stable capital attraction, adaptation to changes in the external environment and the achievement of strategic goals of food security and market integration.

In 2023-2025, Ukraine had powerful economic mechanisms in place to stimulate investment in the dairy farming sector, including direct budget support, tax incentives, and preferential lending. One of the key instruments was state subsidies for livestock maintenance: in particular, 7,000 UAH was paid for each cow (within the range of 3 to 100 heads), and 2,000 UAH for each sheep or goat. There was also 4,000 UAH per 1 hectare of cultivated land (up to 120 hectares), which was relevant for small and family farms registered in the State Agrarian Register. In 2024, 27,614 agricultural producers took

advantage of this support, of which 15,252 received subsidies for cattle and another 1,915 for breeding goats and sheep. The total amount of subsidies per hectare exceeded 1.15 billion UAH (Marchenko, 2025). In addition, a preferential taxation mechanism was in place, which included the payment of a single tax of group 4, exemption from value added tax, a reduced VAT rate of 14% for livestock products, and tax breaks for individuals who sell products within 50 minimum wages per year (Makovei, 2024). The most ambitious financing instrument was the "Affordable Loans 5-7-9%" programme (Privatbank is a participant..., n.d.), which was used by 3,965 agricultural enterprises in 2025, attracting 24.4 billion UAH, and in total, under all programmes, more than 54.6 billion UAH for 8,624 farms. Within this programme, an increased lending limit for livestock farming was set at up to UAH 150 million (Moiseev, 2025). The loans were used to purchase equipment and build or renovate livestock farms, including dairy farms. Some banks, such as Oschadbank in partnership with Global Engineering Alliance Ukraine, provided special loans for dairy farming at a rate of 0.01%. Since 2025, a mechanism for partial compensation of farm reconstruction costs has also been in place, which further stimulates investment in this segment. In general, state policy in 2023-2025 is aimed at increasing the economic attractiveness of livestock production, stimulating investment activity, and reducing barriers to the renewal of material and technical resources and the modernisation of farms.

Analysis of the state of institutional support for investment in dairy farming

Dairy farming in Ukraine in 2022-2025 shows signs of gradual recovery and growth, despite serious challenges caused by military action and economic instability. Against the backdrop of capacity losses in the eastern regions of the country, production and capital investments are shifting to the central and western regions, where a new investment map of the industry is being formed. According to Minister of Agrarian Policy V. Koval, this is where most of the new projects for the construction and modernisation of more than 125 dairy farms are concentrated (AgroPortal, 2025a). The Khmelnytskyi region is the leader in terms of the number of family dairy farms, with 37 farms participating in the Family Dairy Farms project. This indicator demonstrates the high level of interest of local communities in small forms of entrepreneurship and the effective interaction between state support programmes, cooperative associations and private initiatives. In addition, a large-scale investment project to build a farm for 1,200 head of cattle, which started in 2024, is being implemented in this region (AgroBusiness, 2024). The combination of large and small forms of business creates a multi-level model of industry development, where small producers gain access to infrastructure, and large ones provide stable production of raw materials and logistical support. This demonstrates the synergy of different institutional forms within a single region. In the Lviv region, investment activity is concentrated around the private sector. Mukko Dairy Farm (n.d.) is implementing one of the largest projects in Ukraine – the construction of a farm for 2,000 cows in the Morshyn community. This example is important in terms of localising investments in safe regions, which minimises military risks and ensures the long-term operation of the facility. The project also demonstrates the ability of private businesses to attract foreign capital and develop infrastructure in accordance with European quality and safety standards. Its implementation contributes to employment growth, demand for local services, and the formation of a positive investment image for the region.

The Poltava region, traditionally strong in milk production, showed active growth in family farming in 2022, with nine new farms opened as part of a project to support small producers (AgroPortal, 2022). This example illustrates the effectiveness of the implementation of state and donor programmes at the local level and confirms the importance of institutional presence, in particular through advisory services, registration in state registers and access to preferential lending. The growth in the number of small farms in this region indicates positive changes in the structure of production, as well as increased investment activity among the rural population. One of the largest infrastructure projects has been launched in the Chernihiv region – the construction of a complex for 4,000 head of

cattle, initiated by the Ichnia Milk and Canning Plant. The implementation of such a project is strategically important for strengthening the industrial segment of dairy production in the north-eastern region, which has suffered significant losses due to military operations. The project marks the return of investment to regions with high agricultural potential and existing processing infrastructure. Its implementation involves modernising the material and technical base, increasing productivity, improving logistics and creating new jobs. Despite its proximity to the combat zone, the Mykolaiv region is showing signs of stabilisation. In 2024, the region recorded an 18% increase in milk production compared to 2023, indicating a partial recovery of production capacity. This dynamic is possible thanks to support from international partners, the transfer of activities to safer areas of the region, and the adaptation of farms to unstable market conditions. In other words, even in difficult conditions, positive investment dynamics are possible if there are clear mechanisms for stimulating and protecting business.

Alongside regional revitalisation, the role of international support is growing. The Food and Agriculture Organization is implementing a two-year Emergency Response and Early Recovery Plan (2025-2026) aimed at helping more than half a million rural residents, including farmers in the dairy sector (AgroElita, 2025). Since the beginning of the war, the Food and Agriculture Organization has provided support to more than 185,000 households, supplying them with young livestock, feed, generators and equipment (Interfax-Ukraine, 2024). The total amount of aid is approximately 290 million USD In 2024, more than 45,000 families received support. By the end of 2025, the profitability of the dairy business is expected to grow to 40% (compared to 23% in 2022, 26% in 2023 and 35% in 2024), which makes the industry attractive for investment even in wartime. However, part of the farmers' profits is used to cover losses in crop production, which slows down the pace of reinvestment (Rodak, 2024). The Family Dairy Farms project plays a special role in supporting small agribusinesses. It aims to create a network of private farms that could potentially provide up to 15% of Ukraine's total milk production. At the same time, additional investments in the modernisation of milk processing enterprises are needed to improve product quality and enter European markets. Currently, the insufficient level of technical modernisation is hindering the adaptation of production to EU standards, particularly in terms of food safety (Mind, 2022).

In 2022-2024, the dynamics of dairy farm development in Ukraine will reflect both the consequences of military action and the gradual recovery of the industry through investment, modernisation and support from the state and international partners. The full-scale war led to the loss of approximately 100 commercial dairy farms, which was a significant blow to the sector. The cow population decreased from 1.58 million as of 1 January 2022 to 1.155 million at the beginning of 2025. In particular, dairy farms saw a reduction of about 34,000 head (Lubyana, 2025). Despite the losses, by 2023 the industrial sector – dairy farms – was able to restore production volumes to pre-war levels: 2.8 million tonnes, which is 6% more than in 2022 (National Institute for Strategic Studies, 2024). In total, including households, 7.2 million tonnes of milk were produced in 2024, and the rate of decline slowed to 2%, indicating a gradual stabilisation of the industry. At the same time, the construction and modernisation of new dairy farms became a key trend. As of May 2025, 125 farms are undergoing reconstruction or construction, mainly in the central and western regions. This indicates an increase in investment and a change in the geography of production, with the dairy business moving from the eastern regions to safer areas (Volokita, 2025). The family farm sector is developing particularly rapidly. At the end of January 2022, there were more than 150 farms within the Family Dairy Farms project, and this number is steadily growing. Such farms are becoming an integral part of the industry's infrastructure and ensure its sustainability in crisis conditions. In addition, productivity is increasing. The average size of a commercial dairy farm in Ukraine is approximately 300 head of cattle, and the most efficient enterprises provide milk yields of over 12,000 kg per cow per year (MilkUa, 2024). Table 1 summarises the key structural indicators and trends in the investment development of the dairy subsector during the specified period.

Table 1. Key indicators of the dairy subsector's development in Ukraine (2022-2025)

Indicator	2022	2023	2024	As of May 2025
Cow population (million heads)	1.58	1.285	1.21	1.155
Milk production volume (million tonnes)	6.8	7.2	7.2	-
Number of dairy farms lost due to the war	~100	-	-	-
Number of modernisation projects/new farms	32	74	103	125
Number of family dairy farms	>150	~180	~220	~240
Average size of a dairy farm (heads)	270	280	290	300
Productivity (kg)	up to 10,500	up to 11,000	up to 11,800	up to 12,000
Investment geography (main regions)	Central, Eastern	Central	Central, Western	Western, Central

Source: compiled by the author based on data of Mind (2022), MilkUa (2024), Ya. Lubyana (2025)

Table 1 shows the main indicators of the transformation of Ukraine's dairy subsector in 2022-May 2025. During this period, the number of cows decreased from 1.58 million to 1.155 million, reflecting infrastructure losses and the impact of military operations. Despite this, milk production remained stable in 2023-2024 at 7.2 million tonnes. Despite the reduction in the number of cows, milk production remained stable, staying at 7.2 million tonnes in 2023-2024. This indicates a gradual increase in the productivity of dairy livestock, which, according to the table, rose from 10,500 kg in 2022 to 12,000 kg in May 2025. Thus, the increase in milk yield compensated for the loss in the number of cows, which can be seen as a result of the introduction of modern technologies, improved feeding, genetic selection and institutional support. The trend towards an increase in the number of modernisation projects and new farms deserves special attention: from 32 in 2022 to 125 in May 2025. This indicates a revival of investment activity, especially in the safer western and central regions, which is confirmed by the shift in the geography of investments to these areas. At the same time, the number of family farms has increased from over 150 to about 240. The average size of a dairy farm has increased from 270 to 300 head, indicating a gradual consolidation of production. In 2022, approximately 100 farms were lost, but in 2023-2025, the industry showed signs of recovery. The geography of investment gradually shifted from the eastern regions to the central and western regions. This shift was due to both security considerations and the concentration of state support in these regions. Thus, investment activity in dairy farming in Ukraine is gradually increasing thanks to a combination of state policy, private initiatives and international support.

The main trends indicate a geographical concentration of projects in the central and western regions, a gradual increase in farm efficiency and stabilisation of production. However, for a full transformation of the industry in the post-crisis period, further expansion of financing, development of cooperation and deepening of institutional support from the state and international partners are necessary. The main regulatory and legal acts of Ukraine governing investment activities in dairy farming form a comprehensive institutional environment for attracting capital, modernising farms and developing production. In particular, Decree of the Cabinet of Ministers of Ukraine No. 76-r (2025) defines the priorities of investment policy, including the creation of modern production infrastructure, increasing the volume of raw milk and forming a favourable business environment in rural communities. Resolution of the Cabinet of Ministers of Ukraine No. 106 (2018) establishes the procedure for providing budgetary support, including subsidies for keeping cows, and continues to operate in 2025 with updated conditions adapted to the needs of dairy farms. An additional lever of support is the state programme of preferential lending "5-7-9%" (Privatbank is a participant..., n.d.), which allows farmers to obtain loans for the construction and reconstruction of dairy farms at reduced rates, with the possibility of partial compensation of expenses. The basic provisions are also

regulated by Law of Ukraine No. 1560-XII (1991), Law of Ukraine No. 1877-IV (2004) and other industry-specific acts that create the legal framework for the implementation of investment projects. Together, these instruments contribute to the institutional strengthening of the dairy sector, increasing its attractiveness to investors and ensuring the country's food security.

Thus, in 2023-2025, dairy farming in Ukraine is gradually recovering after significant losses caused by the war. A key trend is the active growth of investment activity in the central and western regions, where most of the new projects for the construction and modernisation of dairy farms are being implemented. At the same time, there is a development of a network of family farms, an increase in the productivity of enterprises and stronger international support, in particular from the Food and Agriculture Organization. This creates the economic conditions for modernising production, stimulating new investment and gradually putting the industry on a path of sustainable growth.

Strategic guidelines and institutional decisions to stimulate investment activity in the dairy subsector

Increasing investment activity in the dairy subsector of Ukraine's agriculture is impossible without effective institutional regulation. As of 2025, the regulatory system is characterised by fragmentation, uneven implementation at the regional level, and limited effectiveness in achieving targets. Problems with regulatory support, weak interaction between central and local authorities, and a lack of consistent coordination with international donors are hindering the realisation of the potential for investment in dairy farming. A SWOT analysis was conducted to systematically analyse the internal and external factors of institutional regulation development, as shown in Table 2.

Table 2. SWOT analysis of the institutional environment for investment activity in the dairy sector

Strengths	Weaknesses
▪ The existence of an approved Concept for the State Programme for the Development of Livestock Farming until 2033 ▪ Implementation of the "5-7-9%" programme with the possibility of compensation for expenses incurred on livestock facilities ▪ Existence of preferential mechanisms for farms ▪ Participation of international organisations (United States Agency for International Development, Food and Agriculture Organization, European Bank for Reconstruction and Development) in financing the development of the dairy industry	▪ Lack of a single investment register for livestock farming ▪ Difficulty for small farmers to access budget support ▪ Low institutional capacity of communities to implement investment programmes ▪ Bureaucratic barriers to project approval and delays in obtaining funding
Opportunities	**Threats**
▪ Adaptation of European approaches to regulating agricultural investment ▪ Expansion of electronic services for project registration and obtaining financial support ▪ increasing transparency by opening databases on state support and the effective use of funds ▪ Formation of development institutions in communities (agribusiness support agencies, investment offices)	▪ War risks that make long-term investment impossible ▪ Declining investor interest due to the unpredictability of regulatory policy ▪ Likely reduction in external financial assistance in the event of geopolitical changes ▪ High dependence of the sector on budget decisions and delays in programme funding

Source: compiled by the author based on AgroElita (2025)

The results of the SWOT analysis indicate the presence of basic elements of institutional regulation, but their impact on investment activity remains limited due to uneven implementation, inconsistent procedures and limited transparency. As part of one of the tasks set in the study – developing practical recommendations for agricultural enterprises to increase investment attractiveness – a number of proposals were formulated aimed at improving the institutional environment. In particular, it is necessary to ensure the centralisation and transparency of accounting for investment projects in the sector by creating a single register of agricultural investments, which will allow tracking the progress of implementation, sources of financing, and the impact on production and employment. In addition, the institutional capacity of local

authorities should be strengthened by creating agricultural investment support offices within local communities. Their task will be to advise agricultural producers, support projects and communicate with banks, donors and government agencies. An important step should be the unification of procedures for obtaining support: the development of a single online portal for submitting applications for participation in state aid, compensation and grant programmes. The DREAM platform partially fulfils this function, but needs to be refined specifically for the livestock sector. It is also necessary to expand access to financial instruments by developing local programmes to support farmers in communities where there has been a significant reduction in livestock numbers. The development of an institutional risk insurance mechanism for investors in areas of increased military danger deserves special attention. A model for guaranteeing compensation for lost assets through state funds or international programmes will make it possible to attract new capital even in conditions of instability.

Motivating investors to invest more actively in dairy farming is only possible if tax, financial and organisational instruments of influence are systematically combined. One important area is tax incentives. In particular, it would be advisable to introduce tax holidays for companies that invest in the modernisation of dairy farms above a certain financial threshold. An additional form of support could be the provision of land tax relief for farmers who keep more than 100 head of cattle. In addition, a stimulating measure is to reduce the value-added tax rate on equipment used for the construction and equipping of modern dairy complexes. Financial instruments also play an important role in motivating investors. In particular, the continued operation of the "5-7-9%" preferential lending programme with the possibility of reducing the interest rate for livestock projects is an important factor in accessing capital. In addition, mechanisms for compensating up to 50% of the costs of building dairy farms from the state budget, as well as providing targeted grants for the development of family farms, are important (APK Inform, 2024).

Another important area is the use of organisational tools that provide for the development of agro-industrial clusters, cooperatives, and logistics hubs. Such solutions help reduce the costs of transportation, processing, and distribution of dairy products, create economies of scale, and strengthen the position of small and medium-sized producers. A notable example is the activities of the Dobrobut Andriivka cooperative in the Dnipropetrovsk region, which, thanks to support, received equipment for milk processing, expanded the geography of raw material collection, and created new jobs (AgroPortal, 2025b). This experience demonstrates the effectiveness of combining organisational solutions with financial and tax mechanisms to stimulate investment activity in the dairy sub-sector. At the level of agricultural enterprises, it is advisable to implement a number of practical measures aimed at increasing investment attractiveness. Among the main ones are the formation of a clear investment strategy with projected financial indicators, the preparation of reports in accordance with international standards, the implementation of the ISO No. 22000:2019 (2019) or Hazard Analysis Critical Control Point (n.d.), as well as participation in certification programmes for entry into international markets. It is also important to strengthen communication with potential donors, banks and funds by creating own investment passports, business project presentations, and regularly updating information about investment needs on regional platforms.

The implementation of these steps will increase the investment attractiveness of agricultural enterprises by 30-35% over the next 2026-2027 years. In particular, the profitability of the dairy business could increase from the current 12-18% to 25-28% in 2026, and the volume of funds raised could increase by 40% compared to 2023. In addition, enterprises that integrate digital solutions (milk yield accounting, remote monitoring, feeding automation) and use green technologies (solar panels, biogas plants) will have an advantage in obtaining grant aid and entering EU markets (Daletska, 2024; Polishchuk, 2025).

In conclusion, it should be emphasised that stimulating investment activity in the dairy subsector of Ukraine's agricultural production requires a systematic update of the institutional environment. The barriers and opportunities

identified in the SWOT analysis indicate the need to centralise procedures, digitise support processes, strengthen regional capacity and ensure access to effective investor motivation mechanisms. The introduction of a single register of agricultural investments, a unified online platform for participation in support programmes, and the development of cooperative structures and local investment offices will increase the transparency and effectiveness of regulatory policy. This approach will increase the investment attractiveness of the industry and contribute to the achievement of strategic goals for sustainable agricultural development.

DISCUSSION

In dairy farming research, the focus is gradually shifting from purely technological and economic aspects to a broader analysis of the institutional environment and its mechanisms of influence on the investment attractiveness of the industry. This study focused on the institutional conditions for attracting investment in dairy farming, while the study by A.M. Alvarez *et al.* (2021) examined farmers' strategies for creating added value. Both approaches took into account the influence of context, but the former focused on public policy and cooperation, while the latter focused on entrepreneurial qualities and local conditions. There were also differences in methodology: the first study was based on statistics and normative analysis, while the other was based on the clustering of farming strategies. At the same time, both emphasised the role of diversification in increasing the sustainability of the industry.

A similar contrast was noted in comparison with the study by P. Bórawski *et al.* (2020), which focused on the triple impact of economic, environmental and social factors on dairy farming in Poland. Although the approaches differed – quantitative modelling versus normative-analytical – both studies highlighted the need to balance economic efficiency and sustainable development principles. At the same time, this study considered state support as a means of stimulating investment, while the Polish authors focused more on internal farm indicators. The study by M. Barbeta-Viñas & M. Requena-i-Mora (2021) focused on the microeconomic characteristics of small farms in mountainous regions of Spain. The researchers analysed profitability under natural and operational constraints, which contrasted with the focus of this study on policy and cooperation instruments to stimulate investment in Ukraine. However, both approaches agreed on the need to adapt policies and strategies to specific regional conditions.

The study of technological modernisation in the dairy sector in the work of I. Vázquez-González *et al.* (2021) revealed another important parallel. Both studies confirmed the need to update approaches to industry management, but while the Spanish researchers examined the role of education, technology and internal farm organisation, this study analysed the institutional space and macro-political conditions necessary to attract investors. The work of I. Fertő *et al.* (2021) dealt with the regional characteristics of dairy farming in Central and Eastern European countries. The analysis of production scale, logistics and market accessibility complemented the results of this study, which focused on national regulatory mechanisms. Despite differences in geography and methods, both studies emphasised the importance of combining government intervention with adaptability at the farm level.

A comparison with the study by K. Zalewski *et al.* (2022) also revealed a common point – the importance of cooperation in supporting small producers. However, while the Polish authors conducted a financial analysis of the effectiveness of cooperatives, this study considered cooperative models as an element of the institutional environment that increases the attractiveness of the sector to investors. Despite the difference in methods, the important role of collective forms of organisation in stabilising the industry was confirmed. Finally, the study by L. Coyne *et al.* (2021) was dominated by a behavioural approach to assessing the use of antimicrobials in Irish dairy farming. The authors emphasised the need to transform management models and educational interventions to increase the sector's sustainability. These results complemented the conclusions of this study regarding the need for a comprehensive review of public policy with a focus on effectiveness, trust and long-term stability. Both approaches demonstrated the importance of systemic changes at both the micro and macro levels.

The study by A. Cortes *et al*. (2020) examined the adaptation of Spanish dairy farmers to environmental and market changes, particularly through diversification and cooperation. This study also emphasised the importance of cooperation and institutional support, but focused on the role of the state and the private sector in Ukraine. Both studies pointed to the need for structural changes to increase the sustainability of the industry, but had different methodological approaches – socio-economic in one case and institutional-economic in the other. Another study, presented by E. Celik *et al*. (2024), was based on a quantitative analysis of the efficiency of dairy farms in Turkey using Data Envelopment Analysis, evaluating the impact of state subsidies on productivity. Unlike this approach, the present study was not limited to financial efficiency alone, but considered a wider range of instruments – from government support to cooperative practices – analysing not only the effects but also the preconditions for their implementation. Nevertheless, both studies agreed on the positive impact of support on the development of the industry. The study by X. Du *et al*. (2023), conducted in China, revealed the importance of government policy for the sustainable development of the industry, including the environmental component, which resonated with the focus of this study. However, while X. Du *et al*. worked with a quantitative analysis of farmers' attitudes, this study focused on a normative and analytical study of the institutional environment. Similarly, Y. Zhan *et al*. (2025) explored the possibilities of ensuring the sustainability of dairy production through digital tools and big data technologies. This study, in turn, emphasised the importance of cooperative interaction and government regulation as basic mechanisms for attracting investment. Despite the difference in tools, both works considered innovation as a driving force for development.

The work of J. Yi *et al*. (2023) focused on the introduction of precision livestock farming technologies in China as a means of improving production efficiency. Although the researchers worked at the micro level, analysing technological innovations in individual farms, the focus of this study was on the institutional conditions for investment, reflecting a macro-level approach to assessing sectoral transformations. This multi-level logic was supported by the conceptual approach of D. Robinson & W. Dolfsma (2025), who emphasised general models of institutional interaction in agriculture. While their study was more theoretical, this work demonstrated an empirical approach, using examples of the implementation of state, cooperative and private support in the domestic context. In this regard, the study by R.-A. Gheorghe-Irimia *et al*. (2023) was also indicative, which used Romania as an example to evaluate the impact of EU policy on the productivity of dairy farms using econometric tools. Unlike the quantitative model chosen by the authors, this study was based on a normative analysis and systematisation of existing forms of support in Ukraine. However, despite the differences in methods, all of the above-mentioned works emphasised the key role of the institutional environment in strengthening the economic sustainability of dairy production.

Structural changes in the German dairy sector were the focus of a study by M. Böhme (2021), which emphasised the social consequences of the transformations. At the same time, this study paid more attention to economic instruments and support in wartime, focusing on the functioning of the Ukrainian dairy market. Meanwhile, the study by M. Vaarst *et al*. (2024) was global and conceptual in nature, focusing on the transition to agroecology and value-oriented farming. This study, in turn, demonstrated an applied approach aimed at the practical creation of conditions for investment. Despite the difference in scale and approach, both studies recognised the critical role of institutional transformation in shaping a sustainable dairy sector.

A favourable institutional environment is a key factor in stimulating investment in dairy farming. The combination of government support, cooperative models and private initiatives creates conditions for the sustainable development of the industry in the face of internal challenges and external pressures. The formation of an effective system of interaction between all market participants contributes to strengthening economic stability, increasing competitiveness and ensuring food security.

CONCLUSIONS

In 2022-2025, Ukraine's dairy farming showed signs of stabilisation and recovery, despite the profound shocks caused by the full-scale war. The industry suffered significant losses: a reduction in cattle numbers from 1.58 million to 1.155 million, the loss of more than 100 dairy farms, and a decline in investment activity in the eastern territories. At the same time, as of 2025, 125 dairy farms are under construction or modernisation, including large-scale facilities in the Lviv, Khmelnytskyi, Poltava, Chernihiv, and Mykolaiv regions. In the Lviv region, Mukko Milk is building one of the country's largest farms for 2,000 cows in the Morshyn community. In the Khmelnytskyi region, a project is underway to build a farm for 1,200 head of cattle, and 37 family dairy farms are in operation. In the Poltava region, which is one of the key milk producers in Ukraine, nine new family farms were opened in 2022. In the Chernihiv region, the Ichnia Milk and Canning Plant project is underway, which involves the construction of a complex for 4,000 head of cattle. In the Mykolaiv region, an 18% increase in milk production was recorded in 2024, indicating positive dynamics in the southern region. The development of family dairy farms is particularly active – today, 240 farms are operating within the framework of the "Family Dairy Farms" project.

According to the results of 2024, total milk production reached 7.2 million tonnes, and the rate of decline slowed to 2%, which is a sign of stabilisation processes. Profitability indicators show positive dynamics: growth from 23% in 2022 to 40% in 2025. This, in turn, creates the conditions for increased long-term investment. International aid also contributes to this, in particular support from the Food and Agriculture Organization, which covered more than 185,000 households and amounted to 290 million USD. One of the key levers remains the state programme "5-7-9%", which provides access to preferential lending with the possibility of compensation for farm construction costs. In addition, the institutional ecosystem is strengthened by the functioning of the DREAM digital platform, which ensures transparency of investment flows and simplification of procedures.

A SWOT analysis of the institutional environment revealed that although the strengths are the availability of state programmes and international participation, access to support for small farmers and the lack of transparency in project implementation remain weaknesses. In response to these challenges, a number of strategic guidelines have been proposed: the creation of a single agricultural investment register, the introduction of tax holidays for investors, the expansion of cooperative interaction, and the development of regional agribusiness support offices. Of particular relevance are mechanisms for insuring investments in areas of military risk, which will reduce losses and increase investor confidence. Given the challenges of the war period, the priority is to move towards long-term incentives focused on institutional stability, digitalisation of processes, integration into European markets and the development of sustainable business models. The prospect for future research is to develop integrated models for assessing the effectiveness of institutional support, taking into account the dynamics of post-war recovery and the participation of foreign investors in the dairy subsector.

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Формування інституційного середовища для стимулювання довгострокових інвестицій у молочне тваринництво

Анотація. Метою даного дослідження було обґрунтування механізмів підвищення інвестиційної привабливості молочного тваринництва України шляхом удосконалення інституційної підтримки та впровадження ефективних економічних стимулів. У ході дослідження було проведено аналіз нормативно-правового середовища, оцінено динаміку розвитку галузі у 2022 – травні 2025 років, а також вивчено приклади реалізації інвестиційних проектів на рівні агрохолдингів, кооперативів і міжнародних програм. У результаті встановлено, що у 2024 році виробництво молока в Україні становило 7,2 млн тонн, а рентабельність галузі зросла з 23 % у 2022 році до 26 % у 2023 році, з прогнозованим підвищенням до 40 % у 2025 році. У межах проекту «Сімейні молочні ферми» функціонує 240 господарств, а кількість створених нових і модернізованих молочно-товарних ферм досягла 125. Водночас спостерігалося скорочення поголів'я корів із 1,58 млн у 2022 році до 1,155 млн на момент травня 2025 року, що зумовлено втратами від війни та низькою привабливістю для інвесторів у східних регіонах. У дослідженні визначено основні бар'єри, серед яких – складність доступу до фінансування, регіональна нерівність і нестабільність регуляторної політики. Було проведено комплексний аналіз сильних і слабких сторін, можливостей і загроз інституційного середовища на основі якого розроблено практичні рекомендації щодо впровадження єдиного реєстру інвестицій, уніфікованої онлайн-платформи підтримки, розширення кооперації та податкового стимулювання. Запропоновані рішення дозволяють очікувати підвищення інвестиційної привабливості аграрних підприємств на 30-35 % та зростання рентабельності молочного бізнесу до 25-28 % до 2026 року. Практичне значення дослідження полягає в розробці прикладних інструментів для удосконалення інституційної підтримки, які можуть бути використані органами державної влади, громадами та аграрними підприємствами з метою стимулювання довгострокових інвестицій у молочне тваринництво

Ключові слова: ферми; оподаткування; механізм; ризик; державна програма

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Influence of advanced technologies on the development and implementation of marketing strategies in agribusiness

Abstract. The purpose of this study was to assess the impact of advanced technologies on the effectiveness of marketing strategies of agricultural enterprises, in particular, on the processes of developing and implementing innovative approaches in marketing. The research methodology included analysis to identify the strengths and weaknesses, opportunities and threats of implementing technologies in agribusiness, and the analysis of political, economic, social, and

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technological factors on the process of introducing the latest technologies in agriculture. In particular, it was found that the introduction of precision farming reduced the cost of fertilisers by 10-15%, and drip irrigation reduces water consumption by 30-50%, which helped to increase the efficiency of resource use and reduces the ecological footprint of agricultural production. Based on precision farming, agricultural enterprises were able to optimise the processes of growing crops, ensuring an even distribution of fertilisers and pesticides, which also helped to reduce their consumption and the cost of soil treatment. Financial indicators of Myronivsky Hliboproduct showed a significant increase in the company's revenue and export revenue, which amounted to 1.8 billion USD in 2023, which accounted for 60% of its revenue. Another important result was the discovery that digital platforms such as Kernel's "Open Agribusiness" and Astarta-Kyiv's "Agrichain" significantly reduced operating costs by automating most business processes, allowing agribusinesses to focus on strategic development issues. The use of such platforms has helped to reduce the time spent on production and sales management, while ensuring accuracy and transparency of all stages of the production process, which, in turn, increases the competitiveness of enterprises. Special attention was paid to the impact of digital tools on the sales and marketing activities of agricultural enterprises. The results of the study showed that the integration of the latest technologies is a key factor for improving the competitiveness of agricultural enterprises. The practical significance of the study lies in the fact that its results can be used by agricultural enterprises to implement effective digital solutions in marketing activities to reduce costs and increase profitability

Keywords: innovation; personalisation; online store; forecasting; artificial intelligence

INTRODUCTION

Contemporary agribusiness faces numerous challenges, in particular, high competition, changes in consumer needs, the need to adapt to rapid economic changes, and new market requirements. One of the main factors that ensure the competitiveness of enterprises in this industry is effectively developed and implemented marketing strategies. The development of technologies significantly affects marketing approaches, enabling agricultural enterprises to use the latest tools to optimise their processes, in particular, in planning, forecasting, and market analysis.

In the process of developing marketing strategies in agribusiness, there is an increasing importance of adapting to new technological conditions. In particular, E.O. Oliinyk & B.K. Pererva (2024) investigated the use of digital technologies in the marketing of agricultural products, analysing existing market promotion strategies and pointing out the need to improve sales channels and customer interaction. They noted that the use of innovative approaches and digital platforms helped to significantly increase sales efficiency, although there are certain problems in using these technologies in remote regions. In this area, there is a lack of analysis of the use of the latest technologies in advertising campaigns, and the impact of external economic and political factors, such as global crises and changes in legislation, which require more detailed research to develop strategies that work.

In the context of rapid market development and technological changes, the importance of implementing effective marketing strategies for agricultural enterprises increases. N.M. Vdovenko & V.G. Margasova (2023) explored the basics of adapting marketing strategies for agricultural enterprises in the context of global changes and extreme challenges in the agri-food market. They emphasised the need to integrate innovative elements into marketing strategies at all levels, which allows businesses to adapt to changes in the global environment and use the latest technologies to effectively interact with consumers. However, this study did not sufficiently consider the features of the Ukrainian market, especially regarding the adaptation of foreign methods to internal circumstances, such as customer behaviour in Ukrainian social networks.

The introduction of innovative marketing tools for positioning the brand of agricultural enterprises in the agricultural products market

is an important aspect of agribusiness development. I.O. Korchynskyi *et al.* (2024) emphasised the need to use digital platforms, mobile applications, and online marketing campaigns to increase the competitiveness of agricultural enterprises. They emphasised the importance of adapting to external factors such as seasonality, weather conditions, and international impact, and the role of technology in modernising marketing strategies. However, the study did not consider specific aspects of the use of digital tools in agribusiness in the context of unstable domestic policies and external economic influences.

The use of innovative marketing tools in agricultural enterprises is an important area for increasing their competitiveness. T. Ilchenko (2022) emphasised the role of digital technologies and information and communication technologies (ICTs) for the development of agribusiness. She noted that the use of such tools as content marketing, Search Engine Optimisation (SEO), Social Media Marketing (SMM), helps to improve communication with consumers and optimise operational processes. The study showed that most agricultural enterprises have the potential to use these tools, but often face difficulties due to environmental instability and insufficient infrastructure. The introduction of ICT in certain conditions of agricultural business, especially during economic crises and changes in market conditions, has not been sufficiently investigated.

The impact of information technology on marketing strategies is an important aspect of the contemporary business environment. D. Raiko *et al.* (2024) examined the impact of information technology on marketing strategies, particularly by analysing the use of innovations such as data analytics, social media, and e-commerce. The researchers emphasised that these technologies open up new opportunities for personalising marketing campaigns, in particular, through the use of a large amount of consumer data, which helps to more accurately adapt strategies to their needs. There is a lack of sufficient research on the impact of rapid development of information technologies on the adaptation of marketing strategies in conditions of variable competition and market requirements.

Digital marketing of agricultural products is an important tool for reducing costs and expanding the audience. G.M. Ningsih *et al.* (2024) stressed that despite the benefits of digital technologies, farmers face difficulties due to low levels of digital literacy and insufficient infrastructure. Research pointed to the need to further study the effectiveness of implementing digital tools in rural areas, and the impact of economic and social factors that limit access to these technologies. These aspects require additional research to improve the application of digital marketing strategies in agribusiness.

Research on digital trends in agribusiness marketing highlights the importance of using digital technologies to improve marketing strategies for agricultural products. A. Hermawati *et al.* (2021) emphasised that digital marketing is profitable because of its cheapness and simplicity, which reduces costs and increases access to a wider audience of consumers. While research shows the great potential of digital technologies for agriculture, there are drawbacks, particularly in the fact that farmers do not have sufficient digital literacy, and insufficient infrastructure, which limits the use of digital tools in agriculture.

The introduction of digital technologies in agriculture is important for improving the efficiency of agricultural production. W. Gong *et al.* (2024) emphasised the importance of digital services that help farmers to increase their willingness to adopt new technologies, making it easier to access information and reduce costs. Research showed the significant potential of digital technologies to improve productivity, but gaps remain in underestimating their impact on the long-term transformation of agricultural practices. More attention should be paid to how digital services can affect structural changes in agriculture and their long-term impact on productivity.

The purpose of the study was to investigate the impact of the latest technologies on the optimisation of marketing processes in agribusiness, in particular, on the development of innovative approaches in the field of marketing strategies of enterprises. The objectives of the study were: to analyse the use of digital technologies, such as Big Data, AI, and the Internet of Things, in agricultural marketing; assessment of

the impact of these technologies on the competitiveness of agricultural enterprises and their ability to adapt to changes in the market.

MATERIALS AND METHODS

The research focused on the theoretical analysis and empirical study of the impact of advanced technologies on agribusiness, in particular, on their effectiveness in production processes and management practices. The time frame covered the period from 2020 to 2024, which allowed assessing the impact of the latest technologies in the face of constant changes in global and regional markets. The study focused on the main theoretical approaches to the use of Big Data, AI, and automation in agricultural enterprises, and on the practical results of their implementation.

Analysis of scientific publications, in particular by T.R.C. Konfo *et al.* (2023), S. Sahoo & V. Chahal (2023), K. Bazargani & T. Deemyad (2024) was conducted to substantiate the feasibility of using the latest technologies in the field of agribusiness. These sources provided basic conceptual approaches to the study of Big Data, AI, and automation in agricultural production, which became guidelines for determining key research areas, selecting relevant performance indicators and evaluation parameters. These studies were used because of their relevance, scientific validity, and focus on the practical application of technologies in real production conditions, which adapted the obtained approaches to the Ukrainian agricultural context. Specific examples of the introduction of such technologies in agribusiness were considered, in particular, in companies that actively used automated platforms for data collection and analysis, which allowed optimising the cultivation of crops and reducing the cost of fertilisers and pesticides.

Financial and statistical data collected from official sources of Myronivsky Hliboproduct (MHP) (MHP S.A., 2016; MHP SE, 2018; MHP SE, 2023). In addition, data on the implementation of digital platforms such as Systems, Applications and Products in Data Processing (SAP), Power Business Intelligence (Power BI) analytics systems, the use of AI for marketing personalisation, and other corporate initiatives related to innovation in agribusiness were used to analyse technological and strategic changes. MHP (n.d.) was selected for the study because of its significant role in agribusiness in Ukraine and in the international market. The analysis covers the period from 2016 to 2024, which allows considering long-term changes and strategic initiatives that have taken place in the company during this time. Another important part of the study was the investigation of investments in agricultural technologies, in particular on the example of Syngenta (n.d.), which focused on the need to invest in agro and biotechnologies to combat the food crisis (Koretskyi & Kyslytskyi, 2023). This allowed creating more sustainable agricultural systems that can withstand extreme weather conditions, rising temperatures and other challenges facing agricultural enterprises in the face of global climate change.

The study also analysed how digital technologies help Ukrainian agricultural enterprises, such as Kernel (n.d.), which used the Open Agribusiness platform (n.d.), which allowed agribusiness to significantly reduce costs and increase productivity. Astarta-Kyiv (n.d), an agro-industrial holding which had established its own Information Technology company (IT company) AgriChain (n.d.), actively introduced innovative technologies for managing the production and marketing of products. Another important aspect of the study was the use of online stores by agricultural enterprises, using the example of LNZ Web (n.d.), which has significantly improved sales efficiency through digital platforms. This allowed companies to significantly expand their market, attract new customers and provide better access to agribusiness products, which is especially important in the face of economic instability and pandemics.

As part of the study, SWOT and PEST analyses were developed to assess the benefits and possible threats associated with the introduction of the latest technologies in agribusiness. SWOT analysis revealed the strengths and weaknesses, opportunities and threats of new technologies, while PEST analysis helped to assess the impact of political, economic, social and technological factors on the agricultural sector. Based on these analyses, recommendations were formulated for the effective use of digital

technologies to improve the competitiveness of agricultural enterprises.

RESULTS AND DISCUSSION

Innovative technologies in agribusiness: Impact on management processes

Advanced technologies are significantly changing the agricultural sector, not only increasing production efficiency, but also transforming the marketing strategies of agricultural enterprises. In 2020-2024, agricultural companies actively implemented tools such as Big Data, artificial intelligence (AI) and automation, which provided new opportunities for optimising marketing solutions in a dynamic competitive environment. One of the most revolutionary technologies used in agribusiness is Big Data. They allow predicting the state of crops or resource efficiency, but also analysing consumer behaviour, modelling demand, and setting up accurate communication with the market. The use of Big Data helps marketers build target segments and predict customer activity, which is the basis for personalised marketing campaigns (Konfo *et al*., 2023).

AI is actively used to improve the effectiveness of marketing strategies – from analysing large amounts of market data to automating communications, in particular, machine learning algorithms are used to build systems of individual recommendations, chatbots, analysing consumer emotions in social networks, which can significantly increase the conversion rate and customer loyalty (Sahoo & Chahal, 2023). Automation has also become an important factor in improving marketing efficiency. It includes not only technical processes of harvesting, but also automated management of marketing activities: CRM systems, automatic email newsletters, dynamic pricing, and integrated analytical panels. For example, automated field data collection systems allow creating reliable marketing messages about product quality, which is especially important for export contracts (Bazargani & Deemyad, 2024).

Additionally, the use of precision farming and analytical systems allows generating accurate marketing information about the origin, environmental safety, and technological quality of products. In the face of growing requirements for transparency of supply chains, this allows strengthening the company's positioning in the market. For example, due to QR coding systems, customers can check their product history, which increases brand confidence. Investment in technology also contributes to the development of online sales and personalised services. For example, the introduction of robotic harvesting systems has reduced costs by 40%, and automated irrigation systems have reduced water consumption by 30-50%, freeing up resources to strengthen digital marketing (Adewuyi *et al*., 2024). As a result, the use of Big Data and AI can increase yields by up to 40% by accurately planning crops and harvesting, and reducing risks from pests and climate factors (Cropler, 2024). However, for marketing, it also means being able to predict production volumes and plan promotion campaigns based on actual potential.

During 2020-2024, agribusiness actively implements the latest technologies that significantly change management processes and increase production efficiency. One of the most notable trends is the use of Big Data, AI, automation, and other innovative technologies. There is an increase in investment in technological innovations in agribusiness, although the rate of this growth depends on the economic and political situation. However, even in conditions of economic instability and military conflict, many agricultural holdings and private companies continue to actively invest in the latest technologies. One of the main areas of technological development is precision farming. Technologies such as GPS monitoring, humidity and temperature sensors, and fertiliser management systems allow agricultural enterprises to significantly reduce resource costs by optimising the use of fertilisers, water, and pesticides. For example, the use of technologies for precise fertilisation can reduce costs by 15% on large farms, and the introduction of variable standards for the use of pesticides reduces the use of chemicals by 20-30% (Osabohien, 2024).

The use of artificial intelligence in agribusiness is also gaining popularity. AI algorithms help agricultural enterprises to predict yields, identify diseases and pests, and optimise farm management processes. Such tools can reduce the cost of data processing and decision-making, making processes more automated and

efficient. AI is also actively used to improve the weather forecasting system, which is critical for planning agricultural production. Investment in agricultural technologies increased significantly in 2023-2024. For example, Syngenta invests about 1.3 billion USD annually in research and development, in particular, in agricultural technologies. In addition, agribusiness is experiencing an increase in private companies and startups that actively attract investment. Some of these projects are expected to grow by 30-40% annually by 2027 (Koretskyi & Kyslytskyi, 2023). European integration processes also contribute to the introduction of advanced technologies, in particular, in the field of data analysis and resource optimisation.

Precision farming allows agricultural producers to optimise the use of fertilisers and pesticides, which leads to a significant reduction in the cost of these resources. Due to the differentiated application, which considers the specific needs of each area of the field, fertiliser costs are reduced by an average of 7%. If precision farming is widely used, the savings can increase to 14%. The cost of pesticides, in particular, herbicides, is reduced by about 9%, and with the full implementation of technologies, an additional reduction of up to 15% is possible (WEAGRO, 2024a). Some precision farming systems, such as Variable Rate Technology (VRT) systems (Agrivi, n.d.) Geographic Information Systems (GIS), and sensors for measuring soil nutrients, and automatic fertiliser management systems, can save up to 40% of nitrogen fertilisers, which provides significant resource savings.

Precision irrigation technologies also have a significant impact on reducing water consumption. Drip irrigation reduces water consumption by 30-50% compared to conventional irrigation methods, such as furrow irrigation or sprinkling (AgroPortal, 2024). This is achieved by supplying water directly to the root zone of plants, which minimises losses due to evaporation and runoff. Automated irrigation systems that use advanced soil moisture sensors allow controlling the volume of water supply to fields in real time, which allows avoiding both excessive and insufficient moisture. Due to this, farmers can save significant amounts of water, optimising irrigation for the real needs of plants. In agricultural farms that have integrated advanced humidity monitoring systems, there is a constant decrease in water consumption and an increase in resource efficiency.

The use of AI and Big Data can also significantly increase productivity. The introduction of AI in agricultural production allows for yield growth of up to 40% due to precise resource management, optimisation of sowing and harvesting times, and timely response to risks such as pests, diseases, or undesirable weather conditions (Cropler, 2024). Yield monitoring systems based on satellite data, sensors, and drones help to determine the optimal time for fertilisation, irrigation, and processing. This allows significantly reducing losses and ensuring a stable increase in yield. The use of Big Data and automated AI-based solutions also reduces production costs. Optimising the use of resources such as water, fertilisers, and energy can reduce costs by 15-50%, depending on the resource. Automating routine operations such as watering, processing fields, and monitoring plant health significantly reduces the need for manual labour and reduces the risk of human error. It also helps to reduce labour costs and increase the efficiency of agricultural production (PandaTeam, n.d.).

Big Data analytics improves purchasing, logistics, and sales planning while minimising costs associated with market fluctuations and weather conditions. This reduces operating costs, and agricultural enterprises can better respond to changing conditions, which also contributes to higher profitability. The introduction of autonomous technology and AI can increase farmers' incomes by more than 10%, reducing costs and increasing output (Filippov, 2024). The use of advanced technologies in the competitive strategy of Myronivsky Hliboproduct significantly changed its approaches to market activity, allowing the company not only to strengthen its position in the Ukrainian market, but also to become a leader in a number of important segments. Through digital transformation, innovation in manufacturing and marketing, and the active introduction of new value-added products, MHP has been able to ensure competitiveness in both domestic and international markets.

Since the beginning of its digital transformation in 2016, the company has set itself the

goal of becoming a leader in using the latest technologies to quickly adapt to market changes. Digital solutions have become an important strategic priority for MHP, and based on this, it has been able to function effectively even in times of crises, in particular during the COVID-19 pandemic. The early introduction of digital solutions allowed the company to quickly switch to online and hybrid work formats, which gave it a significant competitive advantage, because it allowed it to quickly maintain production and communication processes even in an unstable product situation (Agropravda, 2025).

The change in the company's focus from a raw material producer to a producer of value-added products was a key stage in the development of MHP. Since 2019, the company has significantly increased its presence in such segments as ready meals, snack products, food service, and business-to-business (B2B) solutions. This allowed MHP to become a leader in the production of value-added products, which made it more resistant to fluctuations in the raw material market and reduced its dependence on external economic factors. The active introduction of new technologies in production and marketing has also allowed MHP to significantly strengthen its competitiveness in international markets. In 2024, the company achieved significant success in the export sector, becoming the leader in its industry in Ukraine with export revenue of 1.7 billion USD. This allowed the company to significantly outperform other market players and strengthen its position in the international food market. One of the important elements of MHP's competitive strategy was investment in digital platforms and analytics. The use of such tools as web platforms, customer relationship management (CRM) systems, enterprise resource planning (ERP) systems, and analytical systems allowed the company to better understand market needs, respond faster to changes in demand, optimise logistics processes and improve the quality of customer service. The integration of these digital solutions allowed the company not only to improve customer interaction, but also to manage internal processes more efficiently. Digital technologies have become an important tool for maintaining the company's leadership in the market, ensuring a quick response to changes and competitive advantages in production processes. The introduction of advanced technologies allows MHP to maintain a leading position in the segments of food and value-added products, where the company actively invests in the development of new products and their adaptation to the requirements of different markets (Agropravda, 2025). The introduction of technologies in MHP also affected its financial performance. For the period from 2016 to 2024, the company showed significant growth in revenue and operating profit, which indicates the efficiency of using the latest technologies and innovations. The data is shown in Table 1.

Table 1. MHP's financial performance for 2016-2024 (million USD)

Indicator	2016	2018	2023	2024 (3 quarters)
Revenue	244	1,136	3,000	2,262
Export income	115 (47% of total)	660 (58% of total)	1,800 (60% of total)	1,368
Operating profit	68	283	339	346
Net profit	-71 (loss)	142	142	141
Earnings Before Interest, Taxes, Depreciation, and Amortisation (EBITDA)	89	362	445	437
Operating profit margin	28%	25%	11%	20%

Source: compiled by the author based on MHP S.A. (2016), MHP SE (2018), MHP SE (2023), MHP (n.d)

The integration of advanced technologies into MHP's activities has become a key factor that has determined its financial success and competitive advantages in the market. Based on the introduction of innovations such as Big Data, AI, automation, and digital platforms, MHP was able to significantly improve the efficiency of its operations and strengthen its position in international markets. As can be seen from the financial indicators (Table 1), the company shows

significant growth in revenue and export revenue. In 2023, export revenue was 1.8 billion USD, which is 60% of the company's total revenue, and at the end of 2024, export revenue continued to remain at a high level -1.368 billion USD. This indicates a successful strategy for entering new markets and effectively adapting products to different consumer segments.

The introduction of digital solutions, in particular in terms of automating business processes and collecting market data, allowed MHP to quickly respond to fluctuations in demand and changes in production conditions. The use of the Power BI analytical system for monitoring key indicators in real time allowed management to make timely decisions on adjusting production plans, and the integration of SAP ERP modules, in particular, SAP Logistics Execution and SAP Materials Management, allowed to reduce transportation costs by an average of 8% by optimising logistics routes and centralised accounting of material flows. The transformation of marketing communications gave particularly tangible results: the company completely abandoned TV advertising, instead focusing on digital channels – SEO, contextual advertising Google Ads and interactive campaigns using augmented and virtual reality (AR/VR) technologies. For example, the use of AR to showcase products in a retail network increased consumer engagement and contributed to a 12% increase in online sales in 2023-2024. In addition, the introduction of customer base segmentation based on machine learning algorithms helped to more accurately predict demand in each sales region and generate personalised offers. This reduced marketing costs by 18% and simultaneously increased the conversion rate by 22%, which had a positive impact on the profitability of campaigns (MHP SE, 2023).

Despite the difficult macroeconomic conditions, MHP continued to maintain growth in key financial indicators. In 2024, the company's EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortisation) reached 437 million USD, resulting from a well-structured implementation of digital solutions in manufacturing, logistics, and marketing. Such changes ensured MHP's stable presence in international markets, including an increase in the share of exports in the company's total revenue to 60%, and allowed it to expand cooperation with partners in the European Union, the United Arab Emirates (UAE) and Saudi Arabia (MHP, n.d.).

Comparison of this study with T. Quan *et al.* (2024) showed that both studies focused on using cutting-edge technologies to improve agribusiness efficiency, such as AI, Big Data, and automation, to optimise management processes and reduce costs. Both papers emphasised the role of precision farming and the impact of technological innovations on marketing strategies, which allows increasing the competitiveness of agricultural enterprises. However, T. Quan *et al.* paid more attention to the impact of digital platforms and Big Data analytics on agricultural marketing, and personalisation of marketing campaigns. Instead, the current study focused on the impact of innovative technologies on marketing strategies. In addition, research by T. Quan *et al.* covered the wider application of digital technologies in all aspects of agricultural production, while this study focused more on marketing aspects and the use of online stores to expand sales markets.

Research by K.K. Arthur *et al.* (2024) and the present study focused on the impact of digital technologies such as artificial intelligence and the Internet of Things on agribusiness. Both studies examined the importance of digital innovation for optimising resource management, marketing, and finance. The difference was that research by K.K. Arthur *et al.* paid more attention to the problems of technology adoption in Africa, in particular, the low level of digital skills and insufficient infrastructure, and the current study focused on specific Ukrainian companies and their use of digital technologies to increase competitiveness. Thus, while both studies analysed digitalisation in agribusiness, K.K. Arthur *et al.* focused on the African context, and this study focused on practices in Ukraine.

Research by X. Zhang *et al.* (2024) and the present study also had similarities in their focus on introducing new technologies in agriculture, particularly Big Data and AI, to improve agribusiness efficiency. However, research by X. Zhang *et al.* used the structural equation method to analyse the impact of technology on small farmers in China, while this study focused

on the impact of digital technologies on the marketing strategies of agricultural enterprises in Ukraine. In addition, X. Zhang *et al.* paid more attention to the model of technology adoption among farmers, and this study focused on technologies for optimising business processes in agricultural enterprises. Ultimately, N. Kanellos *et al.* (2024) and the present study focused on the impact of digital technologies on agribusiness, in particular, on reducing costs and improving efficiency. The study by N. Kanellos *et al.* focused on digital marketing strategies and cost optimisation through online channels, while this study focused on precision farming, AI, and Big Data to optimise production and reduce costs.

Advanced technologies such as Big Data, AI, and automation are significantly transforming the agricultural sector, increasing production efficiency and reducing costs. The introduction of these innovative tools allows agricultural enterprises to optimise processes, increase competitiveness and ensure sustainable development in difficult economic conditions.

Introduction of digital technologies in agribusiness marketing strategies to improve efficiency and competitiveness

The introduction of digital platforms and technologies in agribusiness can significantly improve the accuracy of demand forecasts, optimise business processes, and reduce costs. The use of Big Data analytics and machine learning (ML) helps to increase the accuracy of forecasts by 10-20%, which improves resource planning and management, and avoids errors associated with subjective estimates. The introduction of data processing automation reduces the human factor, which, in turn, reduces the likelihood of errors during manual data entry. Based on Big Data and ML technologies, agricultural enterprises achieve margin profitability growth of 2-5% due to optimisation of production, logistics and pricing. Accurate demand forecasts allow reducing inventory by 20-25%, which reduces storage costs and the risk of writing off products. High accuracy of forecasts also ensures timely availability of products in the required place and time, which increases customer satisfaction (Retailers, 2023).

Especially important is the use of technologies to automate marketing processes, which reduces advertising costs by 30-50% (Solodukhina, 2022). This is achieved by optimising advertising campaigns, automatically allocating the budget, and reducing human errors. Automation also reduces the need for personnel by replacing routine tasks with software robots, which reduces salary costs and operating costs. Kernel is one of the largest agricultural holdings in Ukraine, which actively uses digital technologies, in particular drones, to monitor fields, apply fertilisers, and predict yields using satellite monitoring and Big Data. The company's Data Driven Agriculture concept allows making decisions based on Big Data from various sources, such as the Internet of Things (IoT), AI, and satellite imagery. An example of the effectiveness of implementing this concept by Kernel is the significant growth in agricultural production and exports, which was made possible by the use of Big Data analytics for management decision-making. According to Kernel's annual report for fiscal year 2024, the company's revenue increased by 4% compared to the previous year and amounted to 3.581 million USD, which was supported by an increase in sales of grain, sunflower oil, and meal. The volume of processing of oilseeds increased by 24% to 3.2 million tonnes, which was the result of optimisation of production processes and more accurate planning based on data (Kernel Holding S.A., 2024). These indicators show that the strategic use of digital technologies within Data Driven Agriculture allows Kernel to effectively manage all stages of the production and sales cycle, ensuring the growth of financial results and strengthening the company's position in the international market. In addition, Kernel created the open Agribusiness IT platform (n.d.) to exchange experience and results of digital technology implementation with other farms (AgriLab, 2019). Another example is Astarta-Kyiv, an agropromholding that created its own IT company, AgriChain (n.d.), which has developed a comprehensive agribusiness management system consisting of eight software modules, including land bank management, production, logistics, and analytics. AgriChain allows managing logistics, inventory, and production processes in real time, which helped

Astarta exceed pre-war export figures, exporting products to 44 countries and receiving 325 million EUR from exports (53% of total revenue) (Vishnevsky,2020; Astarta-Kyiv, 2024b).

These companies prove that the use of digital platforms in agribusiness not only increases management efficiency, but also significantly reduces costs, improves sales, and increases competitiveness. Entering new markets through digital platforms allows agricultural enterprises to work 24/7, removing geographical restrictions, and attracting new customers. Artificial intelligence technologies for personalising marketing campaigns also show tangible results in terms of customer conversion and sales growth. Personalised offers using AI increase conversion rates by 20-40% and increase sales by 15-30% (Timarevska, 2024). The use of such technologies also allows reducing marketing costs and optimising advertising budgets. Table 2 below illustrates changes in marketing metrics after the introduction of digital technologies.

Table 2. Impact of digital technologies on marketing metrics

Indicator	Changes after the introduction of digital technologies	Notes
Conversion rate growth	↑ by 20-40%	Due to personalised campaigns and smart recommendations.
Increase in sales	↑ by 15-30%	Personalisation of offers and encouragement of repeat purchases.
Reduction of advertising costs	↓ by 30-50%	Automation of marketing processes, optimisation of budget allocation.
Improvement of customer loyalty	↑ through personalised communication and offers	Increase in repeat purchases and brand loyalty.

Source: Retailers (2023), A. Timarevska (2024)

As the table shows, the use of digital technologies and automation of marketing processes allows agricultural enterprises to increase the efficiency of their operations, reduce costs, and increase profitability. For example, the implementation of the integrated AgriChain system, which includes CRM, allowed Astarta-Kyiv to increase the efficiency of business processes, which was confirmed by the growth of segment revenue by 28% year-on-year (up to 146 million EUR for 9 months of 2024) (Astarta-Kyiv, 2024a). Personalisation of marketing campaigns using AI helps not only to increase conversions, but also ensures constant customer loyalty. As a result, agribusinesses become more adaptive to market changes and can better manage their resources and costs. The introduction of digital platforms and technologies, such as Big Data, machine learning, and artificial intelligence, can significantly improve the efficiency of agribusiness. This ensures sales growth, margin profitability and cost reduction, and allows businesses to reduce the impact of the human factor and increase the accuracy of forecasts, which ensures adaptability and competitiveness in the market.

Among the Ukrainian agricultural companies that successfully use online stores to sell their products, one of the most prominent is LNZ Group with its own LNZ Web platform. The company has been actively developing its online sales channel for more than two years, which allows it to successfully sell seeds and plant protection products throughout Ukraine. This was made possible not only by the development of the digital platform, but also by a strategic approach to integrating new technologies into business processes. One of the most important aspects of the LNZ Web online store is a significant expansion of the product range. This allowed the company to meet more consumer needs and provide a higher level of customer service. An important factor was the opportunity to get an online consultation with an agronomist, which is essential for farmers and agricultural producers who need specialised assistance. The platform also provided convenient logistics through a partnership with Nova Poshta, which allows efficient and fast delivery of products across the country (Kurkul, 2021).

The growth in the number of customers and the volume of online orders has become an obvious indicator of the effectiveness of implement-

ed digital tools. Mykola Mandra, head of LNZ Web, noted that the company receives regular customers from different regions of Ukraine, which confirms the correctness of the platform's development strategy. LNZ Group serves more than 3,000 clients in 19 regions of Ukraine with the help of 100 managers and 5 logistics centres, which provides extensive coverage and support for sales growth. In 2024, LNZ Group increased the area under key crops (soybeans by 20%, rapeseed by 60%, wheat by 20%), which indicates the expansion of the customer base of agricultural producers, potentially increasing the demand for seeds and SPR, which are sold through LNZ Web due to this, sales volumes are steadily growing, which indicates the effectiveness of the online store as an important sales channel (LNZ web, n.d.).

Together with online stores, agricultural enterprises actively use marketing in social networks, which is one of the main tools for product promotion. For example, the company BigBlue, which grows blueberries by implementing SMM strategies, was able to increase sales through social networks three times in a year. This channel has become an important source for 10% of the company's total sales. For small and medium-sized agricultural enterprises that work directly with end users, the share of sales through social networks can reach 70-100% (AgroPortal, 2021). Such results demonstrate the effectiveness of social networks for sales growth in agribusiness, which makes them an important tool for achieving success in the digital environment. One of the biggest achievements of social media marketing is increasing the conversion rate, which increases by 20-40% due to personalised content, direct communication, and quick response to customer requests. This allows agricultural enterprises to significantly increase sales, increase customer loyalty, and ensure long-term stability in the market (AgroMarketing Agency, 2023).

Personalisation and targeting are among the most effective tools in marketing of agricultural products. In the face of high competition and growing consumer demands, agricultural enterprises need to use these tools to improve the effectiveness of their marketing campaigns, attract new customers, and retain existing ones. Based on a personalised approach, farmers can create offers that best meet the interests and needs of a particular consumer, which as a result increases the level of customer satisfaction and loyalty. Personalisation in the marketing of agricultural products involves adapting advertising materials, products, and services to the individual needs of each client. By collecting and analysing data about consumer behaviour, preferences, purchases, and other factors, a company can create personalised offers that will be more attractive to a specific audience. Modern tools, such as CRM systems and Big Data analytics, allow effectively tracking customer needs and building strategies for interacting with them. For example, using your purchase history, geolocation data, and even seasonal factors helps to more accurately predict customer needs and offer them exactly the product that will be most in demand (Casaca & Miguel, 2024).

Targeting is an important component of personalisation and is aimed at accurately identifying the target audience for each marketing campaign. In agribusiness, targeting allows achieving more effective communication with potential customers by choosing exactly the group of consumers that is most likely to be interested in a product or service. Advertising platforms, such as Google Ads or social networks (e.g., Facebook, Instagram), offer tools for creating detailed targeting based on various criteria, such as demographic characteristics, interests, online behaviour, and other data (Mccall, 2024). It is especially important to use targeting to promote agricultural products through online stores and marketplaces. By analysing user data, agricultural enterprises can determine exactly which of the potential customers may be interested in their products, and personalise advertising offers for each of them. For example, Nasha Ryaba targets ads for families who regularly buy chicken for household consumption, offering them discounts or promotions on certain types of products that best suit their taste preferences. In addition, the company actively uses personalised offers for business customers, such as restaurants and supermarkets, where wholesale discounts on certain products can be offered (Nasha Ryaba, n.d.).

In addition, personalisation and targeting help agribusiness reduce advertising costs, since companies do not spend money on general

advertisements for a wide audience, but focus only on those potential customers who are most likely to make a purchase. This allows optimising advertising budget and increasing conversion rate. For example, LNZ Group, with the LNZ Web platform, targets farmers from certain regions where specific crops are popular, which allows increasing the effectiveness of marketing campaigns and ensuring greater accuracy in reaching the target audience (Kurkul, 2021). Thus, personalisation and targeting in the marketing of agricultural products are powerful tools for improving the effectiveness of interaction with customers, reducing advertising costs, and increasing sales. The use of advanced technologies for data collection and analysis gives agricultural enterprises the opportunity to create offers that most accurately meet the needs of each client, which contributes to increasing loyalty and long-term relationships with customers.

Comparison of this study with the papers by F. Sudirjo *et al.* (2023) and X. Yu *et al.* (2024) identified both common and distinctive aspects. X. Yu *et al.* focused on the introduction of multimedia platforms to promote the adoption of "green" agricultural technologies among farmers in China, in particular, by reducing barriers to the perception of new technologies. This study focused more on optimising agribusiness in Ukraine through digital platforms for marketing products. Although both studies emphasised the importance of sustainable environmental technologies, X. Yu *et al.* focused on "green" technologies, while the current study focused on general business processes in agribusiness. The study by F. Sudirjo *et al.* (2023) and the present study also had a similar focus on improving the efficiency of agribusiness through the use of technology. F. Sudirjo *et al.* investigated the automation and monitoring in poultry farming. Both studies highlighted the importance of technological innovation in improving production processes, but F. Sudirjo *et al.* concentrated on poultry farming, and this research was focused on sustainable development through digital platforms. In addition, F. Sudirjo *et al.* focused on Indonesia, while this paper analysed Ukraine and environmental agricultural practices.

L. Lomov-skykh *et al.* (2019) and G. Chiaraluce *et al.* (2024) and this study also focused on implementing the latest technologies to improve the efficiency of agribusiness, in particular, AI, automation, and Big Data. However, G. Chiaraluce *et al.* took a more global approach, analysing the impact of technologies on various aspects of agricultural production at the international level, while this study focused on helping small and medium-sized agricultural enterprises in Ukraine to adapt to the market through digital platforms to optimise marketing strategies and reduce costs. Comparison with the study by L. Meziani *et al.* (2024) found that both studies focused on using the latest technologies to improve agribusiness efficiency. However, L. Meziani *et al.* placed more emphasis on smart technologies to optimise production processes and reduce costs, while this research focused more on digital platforms to optimise marketing and sales processes, such as Open Agribusiness and AgriChain.

The study by R. Abiri *et al.* (2023) and the present study focused on the introduction of digital technologies to improve the efficiency of agribusiness, in particular, automation and Big Data. R. Abiri *et al.* considered the use of smart technologies to optimise production processes, such as automated irrigation and monitoring systems, while this research focused on digital platforms to improve marketing strategies and product marketing. R. Abiri *et al.* analysed agricultural enterprises in Indonesia, while this study focused on Ukrainian companies such as Kernel and Astarta-Kyiv. Regarding comparison with the study by P. Bagri (2024), then both studies had similar features, as they also looked at the use of the latest technologies, such as artificial intelligence, Big Data, and automation, to improve the efficiency of agribusiness. Both studies highlighted the importance of digital platforms, especially online shopping, to reduce costs and improve product availability. However, P. Bagri focused more on precision farming and automating production processes such as irrigation and fertiliser use, while this study focused on digital platforms such as Open Agribusiness and AgriChain to optimise marketing and sales processes, as well as the use of online shopping to expand markets.

The study by B. Fasciolo *et al.* (2024) and the present study also focused on using digital technologies to improve agribusiness efficiency.

However, B. Fasciolo *et al.* covered a wider range of Industry 4.0 technologies, such as IoT, AI, and blockchain for agricultural supply chains, while the current study focused more on the practical application of Big Data and automation in Ukrainian agricultural enterprises. B. Fasciolo *et al.* used bibliometric analysis to study general trends in agricultural technologies, while this study focused on real-world practices in Ukraine. Both studies highlighted the importance of technology for improving efficiency, but differed in methods and application context.

Challenges and prospects for implementing technologies in agribusiness

The introduction of the latest technologies in the marketing strategies of agricultural enterprises is an important aspect for improving their efficiency and competitiveness in the market. However, there are various barriers to this that can slow down or complicate the process. The study considers the main problems and opportunities that open up for agribusiness in a changing market. One of the main barriers is the high initial costs of implementing new technologies. The lack of necessary technical infrastructure, especially in rural areas, makes it difficult for agricultural enterprises to access modern digital solutions. This can make it difficult for small and medium-sized agribusinesses to innovate without proper support from the state or financial institutions. In order to assess in detail the strengths and weaknesses, opportunities and threats that accompany the introduction of the latest technologies in agribusiness, a SWOT analysis was performed, which is presented in Table 3

Table 3. SWOT analysis of the introduction of the latest technologies in agribusiness

Strengths	Weaknesses
■ Increase productivity through precision farming and automation ■ Access to new markets through digital platforms ■ Reduction of resource costs through automation and monitoring	■ High initial costs for implementing technologies ■ Lack of necessary technical infrastructure in rural areas ■ Not enough qualified personnel to work with new technologies
Opportunities	**Threats**
■ Expansion of sales markets through online stores and marketplaces ■ Collaboration with technology companies to develop new solutions ■ State support for innovation and environmental standards	■ Economic instability may reduce the availability of financing ■ Lack of reliable infrastructure for digital solutions in rural areas ■ Deterioration of the political situation may make it difficult to finance innovation

Source: compiled by the authors based on J.H. Al-Ammary & M.E. Ghanem (2024)

SWOT analysis showed that the introduction of the latest technologies in agribusiness has significant potential to increase productivity, reduce resource costs, and access to new markets. Strengths include increased efficiency through precision farming and automation, which can reduce the cost of fertilisers, pesticides, and water. However, there are also significant weaknesses, such as high initial costs for implementing technologies, which can become a barrier for small and medium-sized farmers. The lack of technical infrastructure is also an important problem, especially in rural areas where access to high-speed Internet and the necessary technological facilities is limited. The potential for development lies in cooperation with technology companies and government support for innovation. A worsening economic situation or instability in financial markets can pose serious threats to agribusiness, as they limit the availability of financing for large investments in new technologies. Based on these factors, the key to successful implementation of the latest technologies will be an integrated approach, including state support, improving the technical infrastructure and ensuring that employees are

qualified to work with new systems. Consideration of these aspects will minimise weaknesses and maximise opportunities for farmers. Equally important is the assessment of external factors, such as political, economic, social, and technical factors that can influence the success of new technologies. For this purpose, the PEST analysis is presented in Table 4.

Table 4. PEST analysis of technology implementation in agribusiness

Political factors	Economic factors
■ Government agribusiness support programmes can help to integrate new technologies ■ Policies on environmental standards and sustainable development encourage agribusinesses to innovate	■ High technology implementation costs, funding constraints ■ Economic crises may limit the availability of credit and investment
Social factors	**Technological factors**
■ Growing digital literacy among farmers ■ Consumer needs for more environmentally friendly and high-quality products	■ Development of new technologies in agribusiness, such as IT and AI ■ Problems of compatibility of various technological solutions in existing systems

Source: compiled by the authors based on J.H. Al-Ammary & M.E. Ghanem (2024)

PEST analysis provided a detailed idea of the impact of external factors on the process of implementing the latest technologies in agribusiness. Political factors, such as government support programmes and environmental regulations, can significantly encourage agricultural enterprises to innovate, creating a favourable environment for development. However, economic difficulties, such as crises or instability in financial markets, can make it difficult to access the necessary investments, which creates obstacles to large-scale adoption of technologies. Social factors also play an important role: growing digital literacy among farmers and changing consumer habits can be a driving force for innovation. But technical factors are still a major concern, as many agribusinesses do not have access to the advanced infrastructure needed to implement the latest technologies, such as satellite data or sensor systems. The greatest potential for development lies in improving the social component through training and advanced training programmes for farmers, which will reduce dependence on limited technical infrastructure. It is also important to encourage government support in the form of subsidies and grants for small and medium-sized enterprises, which will allow them to overcome financial barriers and participate in the transformation of agribusiness through innovation. Thus, the analysis of the problems and opportunities of introducing the latest technologies in the marketing strategies of agricultural enterprises concluded that although there are many barriers to innovation, there are significant opportunities for the development of agribusiness in the context of digitalisation. Synergy between government support programmes, infrastructure improvements, and social initiatives aimed at improving digital literacy is an important prerequisite for success. The development of these areas will allow agricultural enterprises to maximise the benefits of the latest technologies, such as precision farming, automation, and Big Data, to increase efficiency and competitiveness in the market.

Based on the results of the study, a number of practical recommendations are formulated aimed at improving the efficiency and competitiveness of agricultural enterprises by introducing advanced technologies. To improve the competitiveness of agribusiness, it is important to introduce the latest technologies that can not only increase the efficiency of production processes, but also ensure the stability of enterprises in a changing market. However, in order to maximise the potential of such technologies, both their advantages and limitations must be considered. First of all, it is necessary to focus on the use of precision farming, process

automation, and the use of Big Data and AI to predict yields and optimise resource costs.

The main recommendation is to introduce technologies that can reduce the cost of resources, in particular, fertilisers, pesticides and water. Precision farming technologies, such as GPS navigation and systems for differentiated application of fertilisers and pesticides, can significantly reduce the excessive use of chemicals and water, which not only reduces costs, but also has a positive impact on the environmental sustainability of production. An example of successful implementation of such technologies is Epicenter Agro, which implemented Real-Time Kinematic (RTK) positioning, which allowed increasing the productivity of agricultural machinery by 10% and reducing the cost of material resources by 5%. In addition, losses from theft and irrational use of fertilisers decreased. Adaptation to such technologies should become a strategic priority for farmers, as it allows not only to save resources, but also to increase profitability by reducing processing costs and improving product quality (WEAGRO, 2024b).

For the successful implementation of these technologies, it is important to provide farmers with the necessary knowledge and support. At a time when many agricultural enterprises have limited access to advanced technical infrastructure, especially in rural regions, it is necessary to create training and advanced training programmes for employees. Through such initiatives, it is possible to reduce the digital divide and ensure efficient use of the latest technologies. A key element of this process should be the development of infrastructure, including access to high-speed Internet, which would allow implementing all the advantages of digital platforms and automated systems.

Equally important is the introduction of intelligent systems for demand forecasting, supply chain management, and logistics process optimisation. The use of Big Data helps to effectively predict market trends, determine the best moments for buying and selling, and carry out accurate planning of production processes. An example is VITAGRO (n.d.), one of the largest agricultural groups in Ukraine, which actively implements artificial intelligence for data analysis, yield forecasting and supply chain optimisation. They also use IoT to collect real-time data, enabling more efficient logistics management, monitoring of machinery, fields, and climate change. In 2024, investments in technological improvement of the production of plant protection products (PPP) helped to increase the productivity of two production lines by 30%, and lines for the production of liquid complex fertilisers – by 40%, which provided an output of up to 7.5 million litres of PPP and 3.5 million litres of fertilisers per year. The use of intelligent systems has helped to increase yields and reduce costs, in particular, by more accurate planning of production and delivery of products. The introduction of intelligent systems, in particular, AI and IoT, in supply chains and manufacturing allows for more accurate planning of production and logistics, which helps to reduce costs and increase yields, although specific figures for these indicators have not been made public. Plans to invest an additional 2 million USD in production assets in 2025-2026 indicate a strategic focus on innovation and technological development, which should further improve production efficiency. Given the current trends, it is important to be prepared for changes and introduce innovations that ensure sustainability and maintain competitive advantages (Interfax-Ukraine, 2024).

In particular, the integration of AI technologies into agribusiness marketing strategies is an important component for improving customer interaction. Personalisation of offers, ad targeting, and process automation allow creating more accurate and effective marketing campaigns that help to increase customer conversion and loyalty (Riabchyk *et al.*, 2021). For example, the introduction of chatbots to automate communication with customers, and the use of personalised recommendations based on data analysis, allows agricultural enterprises to reduce marketing costs, while increasing the effectiveness of advertising campaigns.

Another important component is the integration of agribusiness into global digital platforms that allow not only to expand sales markets, but also to ensure effective communication with partners and customers (Zamkova *et al.*, 2021). The use of online stores and marketplaces opens up new opportunities for selling products in domestic and foreign markets, in particular, by

simplifying the purchase and delivery process, and improving access to potential customers.

Successful adaptation to a changing market also requires flexibility in strategic decision-making for agricultural enterprises. Based on technologies such as Big Data analytics, artificial intelligence, automated yield monitoring systems, digital production management platforms (such as AgriChain) and weather forecasting systems, agribusiness can quickly respond to changes in market conditions, economic fluctuations or natural factors affecting production processes. Considering current trends, it is important to be prepared for changes and introduce innovations that ensure sustainability and maintain competitive advantages (LaZebnik, 2024).

Based on the analysis of current trends, it can be concluded that the effective use of technologies to improve the competitiveness of agribusiness requires an integrated approach, including integration of the latest technologies, training of personnel, improvement of technical infrastructure, and adaptation to a changing market. An important step is the state's support for innovation initiatives, which would allow small and medium-sized agricultural enterprises to reach new levels of efficiency and sustainability in the market.

The study by B. Wang & H. Dong (2023) and the current study had a common focus on using digital technologies to improve agribusiness efficiency, but their approaches and contexts differed. B. Wang & H. Dong focused on studying factors that influenced the adoption of digital agricultural technologies among farmers in China, such as productivity expectations, social impact, and availability of technical facilities. They stressed the importance of socio-cultural aspects for the successful implementation of technologies. This study focused on optimising marketing and production processes through the use of Big Data and AI in agribusiness in Ukraine. While both studies highlighted the importance of technological innovation in reducing costs and improving the competitiveness of agricultural enterprises, study B. Wang & H. Dong considered the behavioural aspects of technology adoption, while this research highlighted technical aspects such as automation and business process optimisation.

Research by N.E. Benti *et al.* (2024) and this study also focused on using digital technologies to improve agribusiness efficiency, particularly through AI, IoT, and Big Data applications. In the study by N.E. Benti *et al.* the main focus was on the use of technologies for soil monitoring and water management in Ethiopia, while this study focused on optimising agribusiness in Ukraine through digital platforms for product marketing and marketing. Both studies recognised the importance of technology for improving agricultural production efficiency, but differed in the context of technology applications. N.E. Benti *et al.* paid more attention to monitoring and forecasting in agriculture, and this study focused on precision farming and business process automation. However, both studies recognised the importance of investing and supporting farmers to introduce the latest technologies and remove barriers to their implementation.

The study by C. Byahatti & P.C. Ramgouda (2024) and this study also highlighted the use of digital technologies in agriculture. C. Byahatti & P.C. Ramgouda investigated the application of technologies in India's agribusiness, in particular, to optimise production processes and improve crop quality. The current study focused more on using digital platforms to optimise marketing processes and product sales in Ukraine. The main difference was that C. Byahatti & P.C. Ramgouda focused on solving the problems of Agriculture in India, in particular the lack of infrastructure and traditional production methods, while this study analysed the more developed situation in Ukraine, where technologies were actively used in agribusiness, in particular for marketing and sales.

The study by R. Valdes *et al.* (2023) and this study had a common focus on using technology to develop agribusiness, but with different approaches. R. Valdes *et al.* focused on the social and production factors that influenced the adoption of technologies among farmers in Chile, in particular, on new irrigation methods and optimisation of production processes. This study focused on the use of digital platforms for marketing and marketing products in Ukraine, optimising business processes. Both studies highlighted the importance of technology for improving competitiveness, but R. Valdes *et al.* paid more

attention to the production aspects, while this study focused on marketing and sales processes.

A comparison of different studies showed similarities in the focus on using technologies to improve competitiveness, but with differences in approaches to their application in different contexts. In particular, the emphasis varies between marketing processes, production aspects, and the impact of socio-cultural factors. Given the importance of digitalisation for the development of agribusiness, it is important to further study these technologies and support their implementation in the agricultural sector.

CONCLUSIONS

As a result of the research, it was determined that the introduction of advanced digital technologies significantly changes approaches to the development and implementation of marketing strategies of agricultural enterprises. Innovative solutions, including Big Data, artificial intelligence (AI), automation, and digital platforms, enable businesses to move from mass to personalised forms of customer interaction, reduce product promotion costs, and increase profitability. The use of Big Data and analytical systems allows agricultural companies to develop accurate forecasts of demand for various types of products, which reduces inventory by 20-25% and reduces storage and write-off costs. Simultaneously, personalisation of marketing campaigns based on consumer behavioural models can increase the conversion rate by an average of 20-40%. The use of AI in marketing activities, including dynamic pricing systems, chatbots for customer service and intelligent recommendation algorithms, allows reducing advertising costs by 30-50% and simultaneously increasing sales by 15-30%. Automation of production processes, from seed drills to harvesting robots, also contributes to significant cost savings. The introduction of robotic systems can reduce labour costs by 40% and reduce water supply costs by up to 30%. This allows agricultural enterprises not only to improve the accuracy of work, but also to ensure stability in production, which is critical for ensuring food security.

The integration of advanced technologies into MHP's operations has become a key factor in its financial success and competitive advantage in the market. MHP has significantly improved the efficiency of its operations and strengthened its position in international markets through the introduction of innovations such as digital platforms, artificial intelligence, automation, and Big Data. Financial indicators showed a significant increase in the company's revenue and export revenue. The company's export revenue was 1.8 billion USD in 2023, accounting for 60% of its revenue. Until the end of 2024, it remained high at 1.368 billion USD. This indicates a successful strategy for entering new markets and effectively adapting products to different consumer groups. The introduction of data processing automation reduces the human factor, which also minimises the likelihood of errors during manual data entry. This allows increasing the margin yield by 2-5% and reducing the inventory of goods by 20-25%, which reduces the cost of storing and writing off products. Thus, digital technologies are becoming not just an auxiliary element, but the core of a advanced marketing strategy in agribusiness. Their integration ensures accuracy, adaptability, and high performance of solutions, which are key factors for success in a competitive market.

A limitation of this study was the lack of access to detailed statistical data on the introduction of digital technologies in small and medium-sized agricultural enterprises in Ukraine, which made it difficult to conduct an in-depth analysis of the effectiveness of their application. The prospects for future research are the development and implementation of a methodology for collecting and analysing data on the use of digital technologies in agribusiness, which would help to more accurately assess their impact on the efficiency of enterprises and develop recommendations for optimising their application.

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Вплив сучасних технологій на формування та впровадження маркетингових стратегій в агробізнесі

Анотація. Метою даного дослідження було оцінити вплив сучасних технологій на ефективність маркетингових стратегій агропідприємств, зокрема на процеси формування та впровадження інноваційних підходів у маркетинг. Методологія дослідження включала аналіз для виявлення сильних і слабких сторін, можливостей і загроз впровадження технологій у агробізнес. А також аналіз політичних, економічних, соціальних та технологічних факторів на процес введення новітніх технологій у сільське господарство. Зокрема, було встановлено, що впровадження точного землеробства дозволяє знизити витрати на добрива на 10-15 %, а крапельний полив зменшує витрати води на 30-50 %, що сприяє підвищенню ефективності використання ресурсів і знижує екологічний слід аграрного виробництва. Завдяки точному землеробству агропідприємства змогли оптимізувати процеси вирощування сільськогосподарських культур, забезпечивши рівномірний розподіл добрив та пестицидів, що також допомогло знизити їх споживання і витрати на обробку ґрунтів. Фінансові показники Миронівського хлібопродукту показали значне зростання доходу та експортного виторгу компанії, який склав $1,8 млрд у 2023 році, що становило 60 % її доходу. Іншим важливим результатом було виявлення того, що цифрові платформи, такі як «Open Agribusiness» компанії Kernel і «AgriChain» компанії Астарта-Київ, значно знижують операційні витрати, автоматизуючи більшість бізнес-процесів, що дозволяє агропідприємствам зосередитися на стратегічних питаннях розвитку. Використання таких платформ допомогло зменшити час на управління виробництвом і збутом, забезпечуючи при цьому точність та прозорість усіх етапів виробничого процесу, що в свою чергу підвищує конкурентоспроможність

підприємств. Особливу увагу було приділено впливу цифрових інструментів на збутову та маркетингову діяльність агропідприємств. Висновки дослідження свідчать, що інтеграція новітніх технологій є ключовим фактором для підвищення конкурентоспроможності агропідприємств. Практичне значення дослідження полягає в тому, що його результати можуть бути використані агропідприємствами для впровадження ефективних цифрових рішень у маркетингову діяльність з метою зниження витрат і підвищення прибутковості

Ключові слова: інновації; персоналізація; інтернет-магазин; прогнозування; штучний інтелект

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Consumer behaviour in the Ukrainian food market under current conditions

Abstract. The purpose of this study was to determine how economic instability, inflation, war, and socio-demographic changes affected the consumer behaviour of the population of Ukraine in the food market. The average per capita income, dynamics of food costs, changes in prices for basic products, and demand for Ukrainian and imported goods were analysed. An analysis of the strengths, weaknesses, opportunities, and threats of current marketing strategies was also conducted. The

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study found that the average salary increased from 11,600 UAH in 2020 to 21,473 UAH in 2024, but in USD it fluctuated due to inflation – from 430 USD to 371 USD in 2022 and to 532 USD in 2024. In 2024, inflation was 12%, and food prices increased by 14.1%, including vegetables – by 48.3%, butter – by 33.9%, milk – by 18.8%, bread – by 18.2%. The share of food costs remained high – from 47% to 53%. In the period from 2020 to 2024, inflation in Ukraine experienced significant fluctuations: from 5% in 2020 to a peak value of 26.6% in 2022, followed by a decrease to 12% in 2024. About 25% of consumers reduced their food costs, and 6 out of 10 Ukrainians chose promotional products. Online food sales rose from 6% in 2021 to 19.4% in 2023. Food exports in 2024 increased by 13% and reached 24.6 billion USD. It was found that urbanisation (73% of the population), average household size (2.9 people) and high level of education (73% with higher education) significantly influenced the transformation of consumer habits. The practical significance of the study lies in the fact that its results can be used to adapt companies' marketing strategies to changes in consumer behaviour in conditions of economic instability

Keywords: inflation; demand; food; costs; marketing strategies

INTRODUCTION

In conditions of economic instability, inflationary processes and socio-political changes, consumers are forced to adapt their habits to new realities, in particular, the demand for food is changing. Given the increase in prices for basic products and the increase in interest in healthy food and organic products, there is a need for an in-depth analysis of the factors influencing consumer behaviour in Ukraine. In addition, the digitalisation of shopping processes, the development of online trading and the changed role of advertising in the context of information congestion create new opportunities for understanding trends and adapting businesses to the needs of consumers.

Changes in consumer behaviour in the Ukrainian food market in conditions of economic instability are caused by higher prices, lower incomes of the population and the war, which led to a decrease in demand for luxury goods and an increase in interest in essential products. N.S. Kosar *et al.* (2022) revealed an increase in demand for health and safety products, and an increase in the role of online trading, in particular, due to mobility restrictions. However, the research did not cover the influence of psychological and cultural factors on consumer behaviour in war conditions, which requires additional study. Consumer behaviour in the food market is an important aspect for understanding demand and optimising marketing strategies. T.V. Chernychko *et al.* (2023) investigated these factors, finding that price, quality, packaging, and brand reputation are key when choosing products. The majority of respondents prefer Ukrainian brands, and the main places for shopping are large retail chains. However, the impact of cultural and social factors on consumer habits remains poorly understood and requires further research.

Consumer behaviour in the market of goods for outdoor activities during the war became an important aspect of the study, considering the changes that have taken place in Ukraine. N. Mashchak & D. Vorona (2023) investigated how the war changed the buying habits of Ukrainians, in particular, in the category of goods for outdoor activities. The researchers found that demand for these products has declined due to economic instability, but support for Ukrainian producers is growing, and the use of online purchases is increasing. A more detailed study of the factors that influence consumer behaviour in war conditions, in particular psychological and social aspects, and the study of changes in consumer motivation under the influence of support for Ukrainian producers, are issues that require additional investigation.

Studying consumer behaviour in international trade is important for understanding market changes. N.V. Dziubanovska (2024) studied modelling of consumer behaviour considering globalisation and international trade, focusing on the impact of economic, social, and cultural factors on demand in international markets. The results of the study show the importance

of adapting companies' strategies to changes in consumer preferences. On the other hand, forecasting demand and adapting supply to the local context need to be improved.

The study of the Ukrainian vegetable market during the war became necessary due to the negative impact of military operations on production and sales. O.V. Semenda & I.I. Korman (2024) analysed changes in the vegetable market caused by the fighting, in particular, the loss of export potential, the destruction of infrastructure, and the reduction of production due to the occupation of territories. The researchers paid attention to the adaptation of agricultural enterprises to new conditions, the development of marketing strategies to ensure efficiency in crisis conditions. The study did not sufficiently consider the impact of social changes and adaptation of consumer preferences in war conditions, which requires additional analysis.

Changes in the socio-economic environment significantly influence consumer behaviour, which requires research into the theoretical foundations of this behaviour in the new conditions. V.A. Litynska (2024) analysed various approaches to the concept of "consumer behaviour" and suggested types of behaviour that correspond to current consumer trends. Models of consumer behaviour, in particular, the need and motivation model and the decision-making model, were considered. These models helped companies to predict consumer behaviour and develop marketing strategies. However, more attention needs to be paid to the impact of digital technologies and social media on consumer habits.

Consumer behaviour undergoes significant changes due to socio-economic factors such as income levels, changes in prices, employment, social context, and consumer culture. G. Lopushnyak *et al.* (2025) examined these factors and identified three main strategies for consumer behaviour in Ukraine: focusing on current consumption using own and credit resources, minimising current consumption, and limiting consumption for future investment. The study also showed how war has transformed consumer patterns among different populations. However, the study did not fully cover the impact of new technologies and psychological aspects, which requires further study. Analysing consumer behaviour in the face of constant socio-economic changes is important for understanding how factors such as economic instability, changes in income and prices affect consumer decisions and their consumption strategies. L. Kvasnii *et al.* (2024) examined the impact of factors such as income levels, price changes, and social context on consumer behaviour strategies. They identified key strategies, including focusing on current consumption and investing in the future. However, the impact of psychological factors and digitalisation on consumer habits requires further study.

The purpose of this study was to investigate the impact of modern economic and social conditions on consumer behaviour in the food market in Ukraine. The objectives of the study were: analysis of factors that determine the change in consumer preferences in the food market in conditions of economic instability; assessment of the impact of war and changes in the social environment on the supply and demand of food products in Ukraine.

MATERIALS AND METHODS

The study applied a practical approach with a focus on the analysis of actual changes in the behaviour of Ukrainian consumers in the food market during 2020-2024, considering the circumstances of the war, economic challenges, political tensions, rising inflation, and a decrease in the purchasing power of the population during this period. In the course of the study, the influence of economic instability on changes in consumer preferences was studied, in particular, the following indicators were considered: average per capita income of the population in Ukraine (Labyak, 2025), dynamics of household spending on food (AgroPortal, 2023), changes in prices for basic foodstuffs and demand for basic necessities (Inflation in Ukraine in 2024..., 2025).

Special attention was paid to the analysis of social and demographic factors, which included the age structure of the population (Ukraine population, n.d), the level of urbanisation (Sinko, 2024), average household size (Ukraine

Longitudinal Survey, 2023). And social changes, in particular, internal and external migration (But *et al*., 2023). In addition, data on the level of education of the population and existing social programmes and initiatives aimed at supporting families with children were considered, with a particular focus on those categories affected by military operations. The study of social support covered government events, and projects implemented with the participation of international organisations, in particular, the United Nations Children's Fund (UNICEF, n.d.), and the initiative for internally displaced persons "Support and integration of internally displaced persons for 2025-2027" (Project "On the approval of the National Target..., 2023) and orphans together with the Foundations "Children of Heroes" and "Together We are Stronger" (Children of Heroes, 2023).

The analysis of the impact of inflation and changes in prices on consumer behaviour was carried out based on statistics of the National Bank of Ukraine (National Bank of Ukraine, 2021; Ekonomichna pravda, 2022; National Bank of Ukraine, 2023), which allowed tracking the dynamics of changes in the cost of basic consumer goods during the study period. Separately, data on changes in the average monthly income of Ukrainians in both UAH and USD terms were considered to identify the relationship between the level of income and consumer habits.

The study also analysed changes in demand for food products, in particular, in the context of partial replacement of Ukrainian products with imported ones (In the first half of 2024, imports..., n.d.). These aspects were considered in light of war-related constraints, logistical difficulties, and changing consumer priorities. In addition, based on the collected information, SWOT analysis of strengths, weaknesses, opportunities and threats was carried out – an analysis of current marketing strategies used to adapt businesses to changes in consumer behaviour. Based on this analysis, reasonable recommendations were formed to improve approaches to interaction with target consumer groups. The last step was to predict consumer trends based on statistical data and the results of previous studies.

RESULTS AND DISCUSSION

Analysis of current economic and social factors influencing consumer behaviour in the food market in Ukraine

Economic instability in Ukraine, caused by the war, high inflation, and falling real incomes, directly affected the consumer preferences of the population. In the context of the economic crisis, declining purchasing power, high inflation rates, and job shortages, Ukrainians are forced to change their habits and adapt to new realities. In 2020, the average per capita income in Ukraine amounted to 74,688 UAH, which was 4.5% more compared to 2019. However, in 2021, despite the fact that 50.8% of the population received incomes above the minimum wage, rising inflation (to 8.6% in 2024) began to limit purchasing power (State Statistics Service..., 2022). In 2022-2023, due to a full-scale invasion, real incomes of the population fell, in particular, due to the destruction of infrastructure, rising unemployment, and migration of the working-age population. The decline in purchasing power became apparent: about 44% of Ukrainians were forced to reduce food costs by changing the consumer basket (Dudka, 2024). In 2024, despite the increase in the minimum wage and subsistence level, inflation and instability remained important factors. As social standards were frozen and inflation was projected at 10%, real income growth remained minimal. This has further affected the low-income segments of the population, who are trying to save on basic needs (Labyak, 2025).

In response to economic difficulties and changes in the financial situation, consumers began to show greater sensitivity to prices, in particular for food. The dynamics of food spending, in particular the share of food spending, remained one of the highest in Europe from 2020 to 2024. In 2020, the share of food expenditures was 53.2%, in 2021 it decreased to 50.1% (Structure of total expenditures..., n.d.), and in 2022 it accounted for about 41% of the average Ukrainian's income. In 2023, this figure was 41.6%, while in 2024, food products remained the second largest item of expenditure after mandatory payments, accounting for 34% of the household budget (Kikhtenko, 2023; Kozhemyakin, 2025).

This decrease in the share of spending is conditioned by both inflation and structural adjustment of the consumer basket due to war and economic pressure (Fig. 1). Demand for affordable products remained high, especially bread, meat, and dairy products, which shows a tendency to save money and avoid more expensive goods (AgroPortal, 2023).

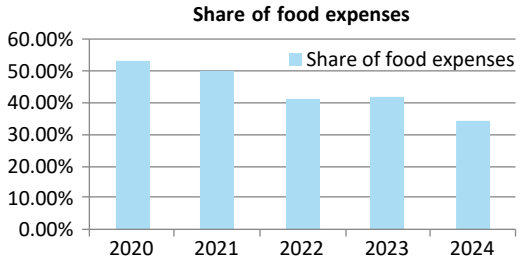

Figure 1. Dynamics of food spending in 2020-2024

Source: compiled by the authors based on the AgroPortal (2023), V. Kikhtenko (2023), S. Kozhemyakin (2025)

One of the important factors influencing changes in consumer preferences is the increase in prices for basic foodstuffs. According to data for 2024, food prices in Ukraine increased by 14.1% compared to 2023, which significantly exceeded the inflation rate (12%). Most of all, vegetables (+48.3%), butter (+33.9%), sunflower oil (+20.9%), milk (+18.8%), bread (+18.2%), and fruits (+16.4%) rose in price. As a result of rising prices, consumers were forced to adapt their purchases, choosing more affordable alternatives or reducing the volume of consumption of certain goods (Inflation in Ukraine in 2024..., 2025).

Against the background of high prices, there is an increase in the popularity of food products that are affordable, nutritious, and easy to prepare. For example, dumplings, traditional dough products with a variety of fillings, remain popular due to their availability and satiety. Sourdough products that have better digestibility and better taste qualities are also gaining popularity. In times of economic instability, there is also a growing demand for protein products, especially meat organs, which are advertised as sources of protein and vitamins. Consumption of plant-based foods such as legumes, tofu, vegetables, and lentils is increasing, which not only support health, but are also more economical food options (Asoyan, 2024).

Against the backdrop of the economic crisis and war, there is also a change in the structure of household spending. Consumers are increasingly choosing economically affordable food products. The share of food expenditures in 2024 was 48-49% of the family budget, which is the highest among all major categories of expenditures and significantly exceeds the European average (12-18%). The war also affected consumer habits, forcing people to focus on more affordable and cost-effective products. These changes in consumer preferences have become important for marketers, who must adapt their strategies to the new environment, given the increased sensitivity to prices. However, businesses consider these changes and adapt their sales strategies to meet the new needs of consumers (Ukrainian consumer sentiment..., 2025).

Economic instability, inflation, and war have also led to a significant decline in the purchasing power of the population. In 2024, 25% of Ukrainians were forced to save on food and choose cheaper products due to rising prices and lower real incomes. Along with this, discounts have become an important tool for maintaining demand for food products. About 6 out of 10 Ukrainians choose promotional products during the crisis, which indicates an increase in sensitivity to prices. However, while discounts and promotions help to drive demand, they often do not generate new customers, but only redistribute existing sales (Samoiliuk, n.d.). Consequently, economic instability, war, and inflation significantly affect the consumer behaviour of Ukrainians. Changes in income, price sensitivity, and a shift in consumer preferences in favour of economically affordable goods are important aspects that need to be considered when forming marketing strategies and price policies in the food sector. In times of crisis and war, consumer habits change, and the main strategies are aimed at saving and adapting to new conditions.

Social and demographic changes are important factors that significantly affect consumer behaviour, as they change the needs, preferences, and priorities of consumers. In the current

conditions of economic instability, war and migration, the demographic structure of the population of Ukraine has undergone significant changes, which in turn determines the types of demand and consumer habits. One of the main factors influencing consumer preferences is the age distribution of the population. In 2025, 57% of the population of Ukraine was made up of people aged 25 to 64 years, which was the main working age group. 15% are people over 65 years of age, which indicates an increase in the share of older people in the total population, and this creates demand for medical services, medicines, and goods for older people. In 2025, the median age of the population of Ukraine was 41.8 years, which confirms a significant share of the average age in a society marked by pragmatism in shopping and a tendency to choose more durable goods (Ukraine population, n.d.).

In 2024, 73% of the population of Ukraine lived in urban conditions, which indicates a steady trend towards urbanisation. The urban lifestyle, which includes greater mobility, access to technology, and convenience of shopping, affects consumer preferences. Urban residents are more focused on the latest technologies, innovative products, and convenient online shopping platforms (Sinko, 2024). Therefore, the needs of consumers in urban and rural areas differ significantly: rural areas have more demand for household goods and durable goods, while urban areas are dominated by technology, mobility, and entertainment.

Household size also determines consumer behaviour. In 2024, the average household size in Ukraine was 2.9 people, which is an indicator of significant changes in the structure of families compared to previous years. Reducing the size of families contributes to an increase in demand for individual goods, including products suitable for small households, such as ready meals, personal gadgets and appliances. In addition, households of Internally Displaced Persons (IDPs) have a slightly smaller average size – about 2.5 people, which may be a consequence of the need to live together in war conditions and temporary resettlement (Ukraine Longitudinal Survey, 2023).

Social changes, in particular migration trends, also affect consumer preferences. Since 2022, more than 6 million Ukrainians have gone abroad, which has significantly affected the demographic situation and demand for goods. In particular, the consumer behaviour of Ukrainians abroad may differ greatly from the behaviour of people who stayed in Ukraine. Young people who are actively migrating may be more focused on fashionable and innovative products than older people who stay at home and try to save money. The level of education is also an important factor determining consumer behaviour. As of 2022, 73% of the adult population of Ukraine had higher education. This indicates a high level of education among the population, which affects the demand for more intelligent goods and services, such as books, educational platforms, popular science materials, and technologies for self-education (But *et al*., 2023).

During the full-scale war in Ukraine, a number of social programmes and initiatives were implemented to support families with children, especially those affected by military operations. Families of fallen servicemen receive one-time monetary assistance, which is an important support for affected families. Family support programmes are also actively implemented, including assistance in matters of paternity, prevention of family problems, and support in difficult life situations. The UNICEF "Jointly" programme (UNICEF, n.d.) – a humanitarian initiative that provided monetary assistance to families with children, internally displaced persons, large and low-income families. It allowed such categories of citizens to support the consumption of essential products, compensating for the growing cost of food. Given significant inflation, this support played a stabilising role for food demand among the most vulnerable groups. The comprehensive programme of social support for veterans and their families (Comprehensive programme..., 2023), adopted in 2023, covered not only psychological adaptation, but also financial assistance. In particular, it provided for subsidies, direct financial support, and employment assistance. This allowed veterans' families to maintain basic economic stability and not be excluded from the food consumption market. And the initiative "Support and integration of internally displaced persons for 2025-2027" (Project "On the approval of the National

Target..., 2023) provided for monetary assistance, temporary housing, access to education and health services. Through financial benefits and humanitarian kits, IDPs were able to cover food costs while maintaining their participation in the domestic consumer market, despite losing their permanent place of residence or work. Charitable foundations "Children of Heroes" and "Together We are Stronger" (Children of Heroes, 2023) implemented programmes to support orphaned children and families who lost their breadwinner. These programmes provided both regular financial assistance and product certificates. Such targeted support ensured the consumption of a minimum set of food products, even in households that found themselves in extremely difficult living conditions. In general, these programmes played a stabilising role in the food consumption system. They reduced the burden on local budgets, supported the purchasing power of vulnerable categories of the population, and prevented the final collapse of demand for basic food products in the face of war, inflation, and mass migration.

Demographic changes and social transformations that are taking place in Ukraine significantly affect consumer habits. Changes in the age and family structure of the population, the level of urbanisation, migration trends, and the level of education form new trends in the market and determine the demand for goods and services. Adapting to these changes is an important aspect for businesses, as understanding social and demographic factors allows them to more effectively meet the needs of consumers and anticipate the development of the market in the future.

The study by C. Richartz *et al.* (2025) and the present study focused on analysing changes in consumer behaviour in the context of crisis factors. C. Richartz *et al.* investigated the impact of the COVID-19 pandemic on consumer preferences in Germany, in particular, on the growth of demand for sustainable goods and local brands, while this study analysed the impact of the war in Ukraine on consumer habits, in particular, contributing to the support of Ukrainian producers not only through economic, but also patriotic motives. Both studies highlighted an increase in demand for basic necessities, especially food products, due to high prices and lower incomes. However, the main difference was that research by C. Richartz *et al.* used sophisticated methods to assess willingness to pay for sustainable products, while the current study focused more on changes in consumer demand for basic products and services.

As for the comparison with study by A.-K. Jacobs *et al.* (2024), both studies analysed changes in consumer behaviour due to socio-economic changes. However, the research contexts varied significantly. This study focused on Ukraine, where war and economic instability forced consumers to reduce spending on food and focus on more affordable goods. Research by A.-K. Jacobs *et al.* focused on Germany and considered the attitude of consumers to innovative products, in particular artificial meat, focusing on environmental, ethical, and health-oriented motivations. Both studies emphasised the impact of external crises on consumer habits, but this study focused on the economic crisis and the war in Ukraine, and study by A.-K. Jacobs *et al.* – on innovative products, such as artificial meat, in Germany. This study also addressed support for Ukrainian goods, while A.-K. Jacobs *et al.* paid more attention to sustainable products because of ethical beliefs.

The study by J. Żurek & M. Rudy (2024) and O. Duralia (2023) and the present study focused on changing consumer behaviour under the influence of socio-economic shocks, in particular, a pandemic or war. In the study by J. Żurek & M. Rudy, changes were related to COVID-19 and panic purchases, a reduction in the frequency of store visits, and a reorientation to online channels. The study by O. Duralia considered the pandemic as the cause of a global restructuring of economic and consumer models, but without focusing on social consequences. But this study examined the consequences of the war in Ukraine, where changes in consumer behaviour were accompanied not only by economic factors, but also by social support for affected groups. Compared to previous study, this paper covered demographic changes and the impact of government programmes more deeply.

The current study and the paper by W. Chen *et al.* (2024) had a general focus on changing consumer preferences under the

influence of socio-economic factors. The current study considered how the war and the economic crisis in Ukraine changed consumer habits, in particular, shifted the demand for affordable products. However, W. Chen *et al*. focused on the impact of health insurance programmes in China, which contributed to the growing interest in healthy eating among consumers. Both studies highlighted the importance of social and economic factors in changing consumer habits. In this study, economic difficulties, in particular declining incomes, forced consumers to reduce spending on expensive products. In the study by W. Chen *et al*., social programmes allowed consumers to choose healthier foods through economic incentives.

Economic instability in Ukraine, caused by war, inflation, and declining incomes, has significantly affected consumer preferences. During the crisis, Ukrainians were forced to adapt their habits, reducing spending on expensive products and focusing on basic necessities. Rising prices and falling incomes contributed to increased demand for local products, which was conditioned not only by economic, but also by patriotic reasons. Demand for affordable and fast-cooked food has increased, while spending on expensive imported goods has declined. Changes in the cost structure showed that consumers became more sensitive to prices, which affected the demand for cheaper products. Social initiatives and support programmes also helped to adapt consumer preferences during the economic crisis.

Investigation of supply and demand in the food market in Ukraine: Statistics and trends

Between 2020 and 2024, the average income of Ukrainians experienced significant fluctuations caused by economic instability, inflation, and war. In 2020, the average monthly income was about 11,600 UAH, which is equivalent to 430 USD. Already in 2021, this figure increased to 14,000 UAH (514 USD), which indicated a certain improvement in income. However, in 2022, against the background of a full-scale war, the average salary increased to 14,857 UAH, but in dollar terms it fell to 371 USD due to the devaluation of the hryvnia and significant inflation. In 2023, there was a gradual recovery in the average salary, which reached 17,442 UAH (477 USD), but purchasing power remained lower than before the war. In 2024, the average salary increased to 21,473 UAH (532 USD), but inflation and high prices still limited the real income of the population, in particular, in the low-income segments of the population (Minfin, n.d.). This increase in income was only partly due to inflationary processes. Figure 2 shows the dynamics of the average salary in Ukraine in the period from 2020 to 2024.

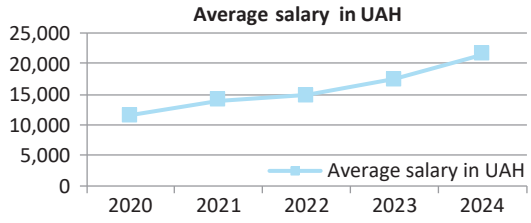

Figure 2. Dynamics of average wages in 2020-2024 in UAH
Source: compiled by the authors based on Minfin (n.d)

During 2020-2024, the average salary in Ukraine grew steadily. This indicates a gradual economic recovery, despite external and internal challenges, in particular war and inflation. From 2020, when the average salary was 11,600 UAH, by 2024 it reached 21,473 UAH, which indicates a significant increase in income in nominal terms. However, it is important to note that this growth was not unhindered, as it was accompanied by high inflation, which reduced the real purchasing power of the population. Figure 3 shows the actual fluctuations in average wages in relation to the USD exchange rate.

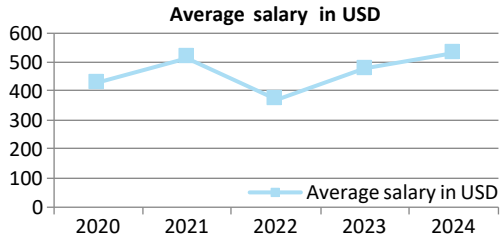

Figure 3. Dynamics of average wages in 2020-2024 in USD
Source: compiled by the authors based on Minfin (n.d)

The chart (Fig. 3) of the average salary in USD indicates significant fluctuations due to the devaluation of the UAH. In 2020, the average salary in dollars was 430 USD, but due to economic instability, devaluation of the hryvnia and high inflation, in 2022 it decreased to 371 USD. This suggests that although nominal wages have increased, real purchasing power has fallen significantly. Only in 2024, wages in dollars recovered to the level of 532 USD, but it still remained lower than before the war, which confirms the existence of economic difficulties for the population.

During this period, the inflation rate also experienced significant fluctuations. In 2020, inflation was 5%, which corresponded to the target range of the NBU (National Bank of Ukraine, 2021). In 2021, inflation accelerated to 10%, mainly due to rising energy prices and increased consumer demand (Ekonomichna pravda, 2022). In 2022, inflation reached a record 26.6%, driven by the effects of war, infrastructure destruction, and significant spending on security and military needs (National Bank of Ukraine, 2023). However, in 2023, inflation slowed to 5.1%, due to the stabilisation of the economy and tough measures taken by the National Bank (National Bank of Ukraine, 2024). In 2024, inflation rose again to 12%, which was conditioned by inflationary pressures and a recovery in consumer demand (National Bank of Ukraine, n.d.). The graph of inflation dynamics for 2020-2024 is shown in Figure 4.

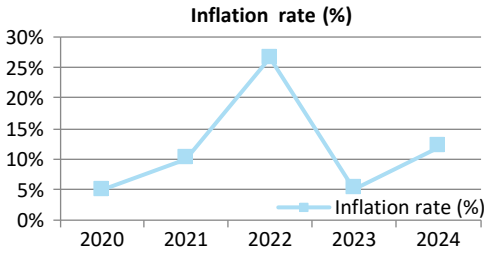

Figure 4. Dynamics of the inflation rate in Ukraine in 2020-2024

Source: compiled by the authors based on National Bank of Ukraine (2021), Ekonomichna pravda (2022), National Bank of Ukraine (2023)

In general, the inflation rate was marked by sharp fluctuations, reflecting the impact of both internal and external factors, in particular war and economic instability, which highlights the complexity of the economic situation in Ukraine during this period. In response to economic difficulties, Ukrainians began to change their consumption habits. Demand for food products has changed, in particular, there was an increase in spending on food, which accounted for 37% of Ukrainians who increased their spending due to higher prices. The average grocery bill increased by 19% in offline stores and by 18% in online stores compared to the pre-war period. Consumers began to focus more on affordable products and promotional offers, and reduced purchases of expensive delicacies and premium products (Ukrainians increased their..., 2025). Demand for expensive delicacies and alcoholic beverages decreased by about 9%. One of the important trends was the growth of online food purchases, the share of online purchases increased from 6% in 2021 to 19.4% in 2023, which demonstrates the desire of consumers to find favourable offers and ease of delivery (Main trends of grocery..., 2024).

From 2022 to 2024, the consumer perception of ready meals also changed. In 2023, sales of cooking increased by 24%, among the most popular dishes were salads, grilled chicken, homemade patties, pizza, and sausages in dough. This indicates the desire of consumers for fast, convenient and affordable food options, which is especially important in the context of the economic crisis. With food prices rising 14.4% in 2024, consumers were forced to reconsider their purchases, reducing spending on less important products and choosing more cost-effective alternatives. This process became necessary due to the fall in real incomes, which, in turn, forced 25% of Ukrainians to save on food (Gertseva, 2024).

One of the most important aspects of this period was the stable growth of demand for Ukrainian food products, while the demand for imported products also increased. Ukrainian consumers preferred Ukrainian goods because of their availability, lower price, and logistical difficulties with imports. Exports of Ukrainian food products increased by 13% and amounted to 24.6 billion USD in 2024, which confirmed the high demand for Ukrainian agricultural

products both in the domestic and foreign markets. Demand for imported products also increased, in particular, for fish, seafood, alcoholic beverages, and ready meals, which indicates a change in the structure of demand for food due to wars and economic challenges (Tarasovsky, 2025).

Due to the decline in production capacity in Ukraine and interruptions in logistics, part of the demand for food was covered by imports, especially in large cities and regions where there was a shortage of certain goods. Imports of agri-food products increased by 10% in the first half of 2024 compared to 2023. The growth in demand for imported products is also confirmed by the trend of growth in imports of finished food products by 23% in 2023 compared to 2022 (In the first half of 2024, imports..., n.d.). In general, the demand for Ukrainian food products remained consistently high, but due to logistics challenges and infrastructure destruction, the demand for imported products also increased, especially in specific categories such as seafood, alcohol, and ready meals. However, total consumption has not yet returned to pre-war levels.

Thus, economic instability in Ukraine, in particular the war and high inflation rates, have significantly changed the consumer preferences and habits of the population. Increased sensitivity to prices, reduced costs for expensive products and the advantage of economically affordable goods became the defining aspects of consumer behaviour of Ukrainians during this period. These changes not only reflect economic difficulties, but also define new trends that require adaptation of marketing strategies in the market.

R. Mudrak *et al.* (2022) pointed out that changes in the structure of agri-food production affect the growth of consumer prices, which, in turn, shapes new consumer behaviour in the food market. Comparison with the study by E. Anastasiadou *et al.* (2020) showed similarities in recording changes in consumer behaviour under the influence of crises, but the causes and contexts of these changes differed significantly. While in Europe COVID-19 and the associated lockdowns caused a surge in demand for basic products and hygiene items due to fear and stress, in Ukraine it was the war that drove the transformation. Ukrainian consumers focused not only on price availability, but also on supporting a local producer, which was formed under the influence of patriotic sentiments. Thus, although both situations caused adaptation, in the European experience the emphasis shifted to safety and health care, while in the Ukrainian experience – to survival and solidarity.

E. Costa *et al.* (2024) also talked about the impact of economic instability on consumer decisions with the focus on seafood choices in Sweden. Swedish respondents showed sensitivity to price, but simultaneously sought a healthy diet. The Ukrainian case, on the other hand, showed a shift in favour of simple, nutritious, and affordable basic necessities – bread, meat, milk. Thus, while in Sweden economic uncertainty has stimulated prudent but still proactive food decisions, in Ukraine it is mainly reactive adaptation to harsh reality. A different vision of consumer change was presented by T. Hu *et al.* (2024), who examined the voluntary choice of young Chinese people in favour of organic products. The main determinants were environmental values, health care, and the impact of marketing. On the contrary, in Ukrainian conditions, the motivation was forced: reducing costs, switching to promotional offers, and searching for cheaper alternatives. As a result, although both studies recorded an increase in interest in healthy eating, in China it was a conscious choice, and in Ukraine it was a consequence of socio-economic pressure.

The study by F. Fernqvist *et al.* (2024) was distinguished by an attempt to integrate a multi-level model of influence on food choices – from individual to cultural. Based on a systematic review, the idea of eating behaviour as a result of multifactorial interaction was formed. This is significantly different from the Ukrainian case, where immediate survival factors dominated: accessibility, simplicity, and discounts. If the analysis by F. Fernqvist *et al.* was based on the influence of norms and attitudes, then it was about adaptation in conditions of scarcity and uncertainty. The study by H. Moshtaghian *et al.* (2023) examined the behaviour of Swedish consumers in relation to upcycled products, where the main motives were ethics, naturalness, taste, and price. Proponents of such nutrition showed conscious environmental responsibility. But the study of the Ukrainian market analysed forced

reactions to inflation and declining incomes: the choice of simpler and cheaper goods, a decrease in consumption volumes. That is, although both studies dealt with the ethical component of consumption, in Sweden it was the engine of choice, and in Ukraine it was a secondary factor against the background of survival.

In 2020-2024, the economic situation in Ukraine remained unstable, which affected the level of income and consumer behaviour of the population. Rising inflation and the war have led to increased price sensitivity and a reorientation of consumers to affordable goods. There was a reduction in spending on non-priority products and an increase in the role of discounts and online trading. In general, consumer habits have been transformed under the influence of economic challenges and the need to adapt to new conditions.

Marketing strategies and recommendations for adapting businesses to changes in consumer behaviour

In 2020-2024, the food market in Ukraine underwent significant changes under the influence of the economic crisis, war, inflation, and changes in consumer preferences. The effectiveness of current marketing strategies used by companies in the face of economic instability depends on the ability to respond quickly to changes in demand, especially for basic necessities such as bread, milk, meat, and groceries.

One of the main strategies is to focus on reducing costs and offering economically affordable products. The market is experiencing an increase in demand for local products, which is also an important element of companies' strategies aimed at supporting the Ukrainian manufacturer. As inflation and declining purchasing power significantly affected income levels, consumers began to pay more attention to discounts, promotions, and cost-effective alternatives. Moreover, changes in consumer preferences, in particular, the growing popularity of online shopping, required the adaptation of marketing strategies to new sales channels and new formats of communication with customers. Table 1 shows a SWOT analysis of current marketing strategies.

Table 1. SWOT analysis of current marketing strategies for adapting businesses to changes in consumer behaviour

Strengths	Weaknesses
■ Well-developed sales network in online channels. ■ Increased demand for local products due to patriotic sentiments ■ Focus on essential products ■ Positive attitude to promotions and discounts that stimulate demand	■ Need for significant investment in the transition to digital platforms ■ High competition in the market of affordable goods. ■ Lack of strategies to support the premium segment in the face of falling purchasing power ■ Uncertainty about the stability of the economy and exchange rates
Opportunities	**Threats**
■ Expansion of the product range in online stores. ■ Introduction of new loyalty strategies and programmes for regular customers ■ Development of new marketing channels, such as social networks and mobile applications	■ Constant growth in raw material prices and inflation ■ Reduced solvency of the population, which leads to a reduction in demand ■ Reduced confidence in imported goods due to the political situation

Source: compiled by the authors based on R. Rijitha (2021)

SWOT analysis indicates that there is a significant potential for developing marketing strategies in the food market, even in conditions of economic instability. Among the strengths, it is especially worth noting the active use of online sales channels, focus on the basic needs of the population, and the growth of loyalty to local brands, which creates a favourable basis for the development of stable demand. There are internal limitations – in particular, the need for financial investment for digital transformation and the lack of strategies for the premium segment, which is losing ground against the background of declining purchasing power.

The existing opportunities open up prospects for introducing new loyalty tools, expanding the range in the online space, and actively using advanced digital channels, in particular social networks. However, these opportunities are accompanied by serious threats – rising inflation, falling real incomes of the population and foreign policy risks that affect import supplies and overall market stability. These risks include the introduction of new trade restrictions, sanctions against individual supplier countries, blocking of sea routes or threats to logistics security as a result of military operations, which significantly complicates the provision of constant commodity circulation and creates price fluctuations. Thus, the key task of a business is to turn its own strengths into competitive advantages, effectively using external opportunities and minimising the impact of threats through flexible strategic planning.

Marketing strategies in conditions of economic instability should be flexible and adapted to new realities, in particular, to the decline in the purchasing power of the population and the transformation of consumer preferences. During a crisis, consumers change their priorities, preferring essential goods, discounts, promotions, and cost-effective purchase formats. In this regard, businesses should actively use online platforms, which have become an important channel of interaction with the client. For example, in 2023, the volume of online sales of food and alcohol increased by 65% in USD and by 85% in UAH compared to 2021 (In 2023, the amount of online..., 2024). This indicates a significant increase in demand for online shopping in this category. Due to economic difficulties, it is important to provide favourable offers for consumers, focusing on discounts and promotions to support the demand for essential products (Dekimpe *et al*., 2023).

In addition, companies should focus on supporting local manufacturers and offering cost-effective products that meet changing consumer preferences. Ukrainian products are more attractive, not only because of the price, but also because of the support of local producers, especially in war conditions. The share of Ukrainians who claim to buy goods/services of Ukrainian manufacturers increased from 69% in December 2022 to 74% in 2024. The main motives are the desire to support the national producer (57% of respondents) (Gradus Research Plus, 2024). Another important area is the development of loyalty programmes that can help to retain customers in difficult economic conditions. Loyalty programmes should be aimed at attracting regular customers and creating personalised offers. The VARUS PERFECT loyalty programme has shown high efficiency – 82% of customers choose a network based on this programme. About 30,000 new members join it every month, and the number of active users of the mobile application has exceeded 170,000. The share of checks using the loyalty programme is 57%. The average receipt with a loyalty card is 35% higher than the total online receipt. The programme contributed to an increase in the frequency of purchases and customer retention (Retailers, 2024).

An important step is to expand the range of products and innovative products that meet the requirements of a healthy diet and sustainability. Healthy foods and eco-friendly products are becoming increasingly popular with consumers, and companies need to focus on these trends. The inclusion of organic and sustainable products in the range really contributes to improving the brand image and attractiveness of products in the market. This is confirmed by the growing demand for local and environmentally friendly products in Ukraine. In particular, according to Gradus Research, 74% of Ukrainians prefer Ukrainian products, and 37% are ready to experiment with new brands, which opens up opportunities for the development of organic and sustainable products. In addition, the growing popularity of private label brands, which often include organic and eco-friendly products, also indicates a tendency to choose more sustainable products. For example, in the ATB chain, private label products already account for 26% of the product range, and this share is growing, especially in categories where quality and affordability are important (Melnyk, 2024).

It is predicted that in the coming years, consumer behaviour in Ukraine will remain focused on economy and availability of goods. Inflation and the economic crisis will continue to determine consumer choice, so demand for essential

goods will remain consistently high. In 2023-2024, 77% of the budget of Ukrainians accounted for housing, food, medical services and transport, which significantly exceeds similar figures in Poland (46%) and Germany (51%). Moreover, vacation expenses did not exceed 3% – several times less than the European average of 15-20%. Demand for premium products may continue to decline due to falling real incomes: 37% of Ukrainians have already increased spending exclusively on food and medicine, while reducing spending on children's goods (by 39%) and building materials (by 48%). E-commerce will continue to grow, although currently 72% of Ukrainians still prefer traditional shopping in stores. Electronics (17%) and cosmetics (15%) have the largest share of online sales. Companies that can adapt their strategies to the demand for healthy food and environmental friendliness will gain competitive advantages: 28% of consumers are willing to pay a higher price for products of companies that support the Armed Forces of Ukraine, and 62% avoid brands operating in the Russian market. This shows the new priorities of Ukrainians – economy, sustainability, and social responsibility (Ukrainian consumer sentiment..., 2025).

Marketing strategies in the food market in Ukraine should be adapted to the new economic realities. In the face of economic instability, it is important to focus on economically affordable products, develop online trading, and focus on supporting local producers. The development of loyalty programmes, promotions, and discounts will help to retain regular customers and attract new ones. Simultaneously, focus on healthy food and sustainable products can become an important element of companies' strategy for the future. S.D. Rietz & A. Kremel (2024) examined barriers and motivational factors that influenced the consumption of products in circular packaging. The researchers concluded that despite the positive attitude towards reusable packaging, the actual behaviour of consumers often did not coincide with their intentions. This has created challenges for sustainable initiatives. In contrast, this study did not record a gap between intentions and actions, but a forced restructuring of eating habits in response to a crisis – war, inflation, and scarcity. The sustainability of consumption faded into the background, giving way to pragmatic solutions.

The study by S. Labiad & S. Marso (2024) focused on emerging markets and consumer sentiment towards organic products. The researchers emphasised the high potential of organics, which was held back by distrust, prices, and lack of information. Both in Ukraine and in developing countries, health remained an important motive. However, if S. Labiad & S. Marso saw prospects for the growth of this segment with the right marketing strategy, in the Ukrainian reality, financial restrictions often made organic products inaccessible. C. Varghese *et al.* (2024) focused on consumers' willingness to pay more for recycled products. Their research showed that customers' decisions were influenced by brand, labelling, and environmental messages. In the Ukrainian context, price, basic quality and stable availability of goods remained key. Thus, although both studies focused on the influence of external factors on behaviour, motivations differed significantly: conscious choice in a stable environment versus forced adaptation to a crisis.

The study by A. Dudziak *et al.* (2023) indicated an increase in interest in local products in Poland, which was explained by ethnocentrism and support for the national manufacturer. In Ukrainian conditions, there was also an increase in demand for Ukrainian goods, but it was caused by savings and logistical difficulties. Thus, similar behavioural manifestations were formed for various reasons: in Poland – for patriotic identification reasons, in Ukraine – for the purpose of survival. R. Stotten (2024) proposed a sophisticated analytical framework for analysing Switzerland's food regime, in which global, regional, and local sub-regimes interacted. This helped to understand how culture, economics, and politics affect consumer habits. The Ukrainian study showed a different dynamic – the dominance of short-term economic factors that replaced the structural transformations of the system.

In the study conducted by S. Xu *et al.* (2024), examined how digital financial instruments affect consumption levels in rural areas of China. They showed that digital services have helped to expand consumer opportunities and improve the quality of life. In Ukraine, households were forced to save money, limit non-basic

expenses and adapt to external pressure. That is, if in one case digitalisation opened up new horizons, in the other – narrowed the choice. The study by M.C. Onwezen & H. Dagevos (2024) analysed factors that contributed to reduced meat consumption and the adoption of alternative proteins. The researchers found that motivation, awareness, and social norms played a crucial role. In the Ukrainian case, changes in food habits were determined by inflation, lower incomes, and logistics barriers. If voluntary transformation dominated Europe, then forced adaptation dominated Ukraine.

V. Haider *et al.* (2022) focused on the potential of environmental beliefs to transform the diet. The researchers examined how consumers in Austria can voluntarily change their habits for the sake of sustainability. In the Ukrainian reality, such a transformation has not become a priority – consumers have focused on minimising costs, reducing the share of premium and non-essential goods. The study by D.C. Petrescu *et al.* (2020) analysed how consumers in Romania and Belgium rated the quality of products, their safety and environmental friendliness. The focus was on labels, composition, origin, and packaging. In Ukraine, due to the crisis conditions, the choice was based on price, promotion, ease of preparation – there was a simplification of consumer evaluation criteria.

Thus, companies' marketing strategies are effective only if they are flexible, digitalised, and adapted to new sales channels, in particular online trading. Approaches that combined support for local brands, loyalty programmes, and promotional offers remained successful. In the future, the strategic advantage will be for those businesses that can simultaneously meet the need for accessibility and meet the demand for healthy and sustainable consumption.

CONCLUSIONS

In 2020-2024, the consumer behaviour of Ukrainians was significantly transformed under the influence of war, inflation, and the socio-economic crisis. Although the nominal average salary increased from 11,600 UAH to 21,473 UAH, in USD it ranged from 430 USD in 2020 to 371 USD in 2022, with a recovery to 532 USD in 2024. Due to high inflation (up to 26.6% in 2022), purchasing power remained low. About 25% of Ukrainians have reduced food costs, focusing on affordable products – bread, milk, meat. The demand for local brands has increased not only because of the price, but also for patriotic reasons. The share of food costs in the cost structure was 47-53%, one of the highest in Europe. In 2024, food prices increased by 14.1%, including vegetables (+48.3%) and butter (+33.9%). This forced consumers to look for cheaper alternatives and buy promotional items. Demand for ready meals has increased: in 2023, culinary sales increased by 24%. Online grocery purchases increased from 6% in 2021 to 19.4% in 2023.

Demographic factors also affected the market. In 2025, 57% of the population belonged to the working-age group, and 73% lived in cities. The average household size fell to 2.9 people, which increased demand for portioned goods. The increase in the level of education (73% with higher education) contributed to interest in healthy eating, but prices remained a constraint. Ukraine's food exports in 2024 increased by 13% and reached 24.6 billion USD. The study of marketing strategies in the field of food trade has shown their key role in maintaining stable demand in conditions of economic instability. In particular, the use of online channels, promotions, loyalty programmes, and a focus on the local manufacturer allowed companies to adapt to new conditions and maintain consumer activity, despite the fall in purchasing power. This study focused mainly on the economic and statistical aspects of consumer behaviour, leaving out an in-depth analysis of psychological motives and cultural factors in consumer decision-making. Further research should focus on studying the impact of digitalisation, social media, and patriotic sentiments on the transformation of consumer preferences in the context of a prolonged crisis.

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Поведінка споживачів на ринку продовольчих товарів України в сучасних умовах

Анотація. Метою даного дослідження було визначити, як економічна нестабільність, інфляція, війна та соціально-демографічні зміни вплинули на споживчу поведінку населення України на ринку продоволь чих товарів. Було проаналізовано середньодушовий дохід, динаміку витрат на харчування, зміну цін на основні продукти, попит на українські та імпортні товари. А також було проведено аналіз сильних, слабких сторін, можливостей та загроз поточних маркетингових стратегій. У ході дослідження встановлено, що середня зарплата зросла з 11 600 грн у 2020 році до 21 473 грн у 2024 році, але в доларах США вона коливалася через інфляцію – з $430 до $371 у 2022 році і до $532 у 2024 році. У 2024 році інфляція склала 12 %, а ціни на продукти зросли на 14,1 %, зокрема на овочі – на 48,3 %, масло – на 33,9 %, молоко – на 18,8 %, хліб – на 18,2 %. Частка витрат на харчування залишалася високою – від 47 % до 53 %. У період з 2020 по 2024 рік інфляція в Україні зазнавала суттєвих коливань: від 5 % у 2020 році до пікового значення 26,6 % у 2022 році, з подальшим зниженням до 12 % у 2024 році. Близько 25 % споживачів скоротили витрати на харчування, а 6 з 10 українців обирали акційні товари. Онлайн-продажі продовольства зросли з 6 % у 2021 до 19,4 % у 2023 році. Експорт харчових товарів у 2024 році зріс на 13 % і сягнув $24,6 млрд.

Виявлено, що урбанізація (73 % населення), середній розмір домогосподарств (2,9 особи) та високий рівень освіти (73 % з вищою освітою) істотно вплинули на трансформацію споживчих звичок. Практичне значення дослідження полягає в тому, що його результати можуть бути використані для адаптації маркетингових стратегій компаній до змін у споживчій поведінці в умовах економічної нестабільності

Ключові слова: інфляція; попит; харчування; витрати; маркетингові стратегії

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Methodological aspects of economic study of the dairy market

Abstract. The aim of this study was to assess the effectiveness of the Ukrainian dairy market in conditions of economic instability and structural changes in the agricultural sector in 2021-2024. The study analysed the production, consumption, export, import and profitability of dairy products. The analysis revealed that during the period under review, total production decreased by 17% and there was a change in structure: the share of agricultural enterprises increased to 51%, exceeding households for the first time. It was found that consumption of dairy products decreased from

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201.5 to 196 kg per person per year, which is almost half the recommended norm. It was found that despite the decline in domestic demand, exports showed positive dynamics: as of the beginning of 2025, their volumes increased by 17% in physical terms and by 57% in value terms compared to the same period in 2024. A reorientation towards Western markets and growth in exports of butter and condensed milk were identified, which can be considered indicators of the competitiveness of individual segments. The results of the analysis of strengths, weaknesses, opportunities and threats highlighted the need for digital transformation of the market: in 2024, 72.3% of reports were already submitted online, and examples of the implementation of the latest technologies, such as by the private agricultural enterprise "Ukraine", proved the effectiveness of using information and communication technologies. The study confirmed the adaptability of the industry and outlined areas for strategic improvement in its monitoring. The practical significance of the study lies in the fact that its results can be used to develop effective tools for economic monitoring, forecasting the development of the dairy market, and forming state support for agricultural enterprises

Keywords: productivity; consumption; imports; profitability; efficiency; supply; methodological approaches

INTRODUCTION

The dairy market is a key segment of the agri-food market, which has strategic importance for ensuring the country's food security, forming the consumer basket and supporting agriculture. In the context of growing competition, the impact of globalisation processes, climate change and an unstable domestic environment, there is a need for a comprehensive economic analysis of this market using methodological approaches. The relevance of the study was determined by the need to improve state regulation tools, support Ukrainian producers and create conditions for the development of dairy farming. Rising costs, declining cattle population, disrupted logistics and unstable relations between producers and processors are hampering the development of the dairy market.

These phenomena are studied in the work of V.M. Ivchenko *et al.* (2024), which analyses the dynamics of cow productivity, the quality of milk raw materials, export-import changes, the structure of supply and regional differences. The authors found that productivity growth, herd reduction, and a decline in raw material supply have led to increased market dependence on certain regions and large enterprises. Declining consumer demand, price instability, and the declining role of small producers complicate the development of the dairy market. These issues were studied by N. Chebotarova (2024), who analysed changes in the structure of production, the growth of large enterprises, increased productivity and the impact of state support. The author also noted the development of domestic processing and changes in consumer preferences.

Declining consumption, the predominance of imports in certain segments, and weak integration into the European market complicate the development of the dairy complex. These aspects were analysed by C. Shikovets *et al.* (2023), who investigated imbalances in production and consumption, trade dynamics, price elasticity and the role of institutional support. At the same time, issues of adaptation to European Union (EU) requirements, forecasting price fluctuations and consumer behaviour remain unaddressed and require further study. Low levels of innovation, unstable government support, the lack of effective mechanisms to stimulate domestic demand, and imperfect logistics infrastructure are holding back the development of dairy production. I. Korman *et al.* (2022) analysed production dynamics, consumer behaviour patterns, the competitiveness of Ukrainian products, and the impact of government policy on the economic performance of enterprises. The authors emphasised the importance of improving resource efficiency, introducing a cluster approach, and developing public-private partnerships.

The decrease in the volume of milk sent for processing, technological backwardness in the private sector, and the weak participation of small producers in market processes

complicate the development of the industry. I. Svynous *et al*. (2020) analysed production dynamics, productivity, farm structure, and raw material supply. They emphasised the advisability of supporting large enterprises and innovative renewal. The issues of interaction between market participants, logistics efficiency and climate impact have not been sufficiently explored and require further study. Low investment activity, lack of technical re-equipment, non-compliance of products with quality standards, and uneven concentration of production capacities hinder the efficiency of dairy production. O. Bochko *et al*. (2023) examined consumption dynamics, distribution of production between regions, the impact of price factors, and access to resources. The focus was on the imbalances between supply and demand, as well as the importance of a comprehensive approach to modernisation.

Increased dependence on external suppliers, a lack of price stabilisation mechanisms, uneven development of production infrastructure and limited access to financing complicate the realisation of dairy production potential. I. Paska *et al*. (2023) studied structural market transformations, the distribution of resources between large and small producers, the impact of inflationary factors, and the assessment of institutional support opportunities. The authors emphasised the need to harmonise public policy with market mechanisms, develop logistics infrastructure, and develop technological potential. At the same time, the issue of assessing the long-term effectiveness of the decisions implemented, consumer behaviour patterns, and the impact of global risks on the domestic market remains insufficiently addressed and requires further research. Low effective demand, limited domestic investment, unstable state support, and lagging behind European standards complicate the formation of a balanced supply in the dairy market. N. Kosar *et al*. (2022) examined the characteristics of production system development, the effectiveness of pricing strategies, and the role of integration processes. The authors emphasised the importance of adapting to international requirements, strengthening the economic self-sufficiency of producers, and developing a competitive environment.

Key aspects of the development of the dairy market remain insufficiently explored, in particular the issues of effective cooperation, investment support, and the consequences of enterprise relocation; support for small producers and regional differences; forecasting the level of self-sufficiency and market fluctuations; long-term investment attractiveness, adaptation to climate challenges and digital transformation of production processes. The aim of this study was to identify the economic patterns of the national dairy market and to justify approaches to improving its efficiency in the context of structural transformations in the agricultural sector. The study set the following objectives: to analyse the dynamics of dairy production and consumption in Ukraine; to assess the impact of price, institutional and behavioural factors on the formation of supply and demand in the dairy market.

MATERIALS AND METHODS

The study was methodological in nature and covered the period from 2021 to 2024. In the course of the work, the characteristics of key economic categories and concepts related to the functioning of the Ukrainian dairy market were identified, in particular: total production volume, supply structure, consumption level, export activity, internal profitability and regional differences. The economic nature of these concepts was theoretically substantiated, and their interrelationships in the context of the agricultural economy were studied.

Based on statistical sources, analytical processing of data on the dynamics of total milk production in Ukraine for the period 2021-2024 was carried out (AgroPortal, 2023; 6.3 million tons of milk were milked..., 2023; AgroPortal, 2025b). In addition, materials related to the level of per capita consumption of dairy products (Milkua.info, 2023) were used as a basis for assessing domestic demand and analysing changes in consumer preferences. Considerable attention was paid to identifying the most popular categories of dairy products in Ukraine in terms of consumption volumes and export share (Ukrainian milk exports jumped by 25%, 2025). In addition, the study included a comparative analysis of economic analysis methods in the agricultural sector, which made it possible to assess their

suitability for the conditions of the Ukrainian dairy market (Carpentier *et al*., 2015; Korenjok *et al*., 2018). To study the state of foreign trade, data on export volumes for 2023 – early 2025 were used, as well as analytical materials on the geographical structure of supplies and the main countries importing Ukrainian dairy products (AgroReview, 2025; Yelanska, 2025).

To comprehensively assess the internal environment of the dairy industry, as well as its external context, the SWOT analysis method (Strengths, Weaknesses, Opportunities, Threats) was used. This method made it possible to systematise analytical observations, determine the structural characteristics of the market, and identify critical points and development potential. Within this approach, an analytical framework was developed for the further formation of strategic guidelines and the improvement of economic monitoring and forecasting tools. In particular, positive dynamics in the development of dairy farms in 2024 were identified (NISS, 2024). For international comparison, the following platforms were considered: the International Dairy Federation (IDF, n.d.), the European Dairy Association (EDA, n.d.), and the International Farm Comparison Network Dairy (IFCN Dairy, n.d.). Analytical reports from the Food and Agriculture Organisation of the United Nations (FAO, n.d.) and the Global Dairy Platform (n.d.) were also considered. These sources made it possible to correlate national indicators with international trends and assess the integration potential of the Ukrainian dairy market.

RESULTS AND DISCUSSION

Methodological approaches to studying the functioning of the dairy market

The dairy market represents a multi-component economic system that includes all stages of product movement – from primary production to final consumption. To ensure the validity of the economic analysis of this environment, it is advisable to identify the basic categories that determine the specifics of its functioning and provide a comprehensive understanding of the internal logic of market processes. The demand category plays a key role in determining development, as it reflects consumers' willingness to purchase relevant products at a certain price level. Demand sets benchmarks for producers in terms of product volume, structure and quality, and also influences investment decisions and the justification of production activities. Its functional purpose is to reproduce the priorities of the end consumer, determining the dynamics of pricing and strategic guidelines for economic entities. Supply plays the role of providing the market with goods. Small and medium-sized producers account for a significant share of milk supply, which determines varying levels of technological equipment, product quality and competitive potential. In methodological terms, supply characterises the sector's production capacity in the context of resource availability, the institutional environment and infrastructure provision. Its function is to maintain market equilibrium and prevent shortages or surpluses. The price on the dairy market is the result of the interaction between supply and demand, and therefore plays the role of the main regulator of economic interaction between market participants. It performs an accounting function, recording the value of products, as well as a stimulating function, encouraging increased productivity and innovation. In addition, the price has a distributive function, ensuring the redistribution of income between producers, processors and consumers. The informational function of the price makes it possible to navigate the market situation and make effective management decisions (Zhao *et al*., 2021).

Cost price is a criterion for assessing production costs, forming the basis for economic diagnosis of resource efficiency and justification of pricing policy. In the dairy sector, the cost price is influenced by a wide range of factors, from the cost of feed and energy resources to technological innovation and management quality. Functionally, this category allows identifying internal reserves for improving the economic performance of enterprises. Efficiency acts as an integral indicator of the effectiveness of economic activity, characterising the degree of achievement of production and commercial goals within given resource constraints. Within the framework of the dairy market research, it is advisable to evaluate both resource efficiency (milk yield, labour productivity) and financial efficiency (profitability, return on investment),

which makes it possible to identify the most promising development models. The category of competitiveness is decisive for the positioning of enterprises in the market environment. It encompasses the ability of a business entity to create products that are capable of competing successfully in both domestic and foreign markets in terms of price, quality and other characteristics. Its functional purpose is to ensure the dynamic stability of the enterprise and increase its adaptive potential in changing external conditions (Fiorillo & Amico, 2024). A comparative analysis of economic analysis methods in the agricultural sector is a necessary step in forming an effective analytical basis in the process of researching the dairy market. Given the specifics of agricultural production – high risk, seasonality, dependence on biological factors – the choice of appropriate methods must be comprehensive and adapted to the specific conditions of the dairy sub-sector. Economic research in this area uses both classical tools and the latest approaches based on digital technologies and mathematical modelling. A substantive description of the main methods of economic analysis was presented in Table 1.

Table 1. Comparative analysis of economic analysis methods in the agricultural sector

Method name	Method essence	Advantages of use	Example of application in the dairy market
Comparative analysis	Comparison of indicators by period or between entities	Identification of deviations, assessment of dynamics	Analysis of changes in the cost of milk production in different regions
SWOT analysis	Identification of strengths, weaknesses, opportunities and threats	Strategic planning, formation of competitive advantages	Determination of market prospects for dairy cooperatives
Coefficient method	Calculation of ratios between economic indicators	Simplicity, versatility, quantitative assessment	Calculation of the profitability of milk production
Benchmarking	Comparison with market leaders	Identification of best practices, benchmark for improvement	Assessment of the efficiency of dairy plants according to EU standards
Economic and mathematical modelling	Building models to describe and forecast economic processes	Forecasting, modelling of development options	Forecast of milk purchase prices depending on costs and consumer demand
Factor analysis	Identification of factors affecting the target indicator	Identification of key reasons for changes in results	Identification of the impact of feed prices on the cost of dairy products
ABC analysis	Classification of products or customers by significance	Assortment optimisation, cost management	Determination of the most profitable types of dairy products
DEA analysis (Data Envelopment Analysis)	Analysis of manufacturer efficiency based on input and output parameters	Determination of technical efficiency without the need for prices	Assessment of the efficiency of farms in the production of raw milk

Source: compiled by the authors based on A. Carpentier *et al.* (2015), D.V. Korenjok *et al.* (2018)

The choice of analysis methods depends on the purpose of the study, the availability of source information, the level of detail of the object of analysis, and the expected result. For example, SWOT analysis and benchmarking would be appropriate for strategic assessment, while comparative and factor analysis would be appropriate for operational control. Modern approaches also involve the integration of digital technologies, including geographic information systems (GIS), business intelligence (BI), and artificial intelligence for big data processing. Assessing the efficiency of dairy production requires the use of a set of research methods that allow not only to analyse the current state of the enterprise, but also to identify the potential for improving its performance. The choice of methods should be based on the specifics of the dairy subsector, which combines the characteristics of agricultural production (biological cycles, seasonality, natural and climatic risks) with the characteristic features of industrial processing,

logistics and marketing of finished products. Therefore, relevant research methods should cover both production and economic, social and environmental aspects of efficiency.

The first key method is factor analysis, which allows determining the impact of individual factors on changes in a generalised efficiency indicator, such as production profitability or profit per unit of output. The methodology of such analysis makes it possible to identify both primary and secondary factors, in particular the productivity of the dairy herd, feed costs, depreciation of equipment, energy costs, logistics support, etc. The use of factor analysis allows the identification of internal reserves for growth in the economic performance of farms. In 2021-2024, a factor analysis of milk production efficiency was conducted for the limited liability company (LLC) "Galychyna Dairy Company" (Galychyna, n.d.). It was found that the company has the potential to improve the efficiency of financial resources, in particular by optimising costs and increasing labour productivity. The second method widely used in efficiency studies is Data Envelopment Analysis (DEA), a method of data envelopment analysis based on the construction of a generalised efficiency frontier. Unlike traditional approaches, DEA allows the efficiency of each enterprise to be evaluated based on a set of input and output indicators without the need to take into account monetary valuation. This is particularly important in the dairy sector, where productivity, milk yield, number of employees and pasture area can be more informative than purely financial metrics (Shrestha, 2021).

It is also advisable to use economic and statistical modelling, including regression, correlation and trend analysis. In particular, building models of the dependence of profitability on variable costs or the selling price of milk makes it possible to predict the economic consequences of certain management decisions. In the context of growing instability in the external environment – war, inflationary pressure, fluctuations in the currency market – modelling makes it possible to ensure flexible anti-crisis management of enterprises. Balance sheet methods are also used in efficiency studies, which allow comparing available resources with production volumes. For example, comparing feed costs with milk production volumes allows calculating the cost per unit of production and evaluating the effectiveness of the feed programme. In addition, the cost-output method provides an assessment of the full cost price, which is the basis for justifying the pricing policy and competitive position of the enterprise (D'Ecclesia *et al*., 2024). Thus, assessing the efficiency of milk production requires a multidisciplinary approach combining quantitative and qualitative methods of analysis, which allows for high accuracy in assessments, adaptation to dynamic conditions, and justification of management decisions based on objective data. Similarly, A. Parzonko *et al*. (2024) studied the sustainability of dairy farms in Germany, France, the Netherlands, Italy and Poland, with a much broader approach covering not only economic but also environmental and social factors. While in the Ukrainian context the main focus was on internal barriers, A. Parzonko *et al*. conducted a comparative international analysis focused on the integration of agricultural policy with the principles of sustainable development.

Another perspective on the issue is presented in a study by P. Madududu *et al*. (2024), which discusses the difficulties of developing Botswana's dairy industry in conditions of import dependency. Although both works emphasise the need to support domestic production, their approaches differ significantly: P. Madududu *et al*. studied the industry in terms of consumer choice and political strategy, while this work was based on an assessment of production efficiency. Similarly, E.K. Balirwa & E. Waholi (2024) examined the barriers to market entry for small farmers in Uganda, particularly access to finance and infrastructure constraints. At the same time, this study analysed the industry from the perspective of the profitability of large and medium-sized farms, without delving into the specifics of small farms. The dairy market is a complex economic system, the functioning of which is determined by the interaction of key elements such as demand, supply, pricing and cost. The efficiency of dairy production is determined not only by the level of resource provision, but also by the ability to adapt to market changes, introduce innovations and optimise costs. The use of comprehensive methods of economic analysis – from factor analysis to

economic and mathematical modelling – makes it possible to identify internal growth reserves and form a sound management strategy. In the face of growing challenges, the economic performance of the industry directly depends on the balance between production efficiency, government support and the ability to respond to demand dynamics.

Analytical assessment of the state and development trends of the dairy market in Ukraine

Total milk production in Ukraine in 2021-2024 experienced significant fluctuations due to a number of economic, social and military factors. In 2021, according to the State Statistics Service, 8.72 million tonnes of milk were produced, which corresponded to the stable production level of previous years. However, in 2022, the volume decreased to 7.7 million tonnes, which is a decrease of 12.1%. The main reason was the full-scale invasion, which caused the destruction of the dairy infrastructure, a reduction in cattle numbers, disruption of logistics and a decline in profitability for private households (AgroPortal, 2023). In 2023, the situation partially stabilised: 7.9 million tonnes, indicating a partial recovery from the previous decline (6.3 million tonnes of milk were milked..., 2023). In 2024, Ukraine produced about 7.2 million tonnes of milk (AgroPortal, 2025b). This again demonstrates a decline in production against the backdrop of prolonged hostilities, an unstable economic environment and high livestock maintenance costs. Figure 1 shows the overall dynamics of milk production in Ukraine for 2021-2024.

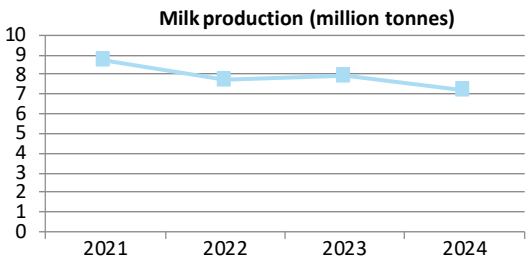

Figure 1. Milk production (million tonnes)
Source: compiled by the authors based on AgroPortal (2023), 6.3 million tons of milk were milked... (2023), AgroPortal (2025b)

Despite a slight temporary increase in 2023, the overall trend is negative, indicating a gradual decline in production. The structure of milk production in Ukraine by product type remained relatively stable during the period. Cow's milk accounted for over 98% of the total volume. Goat and sheep milk production is growing very slowly and is concentrated mainly in private farms and households, remaining a niche segment. Although demand for organic and alternative products is stimulating interest in goat milk, its share in the total volume still does not exceed 2%. Thus, despite a slight increase in interest in alternative types of milk, cow's milk remains the undisputed leader in the production structure (Ukrainian farms overtook private farms..., 2025).

The production structure by form of ownership proved to be more dynamic. In 2021-2023, households continued to account for a larger share of gross production (51-53%), but this share gradually decreased. The reasons for this were the economic unprofitability of keeping cattle in conditions of inflation, rising feed prices, limited access to markets and difficulties in complying with sanitary standards. In contrast, agricultural companies and farms showed positive dynamics thanks to the introduction of technologies, better organisation of production and a focus on processing industry standards. In 2024, the share of agricultural enterprises equalled that of households, and in 2025, it exceeded it for the first time – 51% versus 49%. This was a landmark moment, signalling a change in leadership in milk production in Ukraine. The quality characteristics of the products also shifted the focus in favour of enterprises. While households often do not comply with quality standards due to the lack of necessary equipment, farms mainly supply extra or higher grade milk that meets the requirements of the processing industry. As a result, the Ukrainian dairy industry is gradually transforming towards industrial production with a focus on quality and export potential (AgroPortal, 2025a).

At the same time, the dynamics of dairy consumption per capita in Ukraine has also undergone significant changes. In 2021, consumption was 201.5 kg per person per year, which was relatively close to the recommended norm. In 2022, as a result of the war, migration processes, the economic crisis and a reduction in

supply, consumption fell to 183-185 kg per person. This reflects both the physical unavailability of products and a decline in purchasing power. However, in 2023, the situation partially normalised, with consumption reaching 190-196 kg per person, corresponding to a 7% increase in the total domestic milk market compared to 2022 (Milkua.info, 2023). In 2024, the indicator stabilised at 196 kg. Despite the positive dynamics, this level remains almost half the recommended norm (380 kg), which indicates structural problems in the milk consumption market in Ukraine (Ukrinform, 2024). The largest categories of consumed products are drinking milk, cheese, butter, yoghurt and ice cream. Cheese accounts for a significant share of both the domestic market and imports – up to 64%, which puts pressure on Ukrainian producers. Butter, in turn, is actively exported: at the beginning of 2025, its exports grew by 464%, which indicates the high quality and competitiveness of the product (Ukrainian milk exports jumped by 25%, 2025).

In 2024, Ukraine exported 118,000 tonnes of dairy products worth 296.8 million USD, which is 16% more than in 2023. As of early 2025, exports already amounted to 58,000 tonnes worth 179.3 million USD, indicating a higher average unit price and potential growth in volumes by the end of the year. Compared to the same period in 2024, this represents a 17% increase in volume and a 57% increase in value. Butter accounts for the largest share of exports (40%), followed by condensed milk (26%), ice cream (16%) and cheese (12%). Imports of dairy products in 2024 amounted to about 60 thousand tonnes worth 290.3 million USD, and in January-May 2025 – 25.61 thousand tonnes (+11%) worth 128.63 million USD (+14%). Cheese accounts for the largest share of imports (up to 78%), occupying approximately 47% of the domestic market. This figure is a challenge for Ukrainian producers, who are forced to compete with imported products, mainly from EU countries, in particular Poland. Despite attempts to discuss import restrictions, Poland remains a key partner, and import bans are unlikely (Yelanska, 2025).

The foreign trade balance varied depending on the month. In January 2024, there was a negative balance (-11.7 million dollars), but overall for the year, exports almost doubled imports in physical terms and remained at approximately 295-297 million dollars in value. This indicates that imported products have higher added value, while exports have a larger volume but a lower price per tonne. Regional analysis shows that the Khmelnytskyi, Poltava, Vinnytsia, Ternopil, Cherkasy and Zhytomyr regions are the leaders in milk production in 2024-2025. For example, the Khmelnytskyi region produced over 540,000 tonnes in 2023 and is showing 17% growth in 2025. Other regions show similar dynamics, which indicates the development of the dairy industry in the central and western regions of Ukraine. Despite not being a typical dairy region, Zakarpattia region showed a 50% growth in 2025 (Skoryk, 2025).

The war has had a serious impact on the dairy industry. The fighting has caused livestock losses, destruction of farms, and disruption of supply and distribution chains. The frontline regions, which accounted for about 43% of the industrial cattle population before the war, have been particularly affected. Despite this, the industry continues to function, adapting to the new realities. Producers are focusing on Western markets, exporting across land borders, and the domestic market is demonstrating its adaptability to the new conditions (EU Dairy Forecast for 2025, 2025). Thus, the period 2021-2024 has been a test for the Ukrainian dairy industry, but also a stage of rethinking and transformation. Despite the decline in production and consumption, there has been an increase in product quality, a reorientation of exports, and a strengthening of the role of agricultural enterprises. A striking example of adaptation to wartime conditions is the activity of the "Milk Alliance" group of companies (Milk Alliance, n.d.), whose factories in Pyriatyn, Zolotonosha, Yahotyn, Zgurivka and Bashtanka continued to operate even under the difficult conditions of military operations. The enterprises optimised production by reducing their product range and focusing on goods with a long shelf life (milk, butter, cheese), while fermented milk products were produced exclusively to order for retail chains. The factories did not stop even in the frontline regions, demonstrating flexibility in responding to changes in demand and logistical challenges. All this testifies to the viability of the industry and its ability to develop further even in conditions of

military instability (Latifundist Media, 2022). The research by I. Brkić & N. Puvača (2024) and this work had a common goal – to explore ways to improve the efficiency of milk production, but differed in their approaches and emphases. I. Brkić & N. Puvača focused on internal production factors: feed quality, genetic potential of cows, precise management and the implementation of digital monitoring systems. They used bioeconomic models and standardised performance indicators to assess the efficiency of farms. In contrast, this study examined the dairy market as a holistic economic system, covering analysis of demand, supply, pricing, cost, competitiveness and the institutional environment.

In contrast, G. Mattarello *et al.* (2024) investigated the impact of dairy production on the environment in Italy, focusing on assessing greenhouse gas emissions using the LCA (life cycle assessment) approach. The authors conducted an analysis from an environmental perspective, while this study focused on economic aspects. Both studies shared an understanding of the need for innovation to improve efficiency, but while G. Mattarello *et al.* focused on digital technologies for assessing environmental impact, this study focused on analytical and management approaches to improving the functioning of the dairy market. At the same time, E. Kanire *et al.* (2024) investigated the efficiency of small dairy farms in East Africa in the context of climate change using a stochastic frontier analysis (SFA) approach. However, the studies differed in terms of the scope of analysis, methods and context: E. Kanire *et al.* focused on climate adaptation and small-scale farming, while this study focused on the dynamics of the dairy market in Ukraine. Unlike the study by S.G.H. Meyerding & A. Seidemann (2024), which focused on the behavioural motives of milk consumers in Germany – including the influence of packaging, animal welfare and pricing transparency – this study focused on the economic characteristics of production, such as cost price, resource efficiency and state funding of the industry. While the German authors investigated perceptions of a sustainable approach to consumption, this study focused on the challenges faced by producers in the context of structural market transformations.

The approach used by S. Sahara *et al.* (2022) was aimed at studying the market behaviour of farmers in Indonesia in response to external shocks, including climate change and price instability. The authors focused on adaptation mechanisms, market barriers, and sociocultural characteristics. In comparison, this study focused on a more rational macroeconomic analysis without delving into the behavioural aspects of individual producers. On the other hand, the study by C. Onishi *et al.* (2025) revealed the reactions of Japanese consumers to changes in the fat content of dairy products, highlighting aspects of labelling, perceptions of health benefits and price sensitivity. This contrasts with the approach of this study, which focuses on production and economic parameters and systematic market analysis. Despite this, both studies reflected the complex interaction between different elements of the dairy industry, from production to consumption. Total milk production in Ukraine in 2021-2024 showed negative dynamics due to the impact of military operations, economic instability and a decline in the profitability of private farms. At the same time, the industry gradually transformed towards industrial production with an emphasis on quality, efficiency and export potential. Despite the decline in consumption, there has been growth in the export structure and a reorientation towards Western markets. Overall, Ukraine's dairy industry has demonstrated adaptability and the ability to develop even in times of crisis.

Identification of factors influencing the efficiency of the dairy market and areas for improvement of analytical methods

The functioning of the Ukrainian dairy market in the context of current challenges, in particular full-scale war, economic instability and a decline in the rural population, has become particularly relevant. In 2021-2024, the market underwent profound transformations: there was a gradual decline in production volumes, a decrease in the share of households in the milk supply structure, a change in logistics routes and an increase in the role of the processing industry. At the same time, the industry is showing resilience, maintaining its export potential and responding

to domestic demand through the development of agricultural enterprises. In order to develop effective mechanisms for improving the methods of analysing the efficiency of the dairy market, it is necessary to comprehensively assess its current state, identify its strengths and weaknesses, external opportunities and threats. To this end, it is advisable to conduct a SWOT analysis as a basic tool for strategic assessment of the situation in the industry (Table 2).

Table 2. SWOT analysis of the dairy market of Ukraine (2021-2024)

Strengths	Weaknesses
■ High share of cow's milk in production structure – stable technological base ■ Development of agricultural enterprises, growth of their share in production ■ Improvement of milk quality on industrial farms ■ Growing exports (butter, cheese, condensed milk)	■ Overall decrease in milk production volume ■ Reduction in cattle population, especially in households ■ Low profitability of keeping farming in the private sector ■ Significant dependence on cheese imports
Opportunities	**Threats**
■ Expansion of organic production (goat and sheep milk, niche products) ■ Reorientation of exports to the EU, Asian and Middle Eastern markets ■ Stimulation of domestic demand through information campaigns ■ Use of digital technologies to improve analytics and market management	■ Military action and destruction of infrastructure ■ Blockade of logistics routes (especially seaports) ■ Decline in purchasing power of the population ■ Demographic decline and labour migration, reducing consumer demand

Source: compiled by the authors

A SWOT analysis (Table 2) of the Ukrainian dairy market for 2021-2024 indicates the need for systematic improvement of approaches to its regulation and support. Despite strengths such as the development of agricultural enterprises, improved product quality and growing export potential, internal weaknesses – a decline in cattle population, reduced profitability in the private sector and high import dependence – weaken the market's resilience. External opportunities, in particular digitalisation, entry into new markets and the development of organic production, can be used to compensate for these imbalances. At the same time, current threats, primarily related to the war, logistical barriers and falling consumer demand, require a proactive response.

An effective system for economic monitoring and forecasting of the dairy market in Ukraine should be based on a combination of rapid collection of reliable data, digital information processing, and analytical tools. The implementation of such a system is only possible with the full electronicisation of reporting, the active involvement of producers in the exchange of information, and the formation of forecast models based on actual market dynamics. In this context, the available examples and statistical trends of recent years are indicative. In 2023, total milk production in farms of all categories decreased by 5% compared to 2022. In contrast, in 2024, positive dynamics were recorded in the work of dairy farms, in particular an increase in milk yields in agricultural enterprises, which is associated with the modernisation of technologies and better accounting (NISS, 2024). A successful example of the digital transformation of dairy production is the activities of the private agricultural enterprise "Ukraine" in the Zhytomyr region, where voluntary milking systems (VMS) and electronic productivity control have been introduced. Such technologies provide accurate real-time milk yield accounting, automatic detection of cow productivity problems, and enable quick decisions on veterinary care or changes in diets. The successful operation of such farms demonstrates the real benefits of using electronic tools in dairy farming (Ruban *et al.,* 2024).

Another important area for improving monitoring is digital reporting. As of 2024, the reporting rate of respondents for the third quarter was 72.3% (in total for reporting forms to the State Statistics Service), and all reports, including form No. 24-sg (livestock production), are

submitted exclusively in electronic form. This was made possible by the updated reporting procedure, which came into force on 23 June 2023, and integration with the State Agrarian Register (SAR), which allows reports to be generated and sent automatically. Thus, even without accurate public data on the number of farms submitting reports, it is possible to conclude that the monitoring process in the agricultural sector is highly digitised. At the same time, the low level of digital literacy among the rural population remains a barrier to the widespread adoption of technology: only 15-20% of farmers have a high level of awareness of digital services. This requires a separate programme of training, information support and advice for households and small farming cooperatives, especially in border and war-affected regions (Report on the results of the activities of the State..., 2024).

At the international level, Ukraine is an active participant in global monitoring systems. Data on production volumes, exports, consumption and price dynamics are regularly published on a number of authoritative platforms (External Sector Statistics, n.d.). In particular, the International Dairy Federation (IDF) (IDF, n.d.) provides summary analytical reports on the state of the global dairy industry, including technological innovations, product quality and international standards. The European Dairy Association (EDA) (EDA, n.d.) highlights consumption dynamics, export and import trends, and regulatory changes within the EU, allowing Ukrainian indicators to be compared with European ones. The International Farm Comparison Network Dairy (IFCN Dairy) platform provides a comparative analysis of dairy farms in different countries around the world, focusing on efficiency, cost structure and global price trends (IFCN Dairy, n.d.). At the same time, the Food and Agriculture Organisation of the United Nations (FAO) (FAO, n.d.) is a source of comprehensive information on the development of agricultural markets, food security levels and international trade prospects. The Global Dairy Platform (Global Dairy Platform, n.d.) brings together leading companies in the industry and focuses on innovation, sustainable development and shaping global demand for dairy products. Together, these resources make it possible not only to track current changes in the global market, but also to adapt national policies to international standards. In 2024, in particular, annual export figures were updated for types of dairy products – dry and condensed milk, casein, butter, and ice cream. These platforms allow Ukraine not only to track global trends but also to adapt national policy to international standards. International analytical reviews also include data on potential markets: countries in the Middle East, North Africa, Asia, the Caucasus, and Central Asia (INFAGRO, 2025). Thus, existing cases indicate a gradual digital transformation of the industry, particularly in the dairy farm and electronic reporting segments. At the same time, to improve the effectiveness of the monitoring system, three key limitations must be overcome: insufficient regionalisation of analytics, weak integration of digital data with predictive models, and limited availability of quality public analytics for businesses and consumers. The introduction of monthly interactive dashboards based on data from the SAR, the expansion of electronic monitoring in small farms, and the development of visualisations for communities and analytical services would all contribute to making the Ukrainian dairy market more predictable, transparent, and resilient to external shocks.

The study by G.K. Deshwal *et al.* (2024) examined the digital transformation of the dairy sector in India, in particular the impact of information and communication technology (ICT) solutions on transparency, logistics and cooperative interaction. This study also took digitalisation into account, but as one element of a broader macroeconomic analysis of the Ukrainian dairy market in 2021-2024. Thus, both studies share a common focus on innovation, but differ in their methodological focus: G.K. Deshwal *et al.* focus on technology, while this study focuses on economics. A similar difference can be seen when compared to the study by S. Richter *et al.* (2025), which focused on the application of advanced digital technologies – sensors, blockchain solutions, automated quality control systems – using the Swiss market as an example. In this study, the subject of analysis was economic parameters: profitability, cost price, institutional barriers, foreign trade activity, which leads to

the conclusion that there are different areas of research interest with a common goal – to increase the efficiency of dairy production. The study by L. Tulush *et al*. (2023) focuses on financial support and the development of dairy farming in Ukraine, emphasising the role of state policy. In contrast, this study analyses the market, focusing on declining production, structural changes, export growth and digitalisation. Both studies point to the need to improve the efficiency of the industry, but the first through support mechanisms and the second through adaptation to market conditions. The work by Z. Berezvai & M. Konya (2025) analyses the price transmission process in the milk supply chain in Hungary, focusing on the uneven distribution of profits between producers, wholesale suppliers and retail chains. This study focused on the structure of the market, the peculiarities of its transformation under martial law, and changes in consumption, production and exports. The study by B. Keitshweditse *et al*. (2024) dealt with the creation of added value in the dairy sector in Botswana, in particular through logistical innovations, the development of the donkey milk market and the search for new consumer niches. This study focused on the economic aspects of the industry: profitability, costs, government regulation and institutional challenges. Despite the difference in approaches, both studies emphasised the importance of innovation for the development of the industry – in the first case, functional and product innovation, and in the second, managerial and strategic innovation. The work of A. Chen *et al*. (2024) analyses the factors influencing the choice of dairy products among older consumers in China. The study focused on product characteristics – texture, bioactive components, taste qualities, as well as the potential for using biotechnology to increase the attractiveness and functionality of dairy products. These aspects were not considered in this study; attention was paid to the macro level assessment – market structure, industry performance, and factors affecting the competitiveness of producers. Thus, both studies reflect current trends but are in different planes – micro-consumer and macroeconomic.

In conclusion, the present study revealed profound transformations of Ukraine's dairy market under the influence of military, demographic and economic challenges in 2021-2024. Despite the decline in production volumes and profitability in the private sector, the industry is demonstrating adaptability and maintaining its export potential thanks to the development of agricultural enterprises and digitalisation. The SWOT analysis conducted revealed the need for systematic improvement of monitoring and forecasting mechanisms based on electronic reports, interactive analytics and international standards. Further efficiency gains are only possible if regional analytics are strengthened, digital literacy is improved and modern solutions are actively used in livestock farming.

CONCLUSIONS

In 2021-2024, the Ukrainian dairy market underwent a period of profound structural transformation, driven by both internal and external challenges. Total milk production during this period decreased from 8.72 million tonnes in 2021 to approximately 7.2 million tonnes in 2024, indicating an overall negative trend and a loss of more than 17% of production capacity. The main reasons were military actions, disruptions in logistics chains, a reduction in cattle population, especially in households, and economic instability. At the same time, there was a decrease in the role of households in the production structure: their share in 2021-2023 was 51-53%, but in 2025, for the first time, agricultural enterprises took a larger share of the market – 51%, which indicates the gradual industrialisation of the industry and a shift in priorities in favour of technologically advanced producers. This process was accompanied by an increase in product quality: industrial farms provide a supply of higher-grade milk that meets the standards of the processing industry and export requirements.

Per capita milk consumption fell from 201.5 kg in 2021 to 183-185 kg in 2022, as a result of reduced purchasing power, physical inaccessibility of products and population migration. In 2024, consumption stabilised at 196 kg, but this figure is still almost half the recommended norm of 380 kg, indicating a structural problem in food consumption and potential for domestic market development. Imports of cheese, which

account for about 47% of the domestic market, remain a significant threat to Ukrainian producers, despite the gradual growth of the industry's export potential. In 2024, exports of dairy products amounted to 118 thousand tonnes worth 296.8 million USD, which is 16% more than in 2023. As of early 2025, exports had already reached 58,000 tonnes worth 179.3 million USD, which is 17% more in volume and 57% more in value compared to the same period in 2024. The largest share in the export structure is occupied by butter, condensed milk, ice cream and cheese, which indicates the competitiveness of certain segments of Ukrainian dairy products.

The war has been a decisive factor in destabilising the dairy sector: the frontline regions, which accounted for 43% of the industrial cattle population in 2022, suffered the greatest losses. At the same time, regions in central and western Ukraine, in particular Khmelnytskyi, Poltava, and Vinnytsia, are showing growth in production, indicating a regional reorientation of production. The efficiency of the market largely depends on the level of digitalisation. The introduction of voluntary milking technologies, electronic productivity accounting and online reporting, as in the private agricultural enterprise "Ukraine" (Zhytomyr region), demonstrates opportunities for improving management accuracy and economic performance. Already in 2024, 72.3% of agricultural reports were submitted in electronic format, indicating a high level of automation of management processes. Prospects for further research lie in the development of integrated forecasting models that take into account regional characteristics, the digitalisation of farms and changes in consumer preferences.

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Методологічні аспекти економічного дослідження ринку молока

Анотація. Метою даного дослідження було оцінити ефективність функціонування молочного ринку України в умовах економічної нестабільності та структурних змін аграрного сектору у 2021-2024 роках. У межах дослідження було здійснено аналіз виробництва, споживання, експорту, імпорту та рентабельності молочної продукції. У ході аналізу виявили, що за досліджуваний період загальний обсяг виробництва скоротився на 17 % і відбулася зміна структури: частка аграрних підприємств зросла до 51 %, вперше перевищивши домогосподарства. Встановлено, що споживання молочної продукції знизилось з 201,5 до 196 кг на особу на рік, що залишається майже вдвічі нижчим за рекомендовану норму. З'ясовано, що попри зменшення внутрішнього попиту, експорт демонстрував позитивну динаміку: станом на початок 2025 року його обсяги зросли на 17 % у натуральному виразі та на 57 % у вартісному порівняно з аналогічним періодом у 2024 році. Виявлено переорієнтацію на західні ринки, зростання експорту масла та згущеного молока, що розглядаємо як конкурентоспроможність окремих сегментів. Результати

аналізу сильних і слабких сторін, можливостей і загроз підкреслили необхідність цифрової трансформації ринку: у 2024 році 72,3 % звітів уже подавались в онлайн-форматі, а приклади впровадження новітніх технологій, як-от приватним сільськогосподарським підприємством «Україна», довели ефективність використання інформаційно-комунікаційних технологій. Дослідження підтвердило адаптивність галузі та окреслило напрями стратегічного вдосконалення її моніторингу. Практичне значення дослідження полягає в тому, що його результати можуть бути використані для розробки ефективних інструментів економічного моніторингу, прогнозування розвитку молочного ринку та формування державної підтримки аграрних підприємств

Ключові слова: продуктивність; споживання; імпорт; рентабельність; ефективність; постачання; методичні підходи

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The role of territorial communities in ensuring sustainable development of the agrarian sphere of Ukraine

Abstract. Under the conditions of martial law in Ukraine and the redistribution of global food markets, new prerequisites are being formed for the sustainable development of the agrarian sphere. The purpose of the study was to substantiate the need for the development of a territorial community as a path to sustainable development of the agrarian sphere. The research used such methods as statistical data analysis, system approach, generalisation, abstract and logical method, and synthesis. It was determined that the main task of the country is to preserve the agrarian sphere in a favourable state to ensure that the needs of not only the population, but also future generations are met. It was proved that in order to achieve sustainable agricultural development, it is necessary to implement comprehensive measures that will contribute to achieving sustainability and provide a synergistic effect for the economy, environment, and society. Attention was focused on the fact that this development largely depends on the ability of territorial communities, because it is at their level that conditions are formed for the development of social infrastructure, high-quality provision of public services, creating decent working conditions and opportunities for self-realisation of residents. It was outlined that each community has a unique resource potential and has prerequisites for economic growth, which must be effectively implemented. It was formulated that an important tool for planning and monitoring this process can be the agro-economic passport of the community,

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which is a comprehensive document containing: general characteristics of the territory and socio-demographic profile; information on the availability of industrial, processing enterprises and infrastructure facilities; data on the level of employment and the state of the social sphere; determination of promising areas of agro-economic development. The practical significance of introducing an agro-economic passport lies in the possibility of systematic monitoring of economic, land, human resources, demographic and logistics processes at the community level. This, in turn, will contribute to sound resource management, assessment of human potential, effective analysis of the state of agricultural production by commodity producers, and the creation of strategies for sustainable development of territories

Keywords: agrarian sphere; agrarian sector; agricultural enterprises; agro-economic passport; sustainable development; territorial community

INTRODUCTION

The topic of sustainable development is becoming increasingly relevant, which is defined as systemic, adaptive to natural conditions purposeful changes that ensure an increase in the social progressiveness of the agrarian sphere, its economic efficiency, environmental sustainability and safety. The main criterion for evaluating such progress is to increase the efficiency of functioning of producers of agri-food products, the quality of their use, and the preservation of natural resource potential. It is this criterion that is interpreted as the protection of humans and agricultural production facilities; in particular, this refers to water, land, and ecosystem services that cannot be replaced by something else. The main task of the country in this area is to keep them in a favourable state to meet the needs of not only the population of the country, but also future generations. To ensure sustainable development of the agrarian sphere, it is necessary to introduce measures that would ensure sustainable development and, as a result, would have a synergistic effect.

The effective functioning of the agrarian sphere depends on the development of each individual region of the country, local territorial communities. This, in turn, will contribute to ensuring the sustainable development of the country as a whole and each individual region. The combination of sustainable development and activities of territorial communities is cited in the research by T. Shestakovska & I. Dementov (2023), which considered the state policy of supporting the sustainable development of territorial communities in the context of the transformation of the public administration system and strengthening the decentralisation processes. O. Zharsky & B. Rogalya (2024) analysed the development of the economic environment of territorial communities under martial law, in particular, in the context of adaptation to destructive processes caused by military aggression. V. Borshchevsky *et al.* (2024) examined the prospects for the development of agglomerations in the post-war economy of Ukraine, in particular, in the context of institutional development and spatial development of territorial communities. Instead, S. Gaiduchenko *et al.* (2024) focused on the specific features of the development of social capital of territorial communities in Ukraine, in particular, in the conditions of martial law and post-war reconstruction. The researchers emphasised that social capital plays a key role in mobilising resources, building trust between community members, and effectively managing local development processes during crisis and recovery periods. N. Kondratenko *et al.* (2024) in their research analysed the state and features of the development of territorial communities in Ukraine, in particular, in the context of decentralisation and socio-economic aspects. However, despite a significant amount of research on the sustainable development of economic systems, the issue of analysing the resources and capabilities of each individual territorial community is relevant.

The research covers a wide range of issues that are key to understanding the role of territorial communities in ensuring the sustainable development of the agrarian sphere of Ukraine. They include both theoretical concepts and practical approaches that can be applied

to improve the efficiency of agricultural resource management at the local level. The study by M. Pugachev *et al.* (2023) is devoted to the development of methodological recommendations for the creation of an agro-economic passport of a community as a tool that allows systematic analysis of resource potential, production capabilities, and socio-economic indicators of the territory. This is an important step for territorial communities, because it provides a basis for planning sustainable development of the agrarian sphere, considering local characteristics. A. Hutorov (2021) and I. Kalina *et al.* (2024) proposed methodological approaches and theoretical constructs that emphasise the need for a comprehensive assessment of the agrarian sphere, including socio-economic, organisational, and technological dimensions. They emphasise that sustainable development is possible only with balanced use of resources, infrastructure development and active participation of local communities. It is worth noting that the focus of the development of the agrarian sphere should shift to the development of a particular community, since the quality of public services provided to the population and the development of social infrastructure depend on them. All information about these communities can be displayed in the agroeconomical passport. These areas of development of territorial communities correlate with the sustainable development goals in Ukraine, which are defined by Decree of the President of Ukraine No. 722/2019 (2019). Therefore, this topic is relevant and important. The analysis of sources shows that not all communities use such an effective tool for planning and developing the agrarian sphere as the agro-economic passport, which can help to improve the efficiency of resource management at the local level. That is why the purpose of this study was to substantiate the specific features of the development of a territorial community in the context of ensuring sustainable development of the agrarian sphere.

MATERIALS AND METHODS

Research and the analysis of analytical materials and statistical data covered the period from 2012 until March 2025, which allowed tracing the dynamics of transformations in the role of territorial communities in ensuring the sustainable development of the agrarian sphere of Ukraine. The main methodological basis of the study was scientific achievements of Ukrainian (Dyachenko & Zhmudenko, 2023) and foreign (Niemets *et al.*, 2018; Ma *et al.*, 2022) researchers on the development of the agrarian sphere. These studies are important because they provide a comprehensive understanding of the challenges and trends in the development of the agrarian sphere both in the national and international context, are based on current empirical research, methodological analysis, and practice-oriented approaches, which allows forming reasonable conclusions about the role of territorial communities in ensuring the sustainable development of the agrarian sector of Ukraine.

In the course of the study, official statistical and analytical data from such sources as the Food and Agriculture Organisation of the United Nations (FAO analytical data, n.d.), the Kyiv School of Economics (KSE, 2024), and the State Statistics Service of Ukraine (n.d.) were used. These resources provided up-to-date information on the state of agricultural production, the impact of external and internal factors on the agrarian sector, and trends in the development of agriculture in the context of decentralisation and martial law. In addition, information was used that includes practical experience and recommendations to strengthen the capacity of each territorial community (Zatyshnyak *et al.*, 2025) and materials on the development of the agro-economic passport of the community, which were developed and published within the framework of the project "German-Ukrainian Agricultural Policy Dialogue (APD)" (APD German-Ukrainian Agricultural Policy Dialogue, n.d.) with the support of the Federal Ministry of Food and Agriculture (BMEL) and its order through the contractor LLC GFA Consulting Group, and based on the working community, which consists of LLC IAC Agrar Consulting, Leibniz-Institute for Agricultural Development in Transition Countries and LLC GOPA AFC (Pugachev *et al.*, 2023). Their analysis allowed substantiating the importance of integrating statistical indicators into planning for sustainable development at the level of territorial communities, in particular, through the use of tools such as the agro-economic passport of the community.

To achieve this goal in the process of collecting, analysing, evaluating up-to-date information, and to present results and generalise conclusions, the dialectical method of scientific cognition and such general scientific methods as analysis, synthesis, comparison, graphic method, and generalisation were used. The dialectical method allowed considering the development of the agrarian sphere of territorial communities in dynamics and interrelation with economic and social processes. Methods of analysis and synthesis helped to identify the main factors of influence and generalise their effect on sustainable development. The comparison method was used to compare indicators before and after the outbreak of war. The graphical method was used to visualise data (in particular, losses in agriculture), and the generalisation method was used to form conclusions and suggestions. During the study, various specific methods were used, in particular: methods of induction and deduction, which were used to substantiate the definitions "agrarian sphere" and "agrarian sector"; statistical methods – to analyse the consequences of military operations on the functioning and development of the agrarian sphere during the period of the full-scale invasion of the Russian Federation on the territory of Ukraine, starting in 2022 (State Statistics Service of Ukraine, n.d.); methods of logical generalisation and scientific abstraction – in the process of justifying the need to use an agro-economic passport for rural development; methods of comparative and structural-factor analysis to substantiate the promising areas of sustainable development of a particular territorial community, which is reflected in the agro-economic passport.

RESULTS AND DISCUSSION

In the conditions that have developed in Ukraine, the only central executive authority that ensures the development and implementation of the national policy in the field of rural development and is the Ministry of Agrarian Policy and Food of Ukraine. Resolution of the Cabinet of Ministers of Ukraine No. 124 (2021) approved a new regulation on the Ministry of Agrarian Policy and Food of Ukraine and it determined that this body is the leading in the system of central executive authorities, responsible for the development and implementation of state agrarian policy, and policies in the fields of agriculture, rural development, and agriculture. However, the trend of transferring powers to territorial communities continues, in particular, it concerns the management system and management of their own financial resources. This allows local governments to develop their own strategies by implementing measures aimed at implementing national policies in the field of rural development. Such powers are provided for by the norms of the Law of Ukraine No. 280/97-VR (1997).

However, many economic, social, technological, and other problematic issues arise on the way to the development of each individual territorial community. Migration of the country's population and lack of human resources, damage and destruction of many business entities require reform both in the context of territorial communities of Ukraine and the entire agrarian sphere. The main factors of deterioration of the situation on the labour market of Ukraine are migration and economic crises. Only during 2022, according to official data of the State Statistics Service of Ukraine, about 8 million people left the country, 5 million of them – people internally displaced around the country. In 2023, 14.1 million people left the country, of whom 142 thousand people remained abroad. For the first quarter of 2024, about 7.8 million people crossed the border of Ukraine (State Statistics Service of Ukraine, n.d.). It is precisely because of the forced migration of the working-age population outside the country, the mobilisation of men in the Armed Forces of Ukraine, the deepening of educational and professional imbalances in the labour market, and its uneven sectoral and geographical recovery that there is a significant shortage of workers in the agrarian sphere of Ukraine.

In addition, during 2023, the labour market of Ukraine also experienced seasonal fluctuations, in particular, in the agrarian sector of the economy, the demand for labour increased significantly. Therefore, in order to adapt all areas of employment at the state level, measures are being implemented that are primarily aimed at stimulating the activities of business structures and employment of the population in general. Within the framework of the government

programme "eRobota" (eRobota..., n.d.), in 2023, a grant programme was introduced to create and further develop their own business for participants in military operations, persons with disabilities due to war and their family members, including in agriculture. The programme provides grants to Ukrainians to start a business, expand their business activities, and acquire new professional skills. Within the framework of the project, six grant programmes are implemented, including: micro-grants for creating own business; grants for the development of processing enterprises; state funding for laying perennial plantings (gardens); funds for the development of greenhouses; grants for the implementation of startups, including in the IT sphere; financing professional training in IT specialities. These initiatives are a significant resource of support for residents of territorial communities, especially in rural areas, where agrarian activities form the basis of the local economy.

In addition, the mechanism of compensation to employers for the employment of the unemployed is being improved. As part of the programme of compensation for the employment of internally displaced persons, 186 employers received compensation for the employment of 451 displaced persons. In particular, in the Vinnytsia Oblast, the largest amount of compensation was received by ARGON LLC (78 persons), GREEN COOL LLC (46 persons), and a branch of the meat processing complex Vinnytsia Poultry Farm LLC (39 persons) (Compensation to employers for employing IDPs, 2023). In 2023, about 5 thousand unemployed people were employed under compensation programmes, while employers were compensated for the costs incurred to pay for the employment of 14 thousand internally displaced persons. The development of the agrarian sphere is also affected by losses due to military operations on the territory of Ukraine (Report on direct infrastructure damage from destruction as a result of Russia's military aggression against Ukraine, 2024). At the beginning of 2024, the amount of direct losses amounted to about 10.3 billion USD (Table 1).

Table 1. Assessment of direct losses to the agricultural sector and land resources, as of January 1, 2024

Types of losses	Number of facilities	Number of facilities that have been destroyed or damaged	Total losses, billion USD
Destroyed: Agricultural machinery, units	764,323	130,603	5.43
Granaries, capacity, thousand tonnes	75,084	11,351	1.7
Dead animals, thousand units	203,292	1,899	0.1
Destroyed apiaries and bee colonies, units	2,272,740	86,902	0.0
Perennial crops, ha	197,100	16,364	0.4
Destroyed and stolen factors of production, t	962,951	135,993	0.1
Destroyed and stolen finished agricultural products, t	25,486,613	4,037,542	1.9
Aquaculture and fishing facilities, units	2,102	228	0.03
Damaged: Slaughter of animals due to the inability to keep them, thousand units	203,292	11,963	0.1
Dead and missing bees, bee colonies	2,272,740	192,526	0.0
Agricultural machinery, units	764,323	50,521	0.4
Granaries, capacity, thousand tonnes	75,084	3,341	0.1
Total direct infrastructure losses	-	-	10.3

Note: "-" – data not available

Source: compiled by the authors based on Information Report on direct infrastructure damage from destruction as a result of Russia's military aggression against Ukraine (2024)

According to the Kyiv School of Economics, the largest share of losses are losses due to damage and destruction of agricultural machinery, which is why the estimated losses of agricultural producers amount to approximately 5.8 billion USD. The next largest category includes losses due to theft and destruction of manufactured products, the total value of which is 1.9 billion USD. It also suffered significant losses in the storage of agricultural products, in particular, as of the beginning of 2024, the total capacity of all grain storage facilities that were destroyed is 11.4 million tonne, the capacity of all damaged granaries is 3.3 million tonnes of simultaneous storage capacity. The approximate cost of restoring destroyed capacities, according to experts, is estimated at 1.8 billion USD. Regarding indirect losses of the agro-industrial complex, it was noted that they are estimated at 40.3 billion USD (KSE, 2024).

According to FAO analytical estimates, as a result of the war, rural households suffered significant losses, they are estimated at 2.25 billion USD. Of this amount, approximately 1.26 billion USD was lost in crop production and 0.98 billion USD in livestock production. In addition, in 2023, approximately 25% of agricultural households stopped or reduced production volumes in Ukraine, and 38% in frontline regions (FAO analytical data, n.d.).

The development of the agrarian sphere is also influenced by the fact that Ukraine received the status of candidate for EU on June 23, 2022 (Ukraine received the status of candidate for EU, n.d.). This requires further adaptation of the agrarian policy to the Common Agricultural Policy of the European Union (CAP), which focuses on such issues as maintaining the income level of farms, their well-being, more rational use of forest, water, and land resources, bioenergy technologies, conservation and further reproduction of natural resources, investment attractiveness of rural areas. One of the main areas of CAP is the development of these territories by supporting the agrarian sector, stimulating the creation of new jobs, and diversifying businesses in rural areas, which will ultimately lead to an improvement in the quality of life of the rural population (New EU common..., 2023). The State's support in this area focuses on stimulating the further development of crafts and small businesses in rural regions, preserving landscapes, developing tourism, modernising rural infrastructure, developing education for the needs of the rural economy, creating conditions for the innovative use of renewable energy sources using agricultural products, etc. At the state level, small businesses and crafts are stimulated through subsidy programmes and grants for small farmers and agricultural enterprises, environmental initiatives are introduced: support for organic production, establishment of a "green" regulatory framework, vegetation zones, biodiversity, in particular, the share of such measures in the cap structure reaches 30%; infrastructure projects are financed: road modernisation, lighting, irrigation, and land reclamation, and the budget of more than 4 billion UAH allocated for implementation (KSE, 2024).

In the context of decentralisation and transformation of the Ukrainian economy, territorial communities play an important role in the development of the agro-industrial complex. It is at their level that a significant part of agrarian policy, land management, and infrastructure support for agrarian businesses are implemented. However, it is quite difficult to assess the real economic contribution of communities to the development of the agro-industrial complex due to the lack of systematic analytics based on clear and relevant indicators. Definition of a system of key economic indicators is a necessary condition for forming an effective national policy in the field of rural development and agrarian support. Such indicators will allow not only to compare the effectiveness of communities in the agricultural sector, but also to promote transparent budget decisions, encourage investment in rural areas, and increase the capacity of communities as basic centres of agrarian growth. According to statistics, in 2023, the share of the rural population was 29.9%, while rural residents make up more than 50% of the low-income categories. According to 2023 data, at the national level, GDP per capita was about 2,159.95 UAH, and the average regional differences in the team of rural communities can be significantly lower, approximately in the range of 1,500-2,000 UAH. More than 34.5% of local budget revenues are generated by grants and subsidies, and agribusiness

occupies an important place in the development of the tax base, in particular, due to the single tax and land tax, together these items bring at least 3.9% of GDP (State Statistics Service of Ukraine, n.d.). In 2024, more than 65% of agricultural land is located within the amalgamated territorial communities, but only about 20% of them have approved spatial development plans or agrarian strategies (State Statistics Service of Ukraine, n.d.). More than 40% of these communities face negative demographic dynamics of the rural population, which is directly related to the reduction of agricultural production and a shortage of labour. In addition, approximately 25% of local budget revenues in rural communities are generated from the agrarian sector, but the effectiveness of using these funds largely depends on the managerial capabilities of the territorial communities themselves.

Considering the dynamics of GDP per capita and the role of agribusiness in the development of local budgets, it becomes obvious that there is a need to form a clear system of economic indicators that would reflect the real impact of territorial communities on the development of the agro-industrial complex. Such indicators should cover: the share of the agro-industrial complex in the income structure of communities (especially through the single tax of group IV, land tax, personal income tax); the dynamics of employment in the agrarian sector at the community level; the volume of investments in agrarian infrastructure; the level of subsidies and subventions aimed at the development of agricultural production; the coefficient of self-sufficiency of the community with agricultural products and logistics services. The introduction of such indicators will allow objectively assessing the effectiveness of attracting rural areas to the development of the agrarian sphere, will contribute to the development of a transparent policy of supporting rural communities and a more reasonable redistribution of budget resources.

Considering the areas of rural development (support for sustainable agriculture**,** using innovation and digitalisation in the agricultural sector, increasing the competitiveness of farms, developing the rural economy and employment, social cohesion and quality of life, and territorial integration and local initiatives) in accordance with the proposals of the Common Agricultural Policy of the European Union (CAP), sustainable development to attract new forms of investment resources is an urgent issue. Each territorial community tries to create a favourable investment climate and be open to proposals. Accordingly, it is necessary to have complete information about the available resources of the community and determine possible areas for their use, which should be reflected in the developed document, which can be an agro-economic passport, methodological recommendations for the development of which are provided by specialists of the project "German-Ukrainian agropolitical dialogue" (Project manager – Mariya Yaroshko) together with researchers of the National Research Centre "Institute of Agrarian Economics" of the National Academy of Agrarian Sciences of Ukraine (Pugachev *et al*., 2023).

Due to the project "German-Ukrainian Agricultural Policy Dialogue (APD)" (APD German-Ukrainian Agricultural Policy Dialogue, n.d.), Ukraine receives support in the development of sustainable agriculture and rural areas, and in increasing international competitiveness in accordance with the principles of market and regulatory policies. The project also provides access to information on German and international experience in creating framework conditions and organising relevant institutions in the field of agrarian policy. Support within the framework of the project "German-Ukrainian agropolitical dialogue" (APD) is provided institutionally, consultationally, and analytically. Consulting support includes providing expert assistance to the Ministry of Agrarian Policy and Food of Ukraine on adapting legislation to EU requirements and standards (within the framework of the Association Agreement and preparation for EU accession) and developing recommendations for the future implementation of EU Common Agricultural Policy (CAP) mechanisms in Ukraine, for example, on planning, monitoring and control tools. Analytical activities and development of policy recommendations are carried out through the creation of analytical notes, policy reviews, research (for example, on market instruments, rural development) and the development of mechanisms for transparent state support (for example, the state

agrarian register). Educational and informational support is provided by organising training seminars, workshops, conferences for civil servants, farmers, public organisations and researchers, and issuing newsletters and reference books on agrarian policy, markets, support programmes, etc. Regarding the exchange of experience and the involvement of German experts, it is worth noting that this is carried out through the organisation of study trips to Germany and other EU countries to get acquainted with agrarian management models, advisory services, support for rural regions, and through the participation of German experts in working groups on the formation of Ukrainian rural development policy. Regional initiatives are also supported. Thus, the APD creates a bridge between Ukrainian institutions and European experience to strengthen Ukraine's ability to develop an effective agrarian policy and develop rural areas in accordance with the principles of sustainable development.

Such a passport is developed for a specific community to provide information assistance to various local self-government bodies, while an inventory of all available community resources is carried out for their assessment and further use (Pugachev *et al*., 2023). In addition, due to the agro-economic passport of the community, its investment attractiveness is determined and measures are developed to support rural and agrarian development and attract new forms of investment resources. The tasks during the creation of the agro-economic passport of a particular community are: monitoring of economic, land, human resources, demographic and logistics processes, in a particular territorial community; evaluating human resources that have a production purpose; organising an assessment of the state of land resources; analysing the state of agricultural production in each individual direction of production and in accordance with all industries; analysing the development of the community in strategic areas and substantiating possible priorities for the agro-economic development of a particular community. The agro-economic passport contains a general description of the territorial community, socio-demographic analysis, assessment of the level of employment, development of the agrarian sector within the community, the presence of processing and industrial enterprises, the state of infrastructure, analysis of the development of the social sphere, and an assessment of the investment potential of the community and the agrarian economy.

Especially relevant is the introduction of an agro-economic passport in each territorial community in the context of military operations on the territory of Ukraine, which will help to increase the efficiency of using limited financial resources. The main functions of the agroecomic passport of a territorial community are shown in Table 2. Due to the use of the agro-economic passport for each territorial community, awareness of its resource potential increases, since the passport contains detailed information about: available land plots (their size, purpose, soil quality); existing infrastructure (electricity, roads, warehouses, irrigation) and logistics accessibility (distance to sales markets, railway junctions, warehouses). The agro-economic passport allows agricultural enterprises to see real opportunities for expanding production or joining forces within the community. In addition, due to such a passport, it is possible to form an investment profile of the community by systematising data on existing agricultural enterprises; free production areas; labour potential (availability of specialists, unemployed) and existing programmes of state support and financing. Investors receive a convenient and officially confirmed overview of what they can invest in with the least risks (Zatyshnyak *et al*., 2025).

Table 2. Main functions of the agro-economic passport of a territorial community

Function	Essence of the function	Expected economic effect
Analytical	Summarising statistical data on population, land, infrastructure, and enterprises	Making economically sound decisions at the local level
Investment	Determination of the investment potential of a community (land and human resources, logistics, etc.)	Increase in the investment attractiveness of the territory, attracting external investors

Table 2, Continued

Function	Essence of the function	Expected economic effect
Management system	Use of passport as a tool for programme development and budget planning. Development of a vision for the development of the agrarian sphere in the medium and long term.	Efficient use of community resources and improving the effectiveness of management decisions. Creation of sustainable development strategies, adaptation to changes in the external environment.
Monitoring system	Assessment of changes in the land, labour, and demographic potential of the community.	Identification of risks and response to problems in a timely manner.
Information	Provision of open access to data on the agrarian sphere of the community.	Increase in transparency, increase in investor and partner confidence.
Coordination	Systematisation of information for interaction between communities, government agencies, and businesses.	Improvement of the efficiency of territorial development management and planning.

Source: compiled by the authors based on M.I. Pugachev *et al.* (2023), V. Zatyshnyak *et al.* (2025)

Such a passport is an effective tool for promoting agrarian cooperation, because due to the analytical data of the passport, the community can identify a critical mass of small producers for creating a cooperative; determine the types of cooperation (sales, technical, processing) that are most appropriate, and substantiate the need for joint equipment or logistics solutions. This allows creating competitive value chains at the community level. The public agro-economic passport of the community promotes transparency of data on land and other resources and builds trust on the part of potential partners, in particular banks, investors, and donors. Thus, the agro-economic passport acts as an information basis for planning, cooperation, and investment, giving communities and farmers a common "data language" for decision-making.

In the context of war and market changes, the institutional capacity of territorial communities is gradually weakening. The lack of a strong, resource-rich and strategically oriented system of the territorial community creates significant risks for the sustainable functioning of the agricultural sector (Kussul, 2023). First, without effective management at the local level, agrologistics is disrupted, since communities are not able to ensure proper coordination regarding the storage, transportation, and sale of agricultural products, which is especially critical in the context of military operations and interruptions in national logistics. Second, weak territorial communities are not able to exercise proper control over the rational use of land resources, which leads to soil degradation and the growth of unauthorised development. In addition, without a strong territorial community, the possibility of effective support for small and medium-sized agricultural producers is lost, in particular, in the field of access to state and international grants, support programmes, and educational initiatives. Communities without a strong economic foundation become sources of social vulnerability, which leads to an increase in unemployment, increased migration, and a shortage of labour resources. This situation directly affects the stability of agricultural production and tax revenues. As a result, the investment attractiveness of rural areas decreases sharply. Finally, the weakened territorial community is not able to perform its critical function of ensuring food security at the local level, which in war conditions turns into a national risk (Niemets *et al.*, 2018; Ma *et al.*, 2022). Thus, the weak system of the territorial community threatens not only local agrarian development, but also undermines the basis of the country's economic stability as a whole. Therefore, the development of a strong, efficient and financially sound model of territorial governance is a key factor in preserving and modernising the agricultural sector of Ukraine.

In accordance with the strategy for the development of territorial communities and the adopted programmes of economic and social development of rural areas of specific communities, which are developed by each individual community, determine the needs and areas of its development. It is important to identify which areas of development can be achieved through the further functioning of the agrarian sphere, especially at the expense of business structures, the role of which is shown in Figure 1.

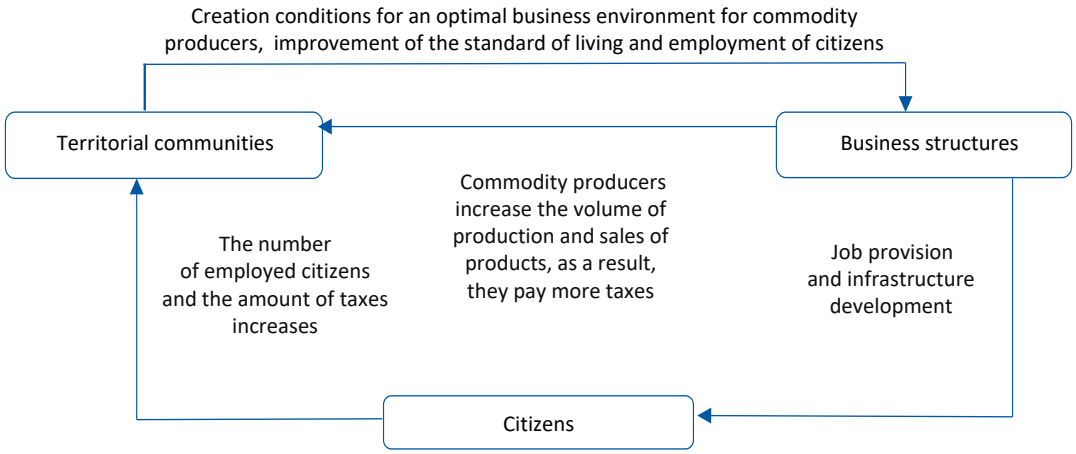

Figure 1. Scheme of optimal cooperation between business structures, territorial communities, and citizens to ensure sustainable development of the agrarian sphere

Source: compiled by the authors

Analysing Figure 1, it should be noted that optimal cooperation can be achieved by expanding the activities of business entities in territorial communities, especially if it is successful not only for the owner of the business structure, but also benefits the territorial community. It is also possible to create specific clusters for the production of agricultural products for further sale. In addition, each territorial community needs to prescribe tasks for business structures and measures for their implementation, indicating the terms and methods of implementation, the necessary sources, and amounts of funding, broken down by year. Indicators that will be used to monitor performance and the expected result must be highlighted. Each area of development of a territorial community will require a separate justification from the business structure, outlining requests not only for financial resources, but also for human resources and material and technical means. However, in this case, the agro-economic passport would be similar to an investment project or a business plan. Therefore, it is enough to highlight the areas of development of the agrarian sphere in cooperation with business structures, volumes, and sources of funding, and most importantly to show how each business structure will contribute to the further development of the territorial community, whether their activities will lead to an increase in employment, an increase in the overall level of income of the local population, ensuring the quality of their life, the development of social infrastructure, increasing revenues to the local budget and solving existing problems. The agro-economic passport is most valuable for domestic and external investors, and for orientation in the development of local support programmes – which will give the greatest result in conditions of limited funding.

To ensure further sustainable development of the agrarian sphere at the level of the territorial community, it is advisable to develop the following areas:

1. Financial, credit, and investment development of a particular territorial community. To implement this area, it is necessary to redistribute the available financial resources of the territorial community, directing them to the implementation of investment projects in the agrarian sphere. It is also necessary to introduce a system of partial reimbursement by the state of rates on loans granted to agricultural producers and other enterprises that are involved in the development of the optimal infrastructure of the territorial community.

2. Improvement of resource and information support in territorial communities should be carried out by implementing the following measures: use various marketing tools to form a positive image of both the territorial community and the business structures that work in it; ensure,

as far as possible, the introduction of special programmes to support the territorial community of entrepreneurs-beginners in the agrarian sphere, for example, to form a base on the availability of free premises for both industrial and non-industrial purposes, which can be leased to these enterprises; ensure the involvement of enterprises in solving various social issues for the development of territorial communities.

3. Providing information and consulting support for agricultural enterprises in each territorial community, which can be carried out by organising "unified advisory days" with the involvement of representatives of state, local, tax, and regulatory authorities; use the Internet network to provide remote information and advice through improving the site of the territorial community, which will allow access to information resources; provision of methodological assistance in the aspect of forming charters, agreements, and business plans during the creation of agricultural enterprises, which will increase their number in the territorial community.

4. Introduction of the position of adviser on agrarian and rural development in communities to improve approaches to the implementation of the state's agrarian policy at the local level, and to improve communication and information transmission between farmers, residents of the community, and government bodies at various levels in the field of agrarian and rural development.

5. Increase the number and restoration of infrastructure facilities in territorial communities, the function of which is to support business structures. This can be achieved by providing advice on the creation of unions of agricultural producers and business incubators with the involvement of insurance companies and credit unions in the community.

All these areas of development of territorial communities have the potential not only to contribute to the expansion and modernisation of agricultural enterprises, but also to significantly increase the level of awareness of potential investors about the opportunities and prospects for cooperation in a particular territorial community. The active involvement of the local population in information campaigns and development processes creates the basis for greater social cohesion and support for initiatives aimed at sustainable development. Such an integrated approach to the development of territorial communities contributes to improving the efficiency of resource management, attracting investment and ensuring stable economic growth of each individual territorial community.

In scientific research, special attention is paid to a comprehensive analysis of the agrarian sphere of Ukraine in the context of its sustainable development, where territorial communities play a key role. Researchers like M. Dyachenko & V. Zhmudenko (2023), emphasised the importance of the agrarian sector as the foundation of food security, which is extremely relevant in war conditions. Their study focused on the adaptability of agricultural production to the conditions of crisis challenges and on identifying mechanisms for strengthening local food systems, in particular, through the creation of closed supply chains for resources and products. A. Herasymenko (2023) also emphasised that the development of the agrarian sector cannot be effective without attracting the human potential of rural areas, the motivational environment, and institutional support from communities.

A significant contribution to the deepening of the conceptual framework of research was made by such researchers as O. Popova (2012), V. Ryabokon (2016), L. Yemelyanova (2017), who substantiated the need to distinguish between the concepts of "agrarian sphere" and "agrarian sector". Researchers point out that the agrarian sphere is a broader concept that includes not only the production component, but also the social, infrastructural, spatial, and ecological components of rural areas. It is within the framework of the agrarian sphere that a multi-vector interaction between the population, economic activity and natural resources is formed. This broad understanding helps to more effectively assess the role of territorial communities as key actors in managing rural development. V. Ryabokon (2016) referred to the agrarian sphere as an association of all agricultural enterprises and business entities that allow ensuring the sale of agricultural products, efficient operation of social infrastructure and the development of agrarian policy at the international, national, and regional levels. O. Popova (2012) emphasised that it is worth using the definition of

"agrosphere". According to the researcher, the agricultural sphere is formed and operates in rural areas, using its resource base, in particular material, natural, spatial, and labour. It is the system-forming basis of rural development and determines its progress and sustainability. The researcher described the relationship between human capital, natural resources, agricultural producers, and infrastructure in rural areas. The researcher emphasised that human potential is a key resource of the agrarian sphere, agricultural production plays an important role in the economy of rural areas, and agricultural landscapes dominate the structure of their socio-economic space. Thus, the basis of agrarian development and rural communities is based on three interrelated elements: population, economic activity, and territorial resources. L. Yemelyanova (2017) considered the essence and features of the agrarian sphere, which means "a system characterised by the presence of a basic industry, around which a certain environment is formed, namely: rural, which determines the specifics of its certain functions, level, conditions, lifestyle of the population". Modelling of sustainable development of the agrarian sphere is carried out considering the factors of the agrarian sector, its impact on food security, environmental situation, and rural development; quality of life, which is one of the main factors in the development of human and natural capital. I. Tsymbalyuk & L. Rykovska (2017), synthesising the interpretation of the definitions "agrarian sphere" and "agrarian sector", proposed their correlation as a whole and partial. This follows from the fact that the concept of "sphere" is much broader than the definition of "sector". Therefore, the agrarian sector of the Ukrainian economy is a narrower concept than the agrarian sphere.

Scientific approaches by A. Solop (2024) expanded the concept of agrarian development, drawing attention to the need for constant monitoring of the state of the agrarian sector, which allows responding in time to structural changes in the rural economy. A. Solop (2024) focused on the agrarian sector, which plays an important role in the functioning of the country's economy, so it needs constant monitoring of its indicators and updating. This will allow identifying all structural changes in a timely manner and priority development vectors. Views reflected in research by L. Niemets *et al.* (2018), Y. Ma *et al.* (2022), N. Kussul (2023), who highlighted the challenges associated with military operations on the territory of Ukraine, which significantly affect the agrarian sector. In these circumstances, territorial communities act as the first line of response, which requires them to be adaptive, prompt, and responsible resource management. But this study not only considered the impact of martial law, but also offered a constructive model for overcoming challenges through the development of territorial communities. Communities were considered not only as reactive structures, but also as key agents of sustainable development, which have their own planning and strategic management tools. The use of remote sensing and data analysis (GIS, Big Data) technologies helps communities to assess damage and plan recovery (Novak, 2022). S. Stepanenko (2023) emphasised in his research the prospects of transition to a circular economy in the agrarian sector, which is directly related to the activities of territorial communities as local management centres that can implement innovative models of production and consumption. H. Studinska (2024) noted the polycrisis nature of the agrarian sphere of Ukraine, emphasising the need for a systematic approach to overcoming challenges, which is relevant for territorial communities that must work for the sustainability and development of their territories. This study also recognised the existence of crisis phenomena, but focused on the potential of territorial communities as key actors capable of ensuring the sustainable development of agriculture through effective management of local resources. In general, analysing these sources, it can be concluded that territorial communities in Ukraine are of key importance for the sustainable development of the agrarian sphere. They are entities that create conditions for efficient use of resources, introduction of innovations, ensuring social stability and food security. They need support in the form of methodological tools (agro-economic passport), access to digital technologies and resources, and integration into national and regional development strategies.

Thus, the analysis of various scientific approaches shows that the effective functioning

of the agrarian sphere in Ukraine is impossible without the active participation of territorial communities that have not only resources, but also managerial powers to implement sustainable development strategies. Rural communities become a space of concentration of human, natural, and institutional capital, which in the context of decentralisation turns them into full-fledged participants in agrarian transformation. Thus, it is territorial communities that act as catalysts for the integration of socio-economic, spatial, and environmental processes within the agrarian sphere of Ukraine.

CONCLUSIONS

The study defines that the agrarian sector is considered to be the sector of the state economy, which includes all subjects of economic activity, regardless of the organisational and legal form and form of ownership, engaged in the production of agricultural products and products of its processing, and all enterprises that serve this sector. But the agrarian sphere is a much broader concept, which includes both the agrarian sector of the economy and the entire social infrastructure of rural areas. That is, it is the "agrarian sphere" that is a comprehensive category for the entire rural area, which directly includes such processes of life in rural areas as social and agricultural production.

The study analysed how the war affected the agrarian sector of the Ukrainian economy and outlined directions for further development of rural areas in accordance with the directions of SAP. During the military operations on the territory of Ukraine, agricultural producers suffered the greatest losses due to damage and destruction of agricultural machinery. In particular, direct losses due to damage and destruction of agricultural machinery amount to approximately 5.8 billion USD, and losses from theft and destruction of products amount to 1.9 billion USD. The destruction of grain storage facilities led to a loss of storage capacity of 11.4 million tonnes, and damaged storage facilities have an additional 3.3 million tonnes, the total cost of their restoration is estimated at 1.8 billion USD. Indirect losses of the agro-industrial complex reach 40.3 billion USD. A weak system of territorial communities creates serious risks for the functioning of the agricultural sector, especially in conditions of war and market transformations. Agricultural households lost approximately 2.25 billion USD, of which 1.26 billion USD in crop production and 0.98 billion USD in animal husbandry. In 2023, 25% of households reduced or stopped production, and in the front-line regions this figure reaches 38%. These losses significantly complicate the restoration of the agricultural sector and require systematic support to ensure the country's food security.

As of 2024, more than 65% of agricultural land is located within united communities, but only about 20% of them have approved spatial development plans or agrarian strategies. In addition, more than 40% of communities have a negative dynamics of the rural population, which is directly related to the loss of agricultural production and human resources. About 25% of local budgets in rural communities are formed at the expense of the agrarian sector, but the effectiveness of using these funds largely depends on the managerial capacity of the territorial communities themselves. In such a situation, the development of a strong, professionally managed and financially autonomous model of a territorial community is critical for ensuring food security, investment stability, and social cohesion at the local level in a protracted war.

To ensure the development of territorial communities by stimulating the creation of new jobs, business diversification in rural areas, which will ultimately lead to an improvement in the quality of life of the rural population, the specialists of the project "German-Ukrainian Agricultural Policy Dialogue (APD)" developed and proposed to apply an agroeconomic passport in territorial communities. It allows monitoring economic, land, human resources, demographic and logistics processes in a particular territorial community; to assess human resources and the state of land resources; to analyse the state of agricultural production in each line of production and in accordance with all industries, to identify possible strategic vectors of community development. The areas of further development of territorial communities for the sustainable development of the agrarian sphere are financial, credit, and investment development, improvement of resource and information support, information and consulting

support for agricultural producers, and restoration and expansion of infrastructure.

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CONFLICT OF INTEREST

None.

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Роль територіальних громад у забезпеченні сталого розвитку аграрної сфери України

Анотація. В умовах воєнного стану в Україні, перерозподілу світових продовольчих ринків формуються нові передумови для сталого розвитку аграрної сфери. Метою статті було обґрунтування необхідності розвитку територіальної громади як шляху до сталого розвитку аграрної сфери. У дослідженні використано такі методи, як аналіз статистичних даних, системний підхід, узагальнення, абстрактно-логічний метод і метод синтезу. Визначено, що головним завданням країни є збереження аграрної сфери у сприятливому стані, щоб забезпечити задоволення потреб не лише населення, а й майбутніх поколінь. Доведено, що для досягнення сталого розвитку сільського господарства необхідно впроваджувати комплексні заходи, які сприятимуть досягненню сталості та забезпечуватимуть синергетичний ефект для економіки, довкілля і суспільства. При цьому акцентовано увагу на тому, що водночас цей розвиток значною мірою залежить від спроможності територіальних громад, адже саме на їхньому рівні формуються умови для розбудови соціальної інфраструктури, якісного надання публічних послуг, створення гідних умов праці та можливостей для самореалізації мешканців. Окреслено, що кожна громада володіє унікальним ресурсним потенціалом і має передумови для економічного зростання, які необхідно ефективно реалізовувати. Сформульовано, що важливим інструментом для планування та моніторингу цього процесу може стати агроекономічний паспорт громади, який є комплексним документом, що містить: загальну характеристику території та соціально-демографічний профіль; інформацію про наявність промислових, переробних підприємств і об'єктів інфраструктури; дані щодо рівня зайнятості та стану соціальної сфери; визначення перспективних напрямів агроекономічного розвитку. Практична цінність запровадження агроекономічного паспорта полягає в можливості системного моніторингу економічних, земельних, людських ресурсів, демографічних і логістичних процесів на рівні громади. Це в свою чергу сприятиме обґрунтованому управлінню ресурсами, оцінці людського потенціалу, ефективному аналізу стану сільськогосподарського виробництва по товаровиробниках, а також формуванню стратегій сталого розвитку територій

Ключові слова: аграрна сфера; аграрний сектор; сільськогосподарські підприємства; агроекономічний паспорт; сталий розвиток; територіальна громада

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Integration of the uniquely designed invention into the apitherapy market in the USA and Ukraine: Comparison of demand and current state of the industry

Abstract. The purpose of the study was to determine the prospects for introducing the innovative apitherapeutic technology "bee therapeutic bed in a pyramid" to the US and Ukrainian markets, based on market trends, regulatory requirements and consumer interest. As part of the study, scientific publications, market reports, and patent documentation were analysed. Methods of comparative analysis, political, economic, social, and technological analysis and assessment of the competitive environment were used to determine the factors affecting the integration of technology. As a result of the analysis, it was found that in the United States, the apitherapy market is characterised by a high level of regulation and demand for natural methods of treatment, which created opportunities for the commercialisation of the invention. In Ukraine, apitherapy remained mainly a part of traditional medicine, and the main barriers to entering the market were the lack of certification standards, low level of scientific verification of effectiveness, and financial restrictions of consumers. In 2024, beekeeping revenue in the United States was 3,958.41 million USD, and North America accounted for more than 40% of the global market (5,017 million USD). The beekeeping market in North America was estimated at 2.94 billion USD in 2023 and is expected to reach 5.46 billion USD by 2031, with a growth rate of 8.53% per year. Based on the results obtained, a business model for integrating the "bee therapeutic bed in the pyramid" was developed, which included identifying key partners, value proposition, distribution channels, and potential sources of income. It was determined that for successful implementation of the technology, it is necessary to adapt to regulatory norms, pass product certification, and develop a marketing strategy that will promote the method among potential consumers. It was concluded that the US market had a significant potential for commercial scaling of technology through a developed wellness industry and high demand for alternative medicine, while in Ukraine, there were opportunities for local development and further export of services

Keywords: beekeeping; health centres; marketing strategy; treatment; methods; bee therapeutic bed in the pyramid

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INTRODUCTION

The current development of alternative medicine and wellness technologies indicates a growing need for effective, safe and natural methods of maintaining health. Apitherapy, based on bee products, has a high potential for integration into the field of preventive and health-improving medicine. In many countries around the world, in particular in the United States and Ukraine, there is a constant increase in interest in natural healing methods. This helps to increase the market and create new opportunities for selling inventive products. However, despite the rapid development of the industry, there are several problems that hinder the introduction of the latest apitherapy technologies. These include regulatory obstacles, building customer trust, requiring scientific confirmation of effectiveness, and adapting technologies to market conditions. In this context, it is important to analyse the comparative aspects of demand for innovative apitherapy drugs in the United States and Ukraine, identify industry trends, and develop the best methods to enter these markets.

In the field of apitherapy, there are no standards for the use of bee products and their integration into medical practice in different countries. W.A. Weis *et al.* (2022) reviewed the use of honey, propolis, royal jelly, and bee venom for the treatment and prevention of diseases. Studies have confirmed their antioxidant, anti-inflammatory, and immunomodulatory properties, but the lack of global standards and a limited number of clinical trials are holding back the widespread acceptance of apitherapy in healthcare systems. Apitherapy does not have uniform standards for the use of bee products in medicine, which makes it difficult to integrate them into official therapeutic practice. R.C. Joshi & L. Kafle (2023) investigated the medicinal properties of honey, propolis, bee venom, and wax, focusing on their antioxidant, anti-inflammatory, and antimicrobial effects. The researchers noted the effectiveness of apitherapy in the treatment of skin diseases, infections, arthritis and chronic pain, and the potential of bee venom in the treatment of cancer and neurological diseases. In addition, they emphasised the need for large-scale clinical trials, standardisation of dosage, and development of uniform regulatory requirements for the wider use of apitherapy in modern medicine.

The growing prevalence of dangerous diseases, such as cancer, autoimmune and chronic pathologies, bacterial, fungal, and viral infections, is complicated by antibiotic resistance and the negative effects of synthetic drugs. S.E. El-Didamony *et al.* (2024) analysed the composition of bee products, their therapeutic effect, and the latest approaches to improving their effectiveness. Beekeeping products have been found to promote wound healing, reduce inflammation, improve blood circulation, and stimulate the immune response. In addition to traditional methods, researchers have developed innovative approaches such as using nanoparticles, biomaterials, and other state-of-the-art technologies to improve the bioavailability of these products.

Insufficient large-scale clinical trials make it difficult to confirm the effectiveness of apitherapy, in particular the use of bee venom to treat diseases such as Parkinson's disease and arthritis. S. Jang & K.H. Kim (2020) identified the potential benefits of apitherapy, but noted mixed results due to different methods and small samples. The researchers emphasised the need for large-scale clinical trials, and the investigation of molecular mechanisms of action and standardisation of the method. K.I. Kasozi *et al.* (2020) studied the potential of bee venom in the treatment of infections, particularly in COVID-19, pointing to the possibility of activating the immune response. G. Özdemir *et al.* (2021) analysed honey, propolis, royal jelly, bee venom, and parchment to determine their antibacterial, antioxidant, and anti-inflammatory properties. Propolis is effective for strengthening the immune system, and bee venom – in the treatment of inflammatory and rheumatic diseases.

Apitherapy is considered as a promising approach to the treatment of allergic reactions and diseases of the respiratory system. N.D. Widjanarko *et al.* (2024) investigated the effects of bee products on the course of allergic asthma, in particular, the use of honey, propolis, and bee venom. These components have been found to reduce inflammatory processes, reduce the level of immunoglobulin E, and regulate cytokine

balance, which helps reduce bronchospasm and improve respiratory function. I.I. Pylypchuk & I.S. Pylypchuk (2021) analysed their composition and medicinal properties, focusing on their use in the treatment of cardiovascular, gastrointestinal, and endocrinological diseases. Apitoxin, which has anti-inflammatory and immunomodulatory properties, is particularly noteworthy. The purpose of this study was to identify the features of introducing the latest therapeutic technology in the field of natural wellness methods in the USA and Ukraine, considering market trends and consumer interest.

MATERIALS AND METHODS

The study of the integration of the "bee therapeutic bed in the pyramid" into the apitherapy market in the USA and Ukraine was based on a comprehensive analysis of market conditions, assessment of the effectiveness of the technology, and comparison of regulatory requirements in the two countries. The main materials of the study were research papers, international publications on the effectiveness of beekeeping products, including research on the use of honey, propolis, royal jelly, and bee venom in medicine, and market analytical reports on the use of beekeeping products in medicine (Dankevych *et al.*, 2018; Shirsath, 2025; Future Market Insights, n.d.). In addition to academic sources, patents and copyright certificates for inventions related to the use of bee products for health improvement were analysed. This allowed assessing the level of scientific and technical development in the field of apitherapy and understanding the uniqueness of the "bee therapeutic bed in the pyramid" among the available solutions (Kononenko, 2025). The regulatory framework of the study included laws and bylaws regulating the use of natural medical products in the United States and Ukraine. The requirements for certification of apitherapy technologies were investigated, in particular, the provisions of U.S. Food and Drug Administration (FDA) (n.d.) and National Centre for Complementary and Integrative Health (n.d.).

Analysis using secondary data helped to assess the level of development of the apitherapy industry, the main competitors, consumer demand features, and potential barriers to entering the market. To assess the overall market attractiveness, PEST analysis was used, which considered political, economic, social, and technological factors influencing the development of apitherapy in the two countries. Not only the current state of the market, but also its prospects were assessed. Trends in growing interest in alternative medicine, changes in legislative regulation, the development of scientific approaches to assessing the effectiveness of natural treatments, and potential barriers to investment in this area were considered. As part of the study, a business model and strategy for integrating the invention into the apitherapy market were developed. For this purpose, key partners, target audience, and possible distribution channels were analysed. The main parameters of the value proposition based on the uniqueness of the product were determined, and possible mechanisms for its entry into the market were considered. In particular, potential ways of adapting the product to the requirements of various market segments were investigated, which determined the optimal strategies for promoting and implementing the invention within the United States and Ukraine.

RESULTS

Apitherapy, as a field of alternative medicine, is actively developing in the world, integrating into various sectors of the economy, in particular, pharmaceuticals, cosmetology, and the food industry. Due to the therapeutic properties of bee products such as bee venom, honey, propolis, and royal jelly, this market is showing steady growth and attracting more and more investment. The demand for natural and eco-friendly products increases interest in apitherapy both in advanced economies and in regions where traditional treatment methods predominate. In the United States, the apitherapy market is an important part of alternative medicine, which is actively developing due to the growing interest in natural treatments, the expansion of the pharmaceutical and cosmetic industries, and the growing demand for bee products. In the United States, beekeeping revenue was estimated at 3,958.41 million USD in 2024. North America took the main market share, accounting for more than 40% of global revenue, with a

market volume of 5,017.00 million USD in 2024. The combined annual growth rate is estimated to be 4.2% between 2024 and 2031. This shows the steady growth of an industry where apitherapy plays a significant role (Shirsath, 2025).

North America is the world's largest market for bee venom extract, accounting for 32.1% of all sales. In 2023, the beekeeping market in North America was estimated at 2.94 billion USD and is expected to reach 5.46 billion USD by 2031, with an average annual growth rate of 8.53%. This increase is the result of the growing use of bee venom in medicine, cosmetology, and the pharmaceutical industry (DataBridge, 2024). Increasing demand for natural and organic medicines is the main driver of market growth. According to the American Apitherapy Association, bee products, such as propolis, honey, and bee venom, are highly effective in treating diseases that do not respond well to conventional therapy. These include neuropathic pain, multiple sclerosis, rheumatoid arthritis, psoriasis, cancer scars, and acne. Apitherapy has also gained considerable popularity in the cosmetics industry in the United States. Bee venom is widely used in anti-ageing cosmetics because it increases collagen production and improves blood circulation, making the skin look younger. This encourages market growth due to the inclusion of bee venom in a number of cosmetic products of American brands (Future Market Insights, n.d.).

The apitherapy product segment in the United States includes several main areas. Medical applications include the use of bee venom, propolis, and royal jelly in pharmaceuticals for the treatment of musculoskeletal diseases, autoimmune diseases, and skin pathologies. In the cosmetics sector, bee products are part of creams, masks, serums, and other skin care products. Natural sweeteners such as honey are actively used as a substitute for sugar, especially among consumers who follow a healthy diet. In addition, apitherapy centres offering bee sting treatment are growing in popularity. Honey dominated the market in 2023 with a market share of 60.3% and is expected to maintain its dominance in the forecast period 2025-2034 (Future Market Insights, n.d.).

Despite the positive trends, the US market faces several challenges that may slow progress. One of the biggest threats is the decline in the number of bees. In 2023-2024, more than 55% of bee colonies were lost, which is the highest figure since the 2010-2011 beekeeping season. This is almost 15 percentage points higher than the average annual loss rate for 13 years, which is 40% (Kendall, 2024). In addition, environmental factors, in particular, urbanisation and climate change, have a negative impact, as they reduce the number of flower fields necessary for the normal functioning of bee colonies. Limited clinical trials of apitherapy products are also a problem. Although bee venom and propolis have proven to be effective therapeutics, the lack of significant clinical trials limits their widespread use in traditional medicine (Shirsath, 2025).

Among the largest companies operating in the apitherapy market in the United States as of 2024 are Beehive Botanicals, Georgia Honey Farms, Burleson's Honey, Mann Lake Bee & AG Supply, Walker Honey Farm. These enterprises invest significantly in expanding their production capacity and researching new medicines that beekeeping products have. In addition to major manufacturers, more and more startups are entering the market that focus on the use of bee products in nutraceuticals and natural cosmetics (Shirsath, 2025). Expanding the clinical use of bee venom, its use in premium cosmetic products, and implementing environmental initiatives aimed at preserving the bee population and sustainable production of bee products are the most promising areas of development. Thus, there is significant potential for the growth of the apitherapy market in the United States, especially in the fields of medicine, cosmetology, and functional nutrition.

The apitherapy market in Ukraine has significant differences from the American one due to a different development model. In Ukraine, apitherapy is more focused on traditional methods of treatment, in particular therapy in special apiary huts, the use of bee stings and inhalation from bee hives. One of the most striking examples of this approach is beekeeper Bohdan Lymar from the Rivne Oblast, who conducts free therapy with the help of bees in a special hut where hives are located. Military personnel of the Armed Forces of Ukraine note the positive impact of such rehabilitation on the nervous system and general

well-being, which is especially important for people who are in a state of chronic stress (Danylyshyna & Savchuk, 2024). Another unique approach in Ukraine is the bee bath, which operates in Cherkasy Oblast. This method of treatment involves inhalation of honey and beeswax vapours, which helps to strengthen the immune system and relax the nervous system. Beekeepers Andriy and Tetiana Stoliarevskyi created a complex for recreation and treatment on the basis of their apiary, which also uses apitherapy with bee stings. In general, the hives on which the bath is located contain from 20 to 80 thousand bees, which creates a favourable environment for medical procedures (Kovalenko, 2019).

Despite the existence of such programmes, the apitherapy market in Ukraine faces serious problems. Insufficient commercialisation of the industry is one of the main problems. Without a clear licensing and standardisation system, most apitherapy services are provided by private beekeepers. This makes it more difficult to expand your business and reach the global level. However, the potential for development is significant. Ukraine is one of the world's largest honey producers, and the second (after China) largest exporter of honey to the European Union (EU), which creates prerequisites for the export of not only honey, but also other bee products (Dankevych *et al*., 2018). The recovery of the Ukrainian economy after the war can give an impetus to the growth of the apitherapy industry, in particular, by attracting investment in the creation of specialised apitherapy centres and the development of the export direction.

Apitherapy markets in Ukraine and the United States differ significantly. In the United States, apitherapy is a commercial field with a high level of regulation, research, and investment in cosmetic, pharmaceutical, and alternative medicine. In Ukraine, apitherapy is mainly used in folk medicine, but due to the large volume of production of bee products and interest in natural methods of treatment, there is a great potential for development. Creating conditions for commercialisation, standardisation of procedures, and expanding international cooperation in the field of apitherapy is necessary for the integration of the Ukrainian invention "bee therapeutic bed in the pyramid".

"Bee therapeutic bed in the pyramid", designed by apitherapist Anatolii Olshanskyi, combines apitherapy and pyramid therapy. The invention includes a pyramidal structure with wooden beehives containing up to 400 thousand bees. Special vents allow the aromas of propolis, nectar, and pollen to reach humans, and vibration from the wings of bees creates a micro-massage effect. The technology is used to improve the health and normalisation of the psychophysiological state. The invention has received patents in Ukraine and Germany, and an international certificate in the field of green agriculture. Olshanskyi investigated the effect of this method on brain activity (Kononenko, 2025).

Potential areas of implementation are sanatoriums, hospitals, dispensaries, and eco-hotels that specialise in natural treatment and the wellness industry. The introduction of this technology could have significant commercial potential due to the growing popularity of natural treatments in Europe and the United States. In addition, the "bee therapeutic bed in the pyramid" does not have many competitors due to the fact that it is unique. In 2024, the alternative medicine market did not have a complete combination of apitherapy and pyramid energy. To determine the prospects for implementing this method in the markets of Ukraine and the United States, a PEST analysis was conducted, which allowed assessing political, economic, social, and technological factors of influence (Tables 1, 2).

Table 1. PEST analysis of the implementation of the "bee therapeutic bed in the pyramid" in Ukraine

Factor	Impact on the apitherapy market in Ukraine
Political	Lack of state regulation of apitherapy; need for certification of treatment methods; weak state support for the wellness industry.
Economic	Low purchasing power of the population; high exports of honey and bee products; ability to attract investment after the economic recovery.

Table 1, Continued

Factor	Impact on the apitherapy market in Ukraine
Social	Prevalence of apitherapy among the population; high level of trust in natural methods of treatment; low awareness of the latest methods.
Technological	Lack of innovations in the field of apitherapy; strong traditions of beekeeping; need to standardise the technique for official medical use.

Source: compiled by the author based on V. Dankevych *et al.* (2018), O. Kovalenko (2019), O. Danylyshyna & Y. Savchuk (2024)

Table 2. PEST analysis of the implementation of the "bee therapeutic bed in the pyramid" in the United States

Factor	Impact on the US apitherapy market
Political	Need for certification through the FDA; support for alternative medicine; the possibility of obtaining research grants.
Economic	High purchasing power; growing demand for wellness products; access to venture capital.
Social	Popularity of medical tourism; high trust in environmental methods of treatment; active introduction of natural medicine.
Technological	High level of biotechnology development; digitalisation of the wellness industry; possibility of conducting large-scale clinical trials.

Source: compiled by the author based on O. Kovalenko (2019), DataBridge (2024), O. Danylyshyna & Y. Savchuk (2024), Future Market Insights (n.d.)

"Bee therapeutic bed in the pyramid" combines pyramid therapy and apitherapy and is a unique and innovative product in the field of natural medicine and health. According to the analysis, the United States is the most attractive market for large-scale implementation due to the significant demand for alternative medicine, the willingness to invest in the latest technologies and support scientific research. Meanwhile, in the field of health improvement and medical tourism, Ukraine has a great potential for development, which can be used for local implementation and export of services to the international level. The implementation of the invention requires a marketing strategy, standardisation of methods and government programmes to help it successfully integrate into the global wellness market.

The integration of the "bee therapeutic bed in the pyramid" in apitherapy faces many challenges. These challenges include infrastructure and technology challenges, regulatory constraints, funding challenges, consumer confidence levels, and the need for scientific verification. The development of apitherapy as an alternative medicine depends on its legal status, government support, prevalence in the medical community, and accessibility to end users. Despite the fact that the method of "bee healing bed in the pyramid" has numerous advantages and is proven effective, in order for it to become widespread in the United States and Ukraine, it is necessary to overcome numerous obstacles that hinder the commercial application of the technology.

One of the biggest obstacles to the introduction of innovative apitherapy methods is the lack or lack of legislation in this area. Treatment with bee products in the United States and Ukraine mainly refers to alternative medicine, which significantly complicates the process of certification and official recognition of the technique. Any treatment that can be used in the United States must be approved by the FDA (n.d.). This requires documented safety evidence, large-scale clinical trials, and evaluation of possible

side effects. The requirements for double-blind placebo-controlled trials significantly complicate and increase the cost of obtaining certification. In addition, there is a clear line between conventional and alternative medicine in the United States, which limits the possibility of introducing this technology into clinical practice. The situation in Ukraine is somewhat different, since apitherapy is a common practice of alternative medicine. However, the lack of uniform certification standards, laws, and state control over treatment methods creates certain risks for the commercial use of the technology. The lack of approved clinical trial protocols, low government involvement in supporting the industry, and lack of clear licensing procedures are major concerns. To address these challenges, it is necessary to create institutional support tools and standardise procedures so that it can be officially incorporated into the health system.

In addition, the introduction of the "bee therapeutic bed in the pyramid" is a significant obstacle due to financial problems. The commercialisation process is complex due to high development costs, the need to scale technologies, and the need for investment. There are many grant programmes in the United States that support alternative medicine. One of them is the National Center for Complementary and Integrative Health (n.d.). To receive funding, it is necessary to demonstrate that the method works and that it is useful for society. Apitherapy can also attract private investors in the healthcare industry. On the other hand, due to the high level of competition in wellness technologies in the United States, it is necessary to use a clear marketing strategy to promote the product. Financing alternative medicine in Ukraine is more difficult, as this sector is developing mainly through private initiatives. The main financial problems are the low level of public funding, the lack of venture funds and the need to develop a new business model that would attract private and international investment. Engaging strategic partners and international organisations that support ecotourism and alternative treatments may be an option.

The need for scientific verification of the methodology is another significant obstacle. The perception of apitherapy as an alternative medicine, the lack of large-scale clinical studies and the difficulty of confirming the effectiveness of the method in evidence-based medicine are the main problems. Alternative medicine in the United States is based on scientific evidence, so without a proper evidence base, the method will not receive the support of the medical community. The situation in Ukraine is more flexible, as many folk remedies are widely used without additional scientific research. However, international certification requires an evidence base that will confirm the effectiveness and safety of the technology. Social barriers also play an important role in the introduction of new technologies. The level of consumer confidence is crucial for product promotion. The main social problems include scepticism about apitherapy among the population, low awareness of the benefits of the method, and limited access to the service due to its cost. In the United States, apitherapy is mostly associated with eco-tourism and alternative medicine, which may limit its distribution to the mass consumer. In Ukraine, apitherapy is more popular, but the lack of state regulation and standardisation may hinder its development.

Infrastructure and technological challenges are also a significant challenge. The construction of health centres that use the "bee therapeutic bed in the pyramid" requires compliance with high environmental standards, proper placement of apiaries and training of qualified personnel. In the United States, the creation of such complexes requires significant investment and compliance with strict standards regarding sanitary conditions and safety. In Ukraine, the main problem is the lack of funding for the large-scale implementation of the project. The introduction of the "bee therapeutic bed in the pyramid" in the apitherapy market requires the development of an effective business model that considers the features of the market environment in the USA and Ukraine, and a comprehensive strategy for promoting innovative technology among potential consumers. For successful commercialisation, it is important to adapt the product to market requirements, find the most effective sales channels, and develop marketing solutions that promote it. The proprietary business model is presented in Table 3.

Table 5. Business model of the "bee therapeutic bed in the pyramid"

Key partners	Key activities	Value proposition	Customer relations	Customer segments
▪ beekeepers and manufacturers of beehive structures; ▪ suppliers of materials for the production of pyramids; ▪ medical institutions and sanatoriums; ▪ organisations engaged in alternative medicine.	▪ production of beds; ▪ product certification and testing; ▪ conducting scientific research to confirm the effectiveness; ▪ development of marketing campaigns.	▪ unique combination of hive therapy and pyramid energy properties; ▪ natural, safe, and environmentally friendly method of improving health; ▪ innovative product that has no analogues on the market.	▪ personalised approach to customers (consultations, individual bed settings); ▪ quality assurance and after-sales service; ▪ educational programmes and trainings on the use.	▪ people who are interested in natural treatment methods; ▪ patients with chronic diseases and weakened immune systems; ▪ medical and sanatorium-resort institutions.
Key resources		**Distribution channels**		
▪ high-quality materials for creating a structure; ▪ technologies for preserving the energy properties of the pyramid; ▪ experienced specialists in the field of apitherapy and structural design.		▪ official website; ▪ social networks and marketplaces; ▪ speciality health stores and clinics; ▪ exhibitions and fairs of alternative medicine.		
Cost structure		**Sources of income**		
▪ purchase of materials and production costs; ▪ logistics and storage of products; ▪ marketing expenses; ▪ certification and scientific research.		▪ sale of beds through online and offline channels; ▪ rent of equipment for sanatoriums; ▪ educational courses and consulting.		

Source: compiled by the author

The developed business model of the "bee therapeutic bed in the pyramid" shows how effective it is to introduce an innovative product to the apitherapy market when modern technologies and traditional healing methods cooperate. The success of this project depends on a strategic partnership with key market participants, who guarantee production stability, scientific verification, and access to the target audience. Creating added value for customers through a combination of natural therapy and the bioenergetic properties of pyramid construction is the goal of the business model. This allows creating a unique market and distinguishing the product from competitors. A personalised approach to the client, which increases the level of trust and promotes the spread of recommendation marketing, is an important component. As the analysis of the business model has shown, a serious educational campaign is needed regarding the mechanism of action and effectiveness of the product. Given that the idea of a bed is based on a unique combination of two wellness approaches, it is very important to build the trust of potential users through scientific research, publications, and hands-on demonstrations.

Marketing strategies of sales channels require a comprehensive approach, which includes cooperation with health resorts and medical institutions, participation in exhibitions and partner programmes with apitherapy centres. Special attention should be paid to the international market, especially in the EU and the United States, where alternative medicine is becoming increasingly common. From a financial standpoint, the business model is aimed at long-term payback by diversifying revenue sources. Sanatorium equipment rental, franchising, training programmes, and wellness consulting are potentially lucrative areas beyond direct sales.

The development of an effective strategy for promoting and popularising the "bee therapeutic bed in the pyramid" in the US and Ukrainian markets is an important stage of its commercial integration. Since these markets have significant differences in consumer habits, levels of trust in alternative medicine, regulatory requirements and financial capabilities of the population, it is necessary to adapt marketing approaches to their characteristics. The US market is highly competitive in the field of

wellness, but at the same time demonstrates openness to new treatments based on scientific evidence and natural ingredients. The wellness industry in the United States reached a market volume of more than 20 billion USD in 2024. There were approximately 373 thousand employees in this industry and almost 20 thousand enterprises in total (Statista, 2024). The main clients are middle- and high-class people who are willing to spend money on their own health, and on medical and wellness facilities that offer alternative treatments. FDA certification is essential for successful entry into the U.S. market. This will increase trust in the product and expand potential implementation channels. Independent clinical trials are also important; these findings should be widely used in marketing materials to attract consumers and the professional community.

The Ukrainian market is affected by the low level of income of the population, which affects the pricing policy and the need to provide flexible options for purchasing goods, such as instalments and rent. Moreover, bee products are traditionally popular, and there is a growing interest in natural methods of treatment in society. Health resorts, private health centres, and people looking to strengthen their immune systems may be the main customers. Due to the fact that a large number of consumers in Ukraine do not know about the healing properties of pyramidal energy, the campaign to expand knowledge about this should be particularly effective. The use of online and offline channels is necessary to promote products in both markets. An important part of website SEO optimisation is to attract organic traffic through search queries related to apitherapy, alternative medicine, and wellness. High-quality materials, such as articles, videos, and reviews, will help to increase product confidence and generate demand. The use of social media such as Facebook, Instagram, TikTok, and YouTube allows interacting directly with the audience by showing real user stories, case studies of the bed, and reviews from doctors. In the United States, collaborating with influencers in healthy lifestyle, bioenergy, and alternative medicine will be an effective tool because they have the opportunity to present their products to their audience.

Using the geographical and demographic targeting settings, advertising through Google Ads and Meta Ads will allow reaching target groups of customers. Regional advertising, especially on television and radio, should be widely used in Ukraine to attract the attention of a larger audience. In addition, participation in exhibitions, forums, and festivals dedicated to wellness and health will be a strategic decision. Presentations and consultations can be held at these events. Building long-term partnerships with health and wellness institutions is an important part of successful promotion. In the United States, it is advisable to enter into agreements with alternative medicine centres and rehabilitation centres that can use the product for their patients. In Ukraine, it is very important to cooperate with sanatoriums and apitherapy centres that have the opportunity to include a therapeutic bed in their programmes.

The pricing strategy should consider the financial capabilities of consumers. The US should offer premium product options, including advanced features and personalised settings that will position the bed as a high-tech wellness device. In Ukraine, it is necessary to introduce various options for price availability, for example, instalment or rental programmes for health resorts, which will reduce the barrier to purchase. Special attention should be paid to the franchise model, which can contribute to rapid business scaling. By offering the opportunity to open certified apitherapy centres, the company will be able to expand the network of using the product without the need for significant investments in opening its own institutions.

Thus, the marketing strategy of the "bee therapeutic bed in the pyramid" was based on an integrated approach, which includes certification, marketing communication, partnership and a changed pricing policy. Product development in the markets of the United States and Ukraine requires considering the characteristics of each country, using digital technologies, cooperation with the professional community, and building the trust of potential customers. These strategies can ensure a successful market entry and continuous sales growth and scaling of the company.

DISCUSSION

Bee venom is the object of numerous scientific studies due to its unique biological properties. It demonstrates significant therapeutic potential in the treatment of inflammatory, autoimmune, neurological, and oncological diseases, which is of interest both from medical science and from commercial structures focused on the market of wellness services. R. Bava *et al.* (2023) and M. Stela *et al.* (2024) analysed the effects of bee venom on inflammation, immunity, and neurodegenerative diseases, focusing on evidence-based medicine and standardisation of medical use. The present study examined the poison as part of a commercial product under the "bee therapeutic bed in a pyramid", focusing on its market implementation, marketing, demand, and regulatory challenges in the US and Ukrainian markets. If M. Stela *et al.* emphasised medical standards, this study focused on product certification.

L.F. Laurindo *et al.* (2024) and the present study analysed the therapeutic potential of bee venom from different approaches. L.F. Laurindo *et al.* investigated biochemical effects of melittin and apamine on cancer cells, while the present study focused on the integration of the poison into health products and marketability. The research by L.F. Laurindo *et al.* was based on preclinical experiments, and the present study focused on marketing strategies and certification. Despite the general recognition of the potential of apitherapy, L.F. Laurindo *et al.* focused on evidence-based medicine, and the present study was aimed at introducing it to the wellness sphere.

A. Kurek-Górecka *et al.* (2021) investigated the effects of bee venom on wound healing, highlighting its antioxidant, antimicrobial, and anti-inflammatory properties, and its ability to stimulate cell proliferation and collagen synthesis. Special attention was paid to its use for the treatment of chronic wounds, in particular in diabetes. In contrast, the present study focused on the commercial use of poison in the wellness industry. Both recognised its regenerative potential, but A. Kurek-Górecka *et al.* focused on traditional medicine, while this study considered its integration into apitherapy products. In addition, A. Kurek-Górecka *et al.* analysed the biochemical mechanisms of melittin and apamine exposure, while the present study focused on marketing strategies and regulatory challenges. T. Lin & C. Hsieh (2020) reviewed the clinical use of poison injections at acupuncture points, highlighting their effectiveness in treating inflammation, pain, neurological diseases, and even cancer. Attention was paid to the mechanisms of action of the poison at the molecular level, such as its effect on anti-inflammatory processes, neuroprotection, and apoptosis. The anti-inflammatory and analgesic properties of the poison were noted in both studies, however, T. Lin & C. Hsieh focused on conventional and clinically verified methods of its application. The present study focused more on the prospects for integrating bee venom into the wellness market.

Apitourism in Slovenia, as a combination of beekeeping, alternative medicine, and entrepreneurship, was the main area of research by V. Tišler & M. Šuligoj (2020). They examined apitherapist certification, the impact of government policies, and the role of certified providers, emphasising the need for legislative regulation. The present study focused on market integration of an apitherapy product that differs from the approach proposed by V. Tišler & M. Šuligoj, who analysed apitherapy in the context of tourism. If V. Tišler & M. Šuligoj focused on legal regulation, the present study considered marketing challenges and product adaptation strategies for the US and Ukrainian markets. Both studies recognised the prospects of apitherapy, but V. Tišler & M. Šuligoj – through regulation, and this research – through commercial strategy.

P. Shi *et al.* (2022) investigated the pharmacological properties of bee venom, in particular, its effect on the PI3K/Akt/mTOR, NF-kB, JAK/STAT signalling pathways and its role in the treatment of cancer, neurological, and inflammatory diseases. They applied bioinformatics to analyse the mechanisms of action of the poison, in particular its oncoprotective potential. This study focused on aspects of the safe use and commercialisation of poison-based products, while P. Shi *et al.* analysed molecular mechanisms in more depth, especially the oncoprotective properties of the poison and its effect on apoptosis signalling pathways and the tumour microenvironment.

The study by A. Małek *et al.* (2023) analysed the anti-cancer activity of bee venom, in particular, the ability of melittin to induce apoptosis without harming healthy cells. They also investigated the synergistic effect of the poison with chemotherapeutic drugs. The present study, unlike A. Małek *et al.*, focused on the broad pharmacological use of the poison, in particular, its effect on inflammation, neurodegenerative processes, and microbial infections. Both studies recognised the cytotoxic effect of melittin, but A. Małek *et al.* considered its oncoprotective properties in more detail, while this study focused on the regulation of inflammation and oxidative stress. K.M. Sadek *et al.* (2024) investigated the therapeutic potential of bee venom from various perspectives. The researchers focused on the biochemistry and effects of the poison on inflammation, neurological and oncological diseases, studying the molecular mechanisms and safety of use. This study examined the poison from a commercial standpoint, focusing on its implementation in the wellness industry, marketing and regulatory challenges in the United States and Ukraine.

M. Carpena *et al.* (2020) investigated the biological activity of bee venom, highlighting its antioxidant, antimicrobial, neuroprotective, and antitumour properties, and its potential in the treatment of various diseases. They focused on the molecular mechanisms of action of the components of the poison. The present study considered marketing aspects, legal regulation, and product adaptation to the market conditions of the United States and Ukraine. Both studies recognised the therapeutic value of the poison and the importance of further research on its safety and efficacy. E.M. Othman *et al.* (2023) investigated the anti-inflammatory and regenerative properties of bee venom, in particular, its use for the treatment of ulcerative lesions by phonophoresis. The effectiveness of poison and ultrasound therapy to improve the penetration of active ingredients was evaluated. The present study examined the poison as part of an apitherapy product for the healthcare sector, with a focus on marketing strategies, regulatory challenges, and product adaptation to the U.S. and Ukrainian markets.

The study by A. Sameh *et al.* (2023) and the present study have a common interest in the antibacterial properties of bee venom. A. Sameh *et al.* focused on the use of poison as an alternative to antibiotics, and on methods of modifying it to reduce toxicity. The present study investigated regulatory and market aspects of product implementation, and the possibilities of its commercial application. The present study and the studies by E. Zeid (2023) and T.G. Gökmen *et al.* (2023) recognised the therapeutic potential of bee venom, in particular, its anti-inflammatory and antimicrobial properties. E. Zeid focused on the treatment of rheumatoid arthritis and skin diseases, and T.G. Gökmen *et al.* – on veterinary applications, such as the treatment of mastitis. The present study focused not only on therapies, but also on the commercial use of the poison, including its integration into the wellness industry, certification, and marketing strategies.

The study by M. Jodidio & R.A. Schwartz (2024) focused on treating skin diseases with bee venom, while the present study covered a wider range of its applications, focusing on regulatory challenges and the commercial introduction of poison-based products to the market. M. Jodidio & R.A. Schwartz investigated mechanisms of action at the cellular level, while this study focused on strategic aspects of implementation. The study by S. Altaf & T. Iqbal (2023) and the present study coincide in recognising the anti-inflammatory properties of bee venom, especially its role in the treatment of rheumatoid arthritis. Both approaches highlighted the importance of melittin and adolapine as active ingredients that help reduce inflammation and pain relief. However, S. Altaf & T. Iqbal focused on pharmacological mechanisms and medical risks, emphasising the need for standard dosage and control of side effects. The present study focused on the commercial introduction of bee venom, its certification, marketing strategies, and entry into the US and Ukrainian markets. If S. Altaf & T. Iqbal analysed mainly medical aspects, the present study examined the possibilities of integrating bee venom into the wellness industry and its prospects as a commercial product.

İ. Yapici *et al.* (2023) investigated the therapeutic properties of bee venom, in particular, its

use for the treatment of neurological, oncological and autoimmune diseases. Their research focused on the pharmacological mechanisms of action of poison components such as melittin, apamine, and phospholipase A2. In contrast, the present study focused on the commercial introduction of a product, its market potential, and adaptation to current market conditions, while İ. Yapici *et al.* paid more attention to traditional and alternative medicine.

Research by A.M.H. Ali (2024) and the present study share a common focus on the biological activity of the venom, in particular its antimicrobial and anti-inflammatory properties. However, A.M.H. Ali reviewed bioactive properties, while this study focused more on the practical use of the poison, in particular, marketing strategies and commercialisation opportunities. In addition, A.M.H. Ali emphasised the mechanisms of action of individual components of the poison, while the present study considered the possibilities of its integration into the health industry and mass production. Analysis of publications confirmed that bee venom has a wide range of therapeutic properties, including anti-inflammatory, antimicrobial, immunomodulatory, and oncoprotective effects. Studies are largely focused on the biochemical mechanisms of its action, pharmacological trials, and the potential for medical use.

CONCLUSION

Apitherapy is a promising area of alternative medicine that uses bee products for the prevention and treatment of diseases. Analysis of the US and Ukrainian markets revealed differences in approaches to technology implementation, apitherapy is actively developing in the US due to its high purchasing power, certification procedures, and clinical trials, and in Ukraine, it remains a popular practice with problems of standardisation and regulation. The apitherapy market in the United States is growing due to the demand for natural treatments. In 2024, U.S. beekeeping revenue was 3,958.41 million USD, with projected growth to 5.46 billion USD by 2031. The "bee therapeutic bed in a pyramid" technology combines apitherapy and the energy of pyramid structures, with the potential for commercial implementation in the United States and Ukraine. However, implementation is hindered by the lack of uniform certification standards, the need for clinical trials, and difficulties in attracting investment. In the United States, the main barrier is obtaining approval from the FDA, and in Ukraine – the lack of support and low purchasing power of the population.

For successful integration of the "bee therapeutic bed in the pyramid" into the US and Ukrainian markets, it is necessary to develop a marketing strategy, including certification, trust building, digital communication channels, and pricing policy adaptation. In the United States, it is important to support the wellness industry, attract investors, and scientifically confirm the effectiveness of the method. Ukraine should focus on cooperation with health resorts, grant programmes and government support. PEST analysis showed that the U.S. has a favourable environment for adoption due to its high purchasing power, alternative medicine support, and grants, but FDA certification and competition can be obstacles. In Ukraine, problems include low purchasing power and the lack of regulation, but the popularity of natural treatments opens up prospects.

The business model of the "bee therapeutic bed in the pyramid" involves multi-channel promotion through the website, social networks, health stores, and medical institutions. The sales strategy is based on a personalised approach and educational programmes. The long-term strategy includes partnership with wellness centres, participation in exhibitions and influencer marketing. The main limitation was the lack of sufficient clinical trials, which makes it difficult to implement the technology in medical practice. Prospects include large-scale clinical trials and the development of use protocols that will contribute to the development of the apitherapy product market.

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Інтеграція авторського винаходу на ринок апітерапії США та України: порівняння попиту та актуального стану індустрії

Анотація. Метою дослідження було визначення перспектив впровадження інноваційної апітерапевтичної технології «бджолиного лікувального ліжка в піраміді» на ринки США та України з урахуванням ринкових тенденцій, регуляторних вимог та споживчого інтересу. У межах дослідження було проведено аналіз наукових публікацій, ринкових звітів та патентної документації. Використано методи порівняльного аналізу, політичного, економічного, соціального і технологічного аналізу та оцінки конкурентного середовища для визначення факторів, що впливають на інтеграцію технології. У результаті аналізу встановлено, що в США ринок апітерапії характеризувався високим рівнем регулювання та попитом на натуральні методи лікування, що створювало можливості для комерціалізації винаходу. В Україні апітерапія залишалася переважно частиною народної медицини, а основними бар'єрами для виходу на ринок були відсутність стандартів сертифікації, низький рівень наукової верифікації ефективності та фінансові обмеження споживачів. У 2024 році дохід від бджільництва в США становив 3 958,41 млн доларів, а Північна Америка займала понад 40 % світового ринку (5 017 млн доларів). Ринок продуктів бджільництва в Північній Америці у 2023 році оцінювався у 2,94 млрд доларів і очікується, що до 2031 року він досягне 5,46 млрд доларів, з темпом зростання 8,53 % на рік. На основі отриманих результатів було розроблено бізнес-модель інтеграції «бджолиного лікувального ліжка в піраміді», яка включала визначення ключових партнерів, ціннісної пропозиції, каналів дистрибуції та потенційних джерел доходу. Було визначено, що для успішного впровадження технології необхідно адаптуватися до регуляторних норм, пройти сертифікацію продукту та розробити маркетингову стратегію, яка сприятиме популяризації методу серед потенційних споживачів. Зроблено висновок, що ринок США мав значний потенціал для комерційного масштабування технології через розвинену wellness-індустрію та високий попит на альтернативну медицину, тоді як в Україні існували можливості для локального розвитку та подальшого експорту послуг

Ключові слова: бджільництво; оздоровчі центри; маркетингова стратегія; лікування; методики; бджолине лікувальне ліжко в піраміді

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The role of state financial control in the implementation of budget programmes

Abstract. The relevance of the study lies in the need to improve the financial control system in Ukraine in order to increase the effectiveness of budget programme implementation in the context of current challenges. The aim of the study was to analyse the impact of state financial control on the implementation of budget programmes, assess the effectiveness of new technologies and identify key problems in this area. The study used the following methods: a survey of financial control agency employees, statistical analysis of the collected data, comparative analysis of international experience (in particular, EU practices), and an expert assessment of the impact of the latest analytical tools on the effectiveness of financial control. A total of 150 respondents were surveyed, including representatives of state bodies, independent experts, and academics. The main results showed that the introduction of electronic monitoring systems, such as ProZorro, led to a 25% reduction in cases of misuse of budget funds, as well as increased transparency of state spending. The use of new analytical tools, such as Business Intelligence systems, increased the accuracy of financial forecasts by 30% and reduced the time required to prepare reports from 5 days to 1 day. In addition, the automation of routine processes reduced the number of errors in financial reporting by 25% and accelerated the processing of financial transactions by 40%. The study also found that 45% of respondents believe that financial control bodies do not have sufficient information to assess the effectiveness of budget programmes, indicating a need to develop new assessment criteria. Furthermore, the use of blockchain technology

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can significantly increase the transparency of financial transactions, and the use of social media to communicate with the public can improve trust in government agencies. The findings indicated the need for further implementation of modern IT solutions, development of comprehensive methods for evaluating the implementation of budget programmes, and intensification of public control. The practical significance of the study lies in providing sound recommendations for improving financial control mechanisms, which will contribute to more effective management of public finances and increase the transparency of government agencies in Ukraine

Keywords: EU countries; assessment methods; effectiveness of methods; management effectiveness; transparency of expenditures

INTRODUCTION

State financial control played a key role in the implementation of budget programmes, ensuring transparency and accountability in the use of public funds. It involved a systematic process of auditing and evaluating financial transactions carried out by state institutions in order to identify shortcomings and prevent the inefficient use of resources. In the context of Ukraine, where reforming the public finance management system has become an integral part of state policy, it was important to consider how financial control affected the implementation of budget programmes.

Research in this area has shown that there were many unresolved issues related to the impact of financial control on the implementation of budget programmes. Research by L.V. Dikan & I.O. Shevchenko (2020) and A.U. Iloh & F.A. Amadi (2022) analysed in detail the need to integrate new technologies into the financial control process, emphasising that modern solutions can significantly improve the accuracy and speed of audits, but did not consider the impact of these technologies on the actual results of budget programme implementation. The study by Y. Negoda (2022) focused on the impact of budget transparency on public trust in state institutions, emphasising the importance of quality control in the context of budget programme implementation. The author stressed that a lack of transparency can lead to mistrust on the part of the community, which, in turn, will affect the effectiveness of budgetary commitments. Research by H. Kaletnik & N. Zdyrko (2021) also provided data showing that control systems using modern analytical tools can significantly reduce the risks of corruption in the public sector and emphasised the importance of implementing algorithms to automate control processes. This indicated the existence of knowledge gaps that could be filled by the current study.

The problem of insufficient control over the implementation of budget programmes could lead to the inefficient use of public funds, which, in turn, threatened the country's socio-economic development. Research by I. Gumenuk & B. Berezovski (2024) emphasised that poor-quality financial control contributed to corruption, which undermined public trust in state institutions. The authors analysed specific cases of corruption scandals in Ukraine that were the result of insufficient financial control, which emphasised the importance of improving it. Research by K. Romenska *et al.* (2020) also pointed to the link between the level of financial control and social stability, emphasising the importance of quality control in preventing social conflicts. The authors cited examples where the lack of proper control led to social protests and public discontent. The study by S. Popovych (2023) pointed to the need to reform the system of state financial control in order to adapt it to the current challenges arising in the field of public finance management and proposed specific steps to improve the effectiveness of control in a changing economic environment. Accordingly, the need for a comprehensive approach to financial control was evident, as it could significantly influence the achievement of budget programme objectives.

There were already a number of studies in the scientific literature devoted to the topic of public financial control, but many of them did not take into account the specifics of Ukrainian conditions. For example, the works of S. Bardash & T. Osadcha (2020) and A. Rahman *et al.* (2021) considered international experience but did not

adapt it to the Ukrainian reality. The authors also emphasised the need to improve the financial control system, but did not analyse its impact on programme implementation. They additionally stressed the importance of adapting international control practices to national conditions, but did not propose specific solutions for implementing these adaptations; they also emphasised the importance of assessing the effectiveness of financial control to ensure the sustainable development of budget programmes. A study by I. Harchenko (2024) pointed to the role of independent audits in increasing the transparency of state financial operations. This created a need for a detailed analysis that would take into account both international practices and local challenges.

Among the theoretical aspects that needed to be considered were the concepts of public administration and financial control, which defined the basic principles and mechanisms that could be used to improve the effectiveness of budget programme implementation. Research by E.B. Karabayev *et al.* (2021) confirmed that effective financial control can increase the productivity of budget funds. The authors also emphasised the importance of transparency and accountability in public finance management, which is critical to achieving successful results in the implementation of budget programmes. E.B. Karabayev *et al.* further highlighted the need to develop new control methods adapted to the specifics of the Ukrainian economy. The authors also stressed the importance of training and upgrading the skills of financial control staff to improve the effectiveness of the system.

The aim of this study was to determine the role of state financial control in improving the effectiveness of budget programme implementation in Ukraine in the context of current challenges. Particular attention was paid to assessing the relevance of introducing new control approaches and tools, as well as finding ways to adapt international experience to the national context. The objectives of the study were: to identify the main problems in the system of state financial control and their impact on the implementation of budget programmes; to analyse the current methods of financial control used in Ukraine; to propose recommendations for improving control mechanisms to increase the effectiveness of budget programme implementation.

MATERIALS AND METHODS

This study conducted a comprehensive analysis of the role of state financial control in the implementation of budget programmes in Ukraine. The study covered the period from 2020 to 2024, which made it possible to identify key changes in the financial control system and their impact on budget processes. Data collection was carried out using a combination of several methods. First, a thorough analysis of secondary sources was conducted, including scientific articles (Kaletnik & Zdyrko, 2021; Markuts & Roberto, 2024), official reports (OECD, 2024), regulatory documents (Law of Ukraine No. 720-IX, 2020; Order of the Cabinet of Ministers of Ukraine No. 1805-p, 2021) and statistical data (International Budget Partnership, 2022; Transparency International Ukraine, 2023) related to financial control in Ukraine.

Among the international sources used were studies by the Organisation for Economic Co-operation and Development (OECD, 2022), a report by the International Monetary Fund (IMF, n.d.), as well as a study by the National Endowment for Democracy (NED, n.d.) and a report by the European Commission (n.d.). Secondly, a survey was conducted among specialists in the field of finance and budget management in order to gather expert assessments of the effectiveness of existing mechanisms of state financial control and their impact on the implementation of budget programmes. The survey consisted of 15 questions, which were divided into three thematic blocks: (1) overall assessment of the current financial control system; (2) identification of key problems and shortcomings; (3) attitude towards the introduction of new technologies in control processes. The questions included: "How effective do you think the existing financial control bodies are?", "What are the main shortcomings you see in the current system?", "Do you support the introduction of automated analytical tools, such as BI systems?".

A total of 150 respondents were surveyed, including: 80 representatives of state bodies (in particular, the Ministry of Finance, the State

Audit Service and the Accounting Chamber), 40 independent experts from non-governmental analytical centres and 30 academics from higher education institutions specialising in finance and economics. Responses were rated on a five-point scale (from 1 – "completely ineffective" to 5 – "very effective"). Respondents also had the opportunity to leave detailed comments on each set of questions, which provided qualitative data for further analysis. During the survey, a separate set of questions was devoted to identifying key problems that hinder the effective implementation of budget programmes. Respondents (150 people) were asked to select from a list of typical obstacles those that, in their opinion, are most relevant in the practice of financial control. The effectiveness of existing control mechanisms was assessed in a separate section of the questionnaire, where respondents were asked to answer the question: "How do you assess the effectiveness of the financial control mechanisms you have encountered in practice?" The assessment was carried out on a five-point scale, where 1 – "completely ineffective", 2 – "ineffective", 3 – "neutral", 4 – "effective", 5 – "very effective". The responses received formed the basis for Table 3 in the results section.

In addition, a practical experiment was conducted to assess the effectiveness of implementing new financial control methods in one of Ukraine's state bodies, the State Audit Service of Ukraine. The experiment was conducted in three stages: in the first stage, the main indicators of control effectiveness were identified, including: the level of timeliness of detection of financial violations, the number of errors in financial reporting, the duration of processing of financial transactions, the amount of budget funds saved as a result of control, as well as the degree of compliance of internal audit with the approved standards that were subject to assessment; in the second stage, new analytical tools were introduced to monitor financial transactions, in particular: the Power BI (Business Intelligence) business analytics system, the CaseWare IDEA internal audit platform, and specialised software for automated risk analysis of financial transactions; the third stage involved analysing the results, in particular comparing the indicators before and after the introduction of the new methods. Fifty employees of the State Audit Service of Ukraine, who had been previously trained in the new financial control methods and the use of analytical tools, took part in the experiment.

The methods used in the study included document analysis, sociological surveys, statistical analysis, and case studies from other countries. The case studies allowed to examine successful financial control practices in the EU, Canada, and the United Kingdom. Document analysis revealed key changes in financial control legislation and practices and analysed their impact on the fulfilment of budgetary commitments. The sociological survey provided qualitative data on experts' attitudes towards existing control mechanisms. Statistical analysis of the data obtained from the survey revealed correlations between the effectiveness of control and the implementation of budget programmes. Approaches to interpreting the results were based on comparing the data obtained with existing theoretical models of financial control, as well as on the opinions of experts obtained through questionnaires. This made it possible not only to assess the effectiveness of the Ukrainian financial control system, but also to identify possible areas for improvement. All studies involving human participants were conducted in accordance with ethical standards, observing the principles of voluntariness, anonymity and confidentiality. Survey participants were informed of the purpose of the study and gave their informed consent to participate. The research methodology complies with the recommendations of the Social Research Ethics Committee (n.d.) and the principles of the World Medical Association (2013).

RESULTS AND DISCUSSION

Analysis of the impact of state financial control on the implementation of budget programmes in Ukraine

During the period under review, Ukraine underwent significant changes in its system of public financial control, driven by the need to adapt to contemporary challenges. The main factors influencing these changes were legislative reform, the introduction of new technologies and approaches to control, and the adaptation of international standards. In particular, Law of Ukraine No. 922-VIII (2015) was adopted in 2015, which

significantly changed the rules of the game in the area of public spending. This law not only increased transparency in public spending, but also introduced mechanisms that made corruption more difficult. Thanks to new requirements for the disclosure of procurement information, the public was given the opportunity to monitor spending, which in turn strengthened trust in state bodies.

The introduction of electronic systems for monitoring financial flows, such as the ProZorro system (n.d.), was also an important step in the fight against corruption. This system allows for real-time control, which significantly increases the effectiveness of tracking budget expenditures. In 2021, Ukraine introduced a number of electronic platforms for monitoring budget expenditures in real time, which was an important step in increasing the transparency and efficiency of the use of public funds. One of the key initiatives in this area is the ProZorro.Sale platform (n.d.), which provides transparent online auctions for the sale, lease and management of state and municipal assets. Thanks to the "everyone sees everything" principle, ProZorro.Sale allows the public, businesses and government agencies to monitor all stages of auctions, which significantly reduces the risks of corruption and misuse of budget funds. According to data from the State Audit Service of Ukraine (2024), between 2020 and 2023, the number of detected violations in the area of budget spending decreased by 25%, indicating an increase in the effectiveness of financial control. In 2024, according to the service's official public report, violations amounting to more than 82.6 billion UAH were detected, demonstrating a continuing trend towards improving the detection and prevention of misuse of funds. This positive trend is also confirmed by the growth in trust in state bodies, as citizens began to see the results of changes in the control system (Table 1).

Table 1. Changes in legislation and their impact on the financial control system (2020-2024)

Year	Change in legislation	Impact on financial control
2020	Adoption of the Public Procurement Law	Increased transparency in government spending
2021	Introduction of electronic systems	Reduced corruption risks
2022	Reform of the budget process	Greater accountability of public authorities
2023	New reporting rules	Improved monitoring of budget programme implementation
2024	Adaptation of international standards (INTOSAI, IPSAS)	Alignment with European control practices

Source: developed by the authors based on research by NED (n.d.), European Commission (n.d.) and I. Gumenuk & B. Berezovski (2024)

Despite the positive changes, the study identified a number of key issues that hinder the effective implementation of budget programmes. These include insufficient coordination between different government agencies, the lack of clear criteria for evaluating the implementation of budget programmes, limited resources for control measures, as well as the low level of professional training of employees and insufficient digitisation of processes. The results of a survey conducted as part of this study showed that 45% of respondents believe that financial control bodies do not have sufficient information to fully assess the effectiveness of budget programmes. The survey examined the aspect of information availability to control bodies. This was determined by analysing the answers to the question: "Do you think that your institution has sufficient information to objectively assess the effectiveness of budget programmes?" Responses were rated on a five-point scale, and the proportion of negative or low-rated responses was exactly 45%. This indicator points to a lack of access to timely, complete and relevant data necessary for effective financial control.

The absence of clear criteria for evaluating programme implementation leads to subjectivity in decision-making and insufficient accountability for results. It also highlights the need to develop comprehensive methods for evaluating programme implementation that include not only financial indicators but also social and economic outcomes. For example, it is important to assess the impact of budget programmes on the

development of social infrastructure, the quality of life of the population, and the overall economic development of regions.

Many respondents noted that existing control mechanisms do not allow for the timely identification of shortcomings in the implementation of budget programmes, which leads to delays in financing and implementing planned measures. In particular, according to the results of the survey, 38% of respondents indicated that violations or deviations are often detected only at the reporting stage, rather than during the implementation of programmes, which reduces the speed of response. This indicates that the current financial control system is not sufficiently preventive. In addition, more than 30% of respondents believe that financial controllers do not have sufficient access to information on programme implementation, which complicates their work. The lack of integration between different information systems also complicates the process of collecting data for analysis, which is critical for making informed decisions.

In addition, the survey revealed other common problems in the implementation of budget programmes. The most significant of these was insufficient coordination between agencies (45%). Limited resources for control were noted by 40% of respondents, and the lack of clear evaluation criteria by 35%. The lack of modern technologies (30%) and low level of professional training (25%) were also among the key barriers. Detailed data are presented in Table 2.

Table 2. Main problems in the implementation of budget programmes (2020-2024)

Problem	Percentage of respondents who indicated this problem
Insufficient coordination between authorities	45%
Lack of clear assessment criteria	35%
Limited resources for control	40%
Low level of professional training	25%
Lack of modern technologies	30%

Source: compiled by the authors of this study based on the results of a survey

A detailed analysis of Table 2 shows that the most common problem, indicated by 45% of respondents, is the weak coordination between state institutions. This suggests a fragmented approach to financial control management, which complicates the effective exchange of information between different levels of government. In second place is the limitation of resources (40%), which concerns both human and technical means required for conducting full-scale audits. 35% of respondents pointed to the lack of clear, unified criteria for evaluating the effectiveness of budgetary programs, which complicates the formation of objective reporting and the adoption of management decisions. The problems with staff qualifications (25%) indicate an urgent need for professional training, and 30% mentioned a lack of modern technologies, which also points to a limited level of process automation. These results demonstrate the systemic nature of the challenges and require a comprehensive approach to improving the state financial control system. In particular, it's necessary to strengthen institutional cooperation, introduce unified approaches to program evaluation, invest in digital solutions, and ensure continuous staff training.

An analysis of the survey results, as well as a review of academic sources and regulatory documents, showed that the effectiveness of state financial control is influenced by both internal and external factors. As for internal factors, respondents most often cited the level of professional training of staff, the availability of modern information technologies and management systems, and the organisational structure of controlling bodies. Insufficient staff qualifications often lead to a misinterpretation of legislation and, as a result, to errors in control. According to the data from the survey conducted as part of this study, 25% of respondents indicated that the lack of specialised training programs for employees of controlling bodies negatively affects their ability to perform their duties effectively. This points to the need for a systemic approach to the professional training of personnel

in the field of financial control. It is necessary to implement systems of continuous learning that will allow specialists to acquire up-to-date knowledge about changes in legislation and new control technologies.

Political changes can significantly affect the state's financial policy and the effectiveness of control. In conditions of political instability, the risk of misappropriation of budgetary funds increases, as control mechanisms may be weakened. This creates additional challenges for financial control bodies, which must operate in conditions of uncertainty and instability. It is also important to note that a high level of corruption can lead to a decrease in a country's investment attractiveness, which, in turn, will negatively affect economic development and the implementation of budgetary programs.

Another important factor is civic engagement and public oversight, which contribute to strengthening the accountability of government authorities in the use of budget funds. Public oversight can substantially improve the effectiveness of financial control. In Ukraine, several effective initiatives actively involve citizens in monitoring state expenditure, thereby promoting transparency, accountability, and efficiency. One such initiative is the Unified Web Portal for the Use of Public Funds, which provides open access to information on all transactions carried out by budget holders. Another important platform is Dozorro – a civic project for monitoring procurement through the ProZorro system, which enables users to leave feedback, report violations, and review analytics. The Ministry of Finance of Ukraine's Open Budget initiative also deserves mention, as it provides visualised and accessible information on the implementation of state and local budgets in the format of open data. The civic movement "CHESNO" also plays a distinct role in strengthening public control, in particular through its "CHESNO.Filter the Budget" initiative, which focuses on analysing the use of budget funds and monitoring the actions of officials (State Audit Service of Ukraine, 2025).

For example, open budget programmes implemented in Ukraine allow citizens to access information about government spending and involve them in the control process. In particular, the "Open Budget" platform from the Ministry of Finance of Ukraine provides visualised access to the distribution and execution of state and local budgets in a convenient format. The "Spending" portal publishes all transactions of budget administrators, allowing for independent public monitoring. In addition, some cities, such as Lviv, Dnipro and Vinnytsia, are actively implementing local initiatives, such as open participatory budgets, which allow residents to vote on projects funded from local budgets. This increases the level of trust in public institutions and provides more feedback between the government and society. It is important that such initiatives are supported at the state level and that information is presented in an understandable and accessible form, allowing citizens to effectively engage in control. Public engagement can be a critical element in the financial control system, as it can provide additional resources for detecting violations and abuses (International Budget Partnership, 2022).

Overall, the results of the study indicate that, despite positive changes in the financial control system, there are many challenges that need to be addressed urgently to ensure the effective implementation of budget programmes in Ukraine. These challenges require a comprehensive approach that includes not only legislative changes, but also staff training, the introduction of modern technologies, and active public participation in control processes. Only a systematic and comprehensive approach can ensure the sustainability and effectiveness of public financial control in Ukraine, which, in turn, will contribute to improving the quality of budget programme implementation and raising the standard of living of citizens. It is important that all stakeholders, from government agencies to citizens, work together to improve the financial control system, as this is the foundation for stable economic development and social progress in the country.

Results of a survey of specialists in the field of finance and budget management

A survey conducted among specialists in the field of finance and budget management provided valuable data on the effectiveness of existing control mechanisms. The survey involved 150

respondents, including representatives of government agencies, the private sector and the scientific community. This diversity of respondents provided an objective picture of the situation in Ukraine in the context of financial control. The results showed that 60% of respondents believe that existing control mechanisms are not effective enough. The main reasons for this were: the complexity of control procedures (45% of respondents), the lack of clear criteria for assessing effectiveness (35%) and the insufficient level of process automation (30%). It is important to note that the complexity of control procedures is often associated with excessive bureaucracy, which complicates the work of financial controllers. Many respondents noted that existing control mechanisms often do not keep pace with changes in the financial environment, making them ineffective in the face of modern challenges. For example, due to constant updates to legislation, specialists face difficulties in adapting to new requirements, which complicates the control process. This highlights the need for flexible control mechanisms that can adapt to changes in the regulatory environment.

Another important issue is the lack of transparency in control processes. About 40% of respondents indicated that the lack of access to information on the implementation of budget programmes complicates their work. This fact highlights the need to introduce more transparent control mechanisms that would allow specialists to quickly obtain the information necessary to make informed decisions. The introduction of open data and platforms for public monitoring could significantly improve the situation, as it would allow the public to be involved in the control process and increase the accountability of public authorities. According to an OECD study (2023), transparency in budgetary processes can reduce corruption by 20-30% and increase the efficiency of financial management and public trust in state institutions. In addition, openness helps to increase public trust, which is critical for the stability of public finances (Table 3).

Table 3. Assessment of the effectiveness of existing control mechanisms (percentage of respondents)

Assessment	Percentage of respondents
Very effective	15%
Effective	25%
Neutral	20%
Not very effective	30%
Completely ineffective	10%

Source: compiled by the authors of this study based on the results of a survey

The survey results also revealed experts' attitudes towards new approaches to financial control. About 70% of respondents expressed a positive attitude towards the idea of introducing new technologies, such as automation of control processes and the use of data analytics. Many experts noted that new technologies can significantly improve control efficiency, reduce the time required for audits, and lower the risk of human error. The implementation of MDM can significantly improve the efficiency of analysing large amounts of information and the timely detection of violations. For example, studies show that companies that have implemented Master Data Management (MDM) software have achieved up to a 20% improvement in data accuracy and a 15% increase in organisational efficiency (Moore, 2023). According to OECD experts (2019), the automation of financial processes can reduce administrative costs by up to 25%, which is a significant improvement in the efficiency of budget spending. The report notes that the implementation of digital platforms and automated systems in the field of public financial management can significantly reduce operating costs and improve the accuracy of budget planning.

However, 30% of respondents expressed scepticism about the new approaches, pointing to the risks associated with their implementation. The main concerns are the possibility of technical errors, insufficient staff training and

the risk of abuse when using new technologies. This highlights the need for additional training for specialists to ensure they are ready to work with the new systems. Seminars and training courses on the use of new technologies in control could be an important step in improving their qualifications. It is also important to create training programmes that cover not only technical aspects but also ethical issues related to the use of new technologies.

Programmes that focus on the ethics of using analytical data can help prevent potential abuse. One such initiative is the Ethical Explorer Pack, which helps organisations evaluate ethical risks when working with data, particularly with regard to confidentiality, bias and transparency of decisions. Another example is the Data Ethics Canvas from the Open Data Institute, which offers a visual tool for discussing the ethical aspects of data analysis projects. The online course "Introduction to Data Ethics" on the DataCamp platform, which covers the basics of an ethical approach to data collection, processing and interpretation, is also popular. These programmes foster a responsible culture of working with information and can be integrated into the professional training of financial control specialists (An ethics guide for tech..., 2020; Open Data Institute, n.d.; Data-Camp, n.d.) (Table 4).

Table 4. Experts' attitudes towards new approaches to financial control

Approach	Positive attitude (%)	Negative attitude (%)
Process automation	70%	30%
Use of data analytics	75%	25%
Introduction of new technologies	68%	32%

Note: the assessment was based on responses to the question: "How do you feel about the introduction of new technologies in financial control processes?" Respondents could choose one of two answers: positively or negatively
Source: compiled by the authors of this study based on the results of the survey

A comparison of the survey results with international practices in the field of financial control showed that Ukraine has significant potential for improving its control mechanisms. In particular, the experience of OECD member countries such as France, Germany, Canada and Sweden was analysed. In France, financial control is based on the activities of the Cour des Comptes, which has a high degree of autonomy and provides independent auditing of public finances, as well as applying medium-term budget planning. In Germany, control is exercised by the Bundesrechnungshof, which applies a risk-based approach and actively implements digital solutions for auditing. In Canada, programmes for public involvement in the budget process and regular publication of open data have been implemented, which contributes to greater transparency. Sweden is noted for its high level of accountability due to the existence of independent audits, access to information, and active public participation in budget monitoring (OECD, 2019; Lulaj, 2021).

The results of the survey of Ukrainian experts are consistent with the key findings of international studies, in particular the OECD (2023), which emphasises the importance of transparency, open data, digitalisation of budget processes and accountability of public authorities. Data from the OECD (2019) report, which analyses public fund management practices in leading countries, was also taken into account. The comparison showed that, despite some progressive steps, such as ProZorro or Spending, the Ukrainian financial control system still lags significantly behind in terms of automation, data integration, and independent auditing.

International experience in financial control demonstrates the effectiveness of independent control institutions, digitalisation of processes and active public participation in monitoring public finances. For example, in France, the Cour des Comptes (Court of Auditors) plays a key role in the audit system, conducting both financial and performance audits, evaluating not only expenditures but also the results achieved. Its findings are public and have significant political implications, promoting government transparency and accountability. Ukraine lacks a sustainable mechanism for evaluating programme

performance based on independent audits, which limits the effectiveness of control (Manes Rossi *et al*., 2020).

In Germany, a similar function is performed by the Bundesrechnungshof (Federal Audit Office), which also has a high degree of independence and cooperates with parliament. Control is exercised on the basis of a risk-oriented approach using centralised digital platforms for monitoring expenditure. In comparison, in Ukraine, the level of digitalisation of control is only just emerging, and access to up-to-date information remains fragmented. Canada implements an open approach to financial control through the activities of the Office of the Auditor General of Canada. One of the effective tools is the GC InfoBase online platform, which provides the public with access to programme implementation indicators. An analogue in the Ukrainian context is the ProZorro system, but its functionality is mainly focused on public procurement rather than the full cycle of budget programme implementation (Wollmann, 2024).

Sweden demonstrates a successful example of combining risk-based auditing (through Riksrevisionen) and citizen engagement in control through open budget data. In contrast, Ukraine lacks full integration of public monitoring into the system of state financial control, which reduces the potential for feedback between the public and the authorities. A comparative analysis shows that EU and North American countries implement more comprehensive and institutionally stable models of financial control. The main differences are: the existence of independent audit institutions with guaranteed powers; the digitisation of control at all stages, from collection to analysis; and the active involvement of parliament and the public in oversight (Riksrevisionen, n.d.).

In Ukraine, however, these elements are implemented only partially or fragmentarily, which reduces the overall effectiveness of the system and its ability to respond quickly to challenges. To achieve a similar level of efficiency, it is necessary not only to introduce new tools, but also to review the institutional logic of state financial control. For example, in European Union countries such as Germany and Sweden, the use of automated control systems reduces administrative control costs by 20-30%. These countries have implemented comprehensive solutions for the automation of financial processes, including not only control but also budget expenditure planning. This not only reduces costs but also improves the quality of management decisions through better data analysis (OECD, 2022).

At the same time, in Ukraine, only 15% of respondents indicated that their organisations use automated control systems, which indicates a significant gap in technology implementation. The lack of integration between different control systems and information platforms complicates the data processing process, which in turn negatively affects the timeliness and accuracy of control. International experience shows that system integration and the use of unified platforms for data processing and analysis are becoming critical to ensuring effective control. In particular, Germany has successfully implemented a centralised platform for financial management (KONSENS), which allows control authorities to exchange information between tax and financial services in real time. Finland has a system called Kieku, which combines the financial, personnel and administrative data of government agencies in a single digital platform, ensuring effective monitoring of public spending. In the United Kingdom, the integrated Government Finance Function system supports financial control through centralised data, common standards and digital management tools (Government Finance Function Strategy 2022-25, 2022; NESH, 2022). In Germany, the introduction of centralised data management systems such as KONSENS (Koordinierte Neue Software-Entwicklung der Steuerverwaltung) has significantly improved the effectiveness of financial control. This system allows data from different sources to be combined, ensuring its accuracy and reliability. According to a study by the Brookings Institution, the institutionalisation of data analysis in Germany's federal administration contributes to more effective decision-making and increases the transparency of financial processes (Engler, 2022).

It is also important to note that international practices emphasise transparency and accountability in budgetary processes, which

is critical for building public trust in state institutions. For example, many EU countries actively use public control mechanisms that allow broad segments of the population to participate in the process of monitoring public spending. In particular, Portugal has an online platform called "Orçamento Participativo Portugal", which allows citizens to propose and vote on projects financed from the state budget. France has implemented the "Budget Participatif" initiative at the national and municipal levels, where residents can control the allocation of local budget funds. In Finland, citizens participate in assessing the effectiveness of budget spending through open data platforms and integrated reports from financial institutions, which are available online. Spain actively uses public budget audits, particularly in cities such as Madrid and Barcelona. This not only increases transparency but also ensures more active citizen participation in policy-making. At the same time, in developing countries, insufficient transparency is often the cause of corruption schemes that can cause significant damage to economic development (European Parliamentary Research Service, 2024).

Ukraine should consider opportunities to integrate international standards into its financial control practices, particularly those analysed in the study results, such as the OECD Budget Transparency Toolkit and the approaches used in KONSENS (Germany) and Kieku (Finland). These standards cover key aspects of process automation, data openness, accountability and the integration of digital systems in the management of budgetary resources. This will not only increase the effectiveness of control, but also help to strengthen public confidence in public finances. The implementation of international practices could form the basis for creating a more effective financial control system in Ukraine that meets modern requirements and standards. Key areas for improvement could include the development of electronic control platforms, staff training and increased public participation in control processes. Thus, taking into account international experience and adapting it to the specifics of the Ukrainian financial control system can significantly improve the situation in this area, which in turn will contribute to a more efficient use of public resources and an increase in the overall well-being of the population. A genuine transformation of the financial control system in Ukraine will require efforts on the part of all stakeholders: the state, business and civil society, which will allow for greater stability and transparency in the use of budget resources.

When analysing the effectiveness of financial control in Ukraine, it is important to compare the results with previous studies in this area. Researchers E. Lovita *et al*. (2023) pointed to the insufficient effectiveness of existing control mechanisms, emphasising the complexity of procedures and the lack of clear evaluation criteria. This study emphasised that 55% of respondents consider control mechanisms to be ineffective, which confirms the results of this study (60% ineffective assessments). The authors also noted that the need to simplify control procedures is critical to improving the efficiency of financial institutions. The authors additionally considered various models of management accounting that can help improve financial control, emphasising the importance of adapting foreign practices to Ukrainian conditions and noting that without proper management accounting, it is impossible to achieve high efficiency in financial control.

In addition, the results of studies by H. Li & Y. Guo (2022) and T. Noer & L. Arival (2023) indicate that insufficient transparency in budgetary processes is one of the main reasons for low control efficiency. In their works, the authors point to the importance of data openness and access to information, which allows the public and regulatory authorities to monitor financial flows more effectively. They also consider mechanisms that can increase transparency, such as electronic reporting platforms and open data, which is consistent with the finding that 40% of respondents cited lack of access to information as an obstacle to control. T. Noer & L. Arival also note that transparency is critical for building trust in public institutions, which is an important aspect for some countries where trust in the authorities remains low. H. Li & Y. Guo proposed the introduction of new technologies, such as blockchain, to ensure greater transparency in financial processes.

A study by C. Kuntadi & L. Puspasari (2023) also indicates that automating control processes can significantly increase efficiency. The authors argued that the introduction of automated systems can reduce management costs by up to 30% and also reduce the human factor, which often leads to errors. C. Kuntadi & L. Puspasari describe in detail the positive results of implementing automated systems in financial institutions, particularly in government agencies, where automation has significantly reduced the time required to process financial reports. This also confirms the data on positive attitudes towards automation (70% of respondents), demonstrating the readiness of specialists for changes in the control system. According to Transparency International Ukraine (2023), countries with the highest level of digital tool implementation (Estonia – 74, Finland – 87 out of 100 in the transparency ranking) also have the lowest corruption perception scores. This indicates a direct link between the level of automation of financial control and a reduction in corruption risks.

The studies by D. Suwanda *et al.* (2021) and K. Sakhraoui & S. Chaouadi (2025) are also noteworthy, as they analyse the impact of innovative technologies on financial control. K. Sakhraoui & S. Chaouadi pointed out that the use of modern IT solutions, such as big data analytics and artificial intelligence, can significantly improve the quality of financial control. D. Suwanda *et al.* provided examples of the successful implementation of such technologies in Western European countries, which reduced audit time and improved the accuracy of financial forecasts. This highlights the importance of introducing new technologies into financial control in Ukraine, which is also reflected in the conclusions of this study. The study by L. Hnatyshyn *et al.* (2025) shows that the use of digital innovations, particularly in accounting and analytical processes, can be an additional factor in the economic growth of enterprises and public institutions, confirming the feasibility of introducing IT solutions into the public financial control system.

A comparison of the results of this study with international practices, particularly in EU countries, reveals both common trends and significant differences. In EU countries, automated financial systems cover not only control, but also planning, auditing and reporting. For example, Finland has implemented the Kieku system, which integrates the financial and administrative data of all state institutions, ensuring transparency and control in real time. In Sweden, financial reporting is public, and audit institutions have a high degree of independence and use digital tools to assess cost effectiveness. In Germany, centralised systems, such as KONSENS, allow data from different sources to be combined, which significantly improves the accuracy of analytics and reduces the audit burden.

Compared to these countries, only 15% of respondents in Ukraine said that their organisations use automated financial control systems. In addition, the study revealed fragmented information systems, limited access to financial data, and a lack of integration between government agencies. This indicates a significant lag in the digitalisation of control and the need to adapt best European practices to Ukrainian realities. For example, in EU countries such as Germany and Sweden, the level of financial control automation reaches 80% (Reznik *et al.*, 2020; Nukpezah *et al.*, 2023), which reduces administrative control costs by 20-30%.

Studies by J.A. Vargas Merino & W.E. Zavaleta Chávez (2020) and R. Pentoria *et al.* (2023) emphasise that automation not only increases the effectiveness of control, but also ensures greater transparency in financial matters. This indicates a high level of integration of new technologies into the financial control system, while in Ukraine only 15% of respondents confirmed the use of automated systems. This indicates a significant difference in approaches to financial control, which requires urgent response from the state. In addition, the study by D. Guariso *et al.* (2023) emphasises the importance of transparency and accountability in budgetary processes. These factors contribute to reducing corruption and increasing trust in state institutions. In Ukraine, this aspect remains at a low level, with only 40% of respondents citing transparency as an important condition for effective control. Thus, Ukraine lags behind international best practices, which requires urgent action on the part of the state in order to keep up with global trends.

The results of the study have a significant impact on the theoretical models of financial control proposed by other authors. Researchers I.E. Ajayi & S.O. Dada (2022) developed a financial control model that focused on the integration of automated control systems into budget management processes. I.E. Ajayi & S.O. Dada emphasised that the integration of technologies not only optimises processes but also makes them more transparent. The authors also note that without the introduction of modern technologies, it is impossible to achieve high efficiency in financial control. These results, which indicate a positive attitude of respondents towards automation (70%), confirm the feasibility of introducing such systems as an integral part of effective financial control.

In addition, the results of this study can complement the financial risk management model developed by A.A. Augustine (2022), who emphasises the importance of transparency in budget management. A.A. Augustine points out that transparency is a critical factor in ensuring public trust. According to this study, 40% of respondents cited insufficient transparency as the main problem, indicating the need to adapt this model to the conditions of Ukrainian reality. The author also notes that in order to improve financial control, it is necessary to introduce new mechanisms that take into account changes in the economic environment, which also confirms the findings on the need to reform the control system. A. Bandiyono's (2020) study may also be useful in this context, as the author proposes new approaches to risk assessment in financial control, emphasising the importance of a systematic approach. A. Bandiyono argues that the integration of risk-based methods allows for more effective detection and prevention of financial abuse, which is important for the Ukrainian control system.

Conclusions of a practical experiment on the implementation of new control methods

A practical experiment on the implementation of new analytical tools in financial control showed significant positive results. The use of tools such as BI systems and big data analytics has increased the accuracy of financial forecasts by 30%. Compared to the traditional methods used previously, the new analytical tools provided a more in-depth analysis of data in less time. For example, automated reports generated by BI systems reduced the time required to prepare reports from 5 days to 1 day, demonstrating the significant effectiveness of the new approaches. Users also noted the convenience of data visualisation, which facilitates faster decision-making. The use of interactive dashboards allows managers to receive instant reports on financial results, enabling them to respond quickly to changes in the financial situation. With the help of dashboards, managers can track key performance indicators (KPIs) such as profitability and expenses in real time and compare them with planned values. In addition, new analytical tools enable forecasting based on historical data, which significantly improves the quality of management decisions. Analytics showed that certain financial indicators have seasonal fluctuations, which allowed for better budget and resource planning. Thanks to machine learning algorithms, the system can automatically detect trends and anomalies, which was previously a difficult task. This, in turn, contributed to the timely detection of potential financial risks and abuses, which is critical to preventing financial losses.

The introduction of new control methods, including automated reporting systems, the use of business intelligence (BI) systems, and algorithms for detecting anomalies in financial data, has significantly impacted the speed of financial information processing. According to the results of the experiment, the processing time for financial transactions decreased by 40%, allowing organisations to respond more quickly to market changes. A key factor in this improvement was the automation of routine processes, which reduced the need for manual data entry, which often leads to errors. According to the data obtained, the number of errors in financial reporting decreased by 25%, which is an important achievement against the backdrop of previously recorded high error rates with traditional control methods. This indicates that new technologies not only increase efficiency but also contribute to improving the quality of financial information. In addition, the analysis showed that the automation of control processes had a positive impact on employee morale, reducing

their workload and stress associated with routine tasks. The introduction of new control methods also involved the creation of a monitoring system that allowed real-time tracking of financial indicators, which increased the speed of response to critical situations. For example, if abnormal transactions are detected, a monitoring system based on Business Intelligence platforms (in particular, Power BI combined with machine learning algorithms or specialised control software such as CaseWare IDEA) can automatically generate alerts for responsible persons. This allows financial abuse to be prevented before it occurs. Moreover, the use of algorithmic solutions for automatic detection of errors in reporting has reduced the time spent on auditing by 30%.

Based on the experiment, several recommendations can be made regarding the adaptation of successful international practices in financial control in Ukraine. First, Ukraine should actively implement modern IT solutions for the automation of control processes, in particular, management systems based on artificial intelligence and big data analytics, as confirmed by the successful experience of EU countries. In particular, attention should be paid to the experience of Estonian and Finnish financial institutions, which have successfully integrated electronic platforms for financial management, in particular e-government systems that ensure transparency and accountability in financial processes. It is also important to study the experience of countries that have solved similar problems, such as Germany, where electronic financial flow control systems have significantly improved the efficiency of budget management (IMF, n.d.).

Secondly, it is important to establish cooperation with international organisations to exchange knowledge and experience, which will allow for faster implementation of new control methods. In particular, Ukraine should pay attention to training and certification programmes offered by organisations such as the International Federation of Accountants (IFAC) and the European Court of Auditors (ECA). It would also be useful to hold joint seminars and conferences with international experts to help integrate the latest approaches into financial control.

It is also necessary to provide training for staff so that they can use new technologies effectively. This may include both internal training and participation in international seminars and webinars. It is recommended to establish training centres that specialise in new methods of financial control and analytics, as well as to provide access to online courses and certifications offered by leading universities around the world. It is important that training programmes include practical case studies and examples from international practice, which will allow employees to gain valuable experience.

The introduction of transparency and accountability standards in financial processes based on international practices will also help to increase trust in Ukraine's financial institutions. A public communication strategy needs to be developed that focuses on achievements in the area of financial control, which will help strengthen trust in state bodies. An important element of this strategy should be the use of social media and other communication platforms to disseminate information about positive changes in financial policy.

In addition, Ukraine should consider introducing control mechanisms that allow the public to participate in control processes, for example through open data and platforms for monitoring financial flows. This could include the use of blockchain technology to ensure the transparency of financial transactions. The next recommendation is to establish an independent audit system to assess the effectiveness of new technologies in financial control, thus providing an additional level of oversight and accountability. In addition, consideration should be given to engaging experts to conduct regular assessments of the effectiveness of the control systems in place and their adaptation to changes in the external environment. In conclusion, the results of the practical experiment confirm the feasibility of introducing new control methods in Ukraine, which not only increases the effectiveness of financial control but also helps to reduce errors and improve the quality of financial data. This enables Ukraine to move to a new level in the field of financial control, which, in turn, will have a positive impact on the country's economic stability and development.

CONCLUSIONS

The study provided significant results confirming positive changes in the effectiveness of financial control in Ukraine, in particular through the analysis of the impact of state financial control on the implementation of budget programmes. During 2020-2024, significant changes took place in the financial control system, in particular due to the adoption of the Law on Public Procurement, which increased the transparency of state expenditures. The introduction of electronic monitoring systems, such as the ProZorro system, has reduced the number of cases of misuse of budget funds by 25%. This indicates an increase in the effectiveness of control and a strengthening of public confidence in state bodies. According to data from the State Audit Service, between 2020 and 2023, there were 25% fewer cases of violations in the area of budget spending, and in 2024, this figure fell by another 7%, indicating a sustained positive trend in the control system.

The impact of new analytical tools, such as BI systems, is also important, as they have increased the accuracy of financial forecasts by 30% and reduced the time required to prepare reports from 5 days to 1 day. For example, automated reports generated by BI systems have made it possible to identify anomalies in financial data, which was previously a difficult task. The introduction of new control methods has significantly affected the speed of financial information processing, reducing the processing time for financial transactions by 40%. In addition, the automation of routine processes has led to a 25% reduction in errors in financial reporting. This shows that new technologies not only increase efficiency but also contribute to improving the quality of financial information.

However, the problems identified, such as insufficient coordination between government agencies and the lack of clear criteria for evaluating the implementation of budget programmes, indicate the need for further work in this area. The survey results showed that 45% of respondents believe that financial control bodies do not have sufficient information to evaluate the effectiveness of budget programmes. This highlights the need to develop comprehensive programme performance assessment methodologies that include not only financial indicators but also social and economic outcomes. For example, it is important to assess the impact of budget programmes on the development of social infrastructure, the quality of life of the population, and the overall economic development of regions. The practical recommendations of the study include the introduction of modern IT solutions for automation of control, staff training, and increased public participation in the monitoring of public spending. The integration of new technologies, in particular blockchain, can significantly increase the transparency of financial transactions, and the use of social media can improve communication with the public on financial policy. The limitations of the study lie in the limited amount of data from individual regions and the subjectivity of survey assessments, which may affect the generalisation of results. Prospects for further research lie in studying the impact of artificial intelligence on control processes, as well as in developing more comprehensive methods for assessing the effectiveness of budget programme implementation.

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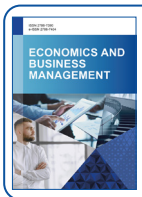
Роль державного фінансового контролю при виконанні бюджетних програм

Анотація. Актуальність дослідження полягає у необхідності вдосконалення системи фінансового контролю в Україні для підвищення ефективності виконання бюджетних програм в умовах сучасних викликів. Метою роботи був аналіз впливу державного фінансового контролю на виконання бюджетних програм, оцінка ефективності нових технологій та виявлення ключових проблем у цій сфері. У дослідженні використовувалися такі методи: анкетування серед працівників органів фінансового контролю, статистичний аналіз зібраних даних, порівняльний аналіз міжнародного досвіду (зокрема практик ЄС), а також експертна оцінка впливу новітніх аналітичних інструментів на ефективність фінансового контролю. Усього було опитано 150 респондентів, серед яких – представники державних органів, незалежні експерти та науковці. Основні результати показали, що впровадження електронних систем моніторингу, таких як ProZorro, призвело до зниження випадків нецільового використання бюджетних коштів на 25 %, а також до підвищення прозорості витрат держави. Використання нових аналітичних інструментів, таких як Business Intelligence-системи, підвищило точність фінансових прогнозів на 30% і скоротило час підготовки звітності з 5 днів до 1 дня. Окрім цього, автоматизація рутинних процесів зменшила кількість помилок у фінансовій звітності на 25 % і прискорила обробку фінансових транзакцій на 40 %. Дослідження також виявило, що 45 % респондентів вважають, що органи фінансового контролю не мають достатньої інформації для оцінки ефективності бюджетних програм, що свідчить про потребу в розробці нових критеріїв оцінки. Крім того, застосування блокчейн-технологій може суттєво підвищити прозорість фінансових операцій, а використання соціальних медіа для комунікації з громадськістю може поліпшити довіру до державних органів. Висновки свідчать про необхідність подальшого впровадження сучасних ІТ-рішень, розробки комплексних методик оцінки виконання бюджетних програм та активізації громадського контролю. Практичне значення дослідження полягає в наданні обґрунтованих рекомендацій для вдосконалення механізмів фінансового контролю, що сприятиме більш ефективному управлінню державними фінансами та підвищенню прозорості діяльності державних органів в Україні

Ключові слова: країни ЄС; методики оцінки; ефективність методів; ефективність управління; прозорість витрат



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Behavioural economics as a tool for improving financial policy in Ukraine's agricultural sector

Abstract. The aim of this study was to determine the impact of behavioural factors on the financial decision-making process of agricultural producers in the context of economic instability in Ukraine. The methodology was based on an interdisciplinary approach using behavioural economics concepts, which made it possible to analyse economic decision-making through the prism of cognitive biases, social context and emotional factors. Statistical data for 2022-2024 on lending, insurance, agricultural producers' participation in grant programmes, and the level of digitalisation in the agricultural sector were analysed. In particular, during this period, more than 13,000 agricultural producers took advantage of the "Affordable Loans 5-7-9%" programme, attracting 104.5 billion UAH, and more than 1,500 farmers applied for grants totalling more than 7 billion UAH. Particular attention was paid to studying the impact of the social environment, in particular participation in cooperatives, which cover 15-20% of farmers. It was also found that in 2024, more than 79% of farmers used IT solutions, including the Global Positioning System, drones and elements of artificial intelligence. The study identified key behavioural anomalies, including the status quo effect, overconfidence, attachment and postponement of decisions. The study showed that, despite the formal availability of government programmes, the level of their implementation remains low due to mistrust of institutions, complex procedures and a lack of tailored information. The results confirmed the feasibility of integrating behavioural tools – such as nudge interventions, digital services, and personalised messages – to

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improve the effectiveness of financial policy in the agricultural sector. The practical significance of the study lies in the possibility of applying its results to improve the mechanisms of state financial support for the agricultural sector by introducing behavioural tools into software, communication strategies and decision-making procedures

Keywords: behavioural methods; financial policy; behavioural factors; agriculture; management; behavioural barriers

INTRODUCTION

In the current conditions of heightened economic instability and high uncertainty, financial policy in Ukraine's agricultural sector requires not only traditional macroeconomic regulation tools, but also new approaches that can take into account the behavioural characteristics of market participants. One of the promising theoretical and practical foundations for such an approach is behavioural economics, which combines economic models with advances in psychology, analysing the impact of cognitive biases, emotions, social norms and irrational actions on economic decision-making. In the agricultural sector, where a significant proportion of participants are small and medium-sized entrepreneurs, households or farmers, behavioural factors play a key role in financial planning, investment, resource consumption and risk-taking.

The insufficient accuracy of traditional macroeconomic models in reflecting Ukraine's economic dynamics in conditions of military instability and economic transformation necessitates new approaches to modelling. This was investigated by L.V. Levkovska *et al.* (2023), who justified the need to integrate behavioural economics concepts into the process of macro model formation. The authors analysed irrational decision-making factors and the influence of sociocultural and psychological aspects, and demonstrated how taking into account the expectations of economic agents affects inflationary processes through a modified Phillips curve. They proved that adapting models to the specifics of the national context increases the reliability of forecasts. Financial decisions of agricultural enterprises are complicated by the instability of the environment and a high level of uncertainty. L. Kostyrko *et al.* (2024) developed a comprehensive risk assessment methodology that takes into account external factors, scenario modelling, and the financial strategy of Kernel-Trade, Myronivsky Hliboproduct (MHP), and Astarta-Kyiv. The authors proved the effectiveness of the approach to choosing a financial strategy based on risk assessment, but did not take into account behavioural factors, in particular the perception of risks and the reactions of farmers.

Innovative development in Ukraine is hampered by insufficient funding, especially in strategically important sectors. O. Radchenko (2023) analysed the dynamics of research expenditure in 2010-2021, revealing a decline in its share in gross domestic product (GDP) and the budget. The author constructed econometric models confirming the dependence of macroeconomic indicators on investment in science and compared the Ukrainian experience with EU practices. However, the study does not take into account behavioural aspects that influence innovation activity in agriculture, in particular risk perception and the level of trust in institutions, which requires further research. Insufficient funding, ineffective state support, and limited access to resources for small producers hamper the development of agriculture. This topic was explored by I. Rumyk *et al.* (2021), who used economic and mathematical modelling to show the dependence of food production on investment volumes and budget financing. They found that subsidies are mainly directed to large agricultural enterprises, and most programmes are only partially implemented.

Agricultural enterprises are facing increased risks in their production activities, which requires new approaches to ensuring their sustainability. B. Khakhula *et al.* (2023) investigated the implementation of innovative risk management tools in the institutional environment, in particular blockchain, contract farming, and digital financial technologies. They built risk assessment models and proved that the combination of such tools increases the level

of safe development of enterprises, especially in Polissya and Forest-Steppe regions. Improving the efficiency of agricultural production in conditions of military risks requires new management approaches. This issue was studied by M.W. Sitnicki *et al.* (2024), who substantiated the feasibility of a cluster approach to strategic management of agricultural enterprises. The authors applied the Kohonen self-learning map method and hierarchical cluster analysis to group regions according to logistics, yield, risk and infrastructure indicators. Seven agricultural clusters with different levels of competitiveness were identified, which made it possible to form differentiated development strategies for each group. This made it possible to propose differentiated development strategies.

Economic reforms in Ukraine often do not take into account the behavioural characteristics of economic agents, which reduces their effectiveness. V.I. Zakharchenko (2024) justified the applicability of prospect theory, cognitive heuristics, nudging, and behavioural finance to improve the effectiveness of reforms. The author demonstrated the possibility of using behavioural principles in various fields, from finance to agriculture. Limited financial resources, unstable revenues, and external risks complicate the development of agricultural production. V. Matskiv (2020) analysed types of financing, support mechanisms, and the role of the state in stimulating investment, and identified livestock farming as a priority area. The author proposed instruments for preferential lending and regional bonds. Despite the significant results of previous studies, they did not take into account key behavioural factors that influence the financial decisions of agricultural producers, their willingness to innovate, risk perception, level of trust in institutions, attitude to clustering and propensity to cooperate, which requires further applied research using behavioural approaches to formulate effective financial policies and support strategies in the agricultural sector.

The aim of this study was to identify opportunities for applying behavioural mechanisms to improve the effectiveness of financial decisions in the system of support for agricultural producers in conditions of economic instability. To achieve this goal, the following tasks were set: to analyse the key behavioural factors that influence the financial activity of agricultural enterprises and households; to justify the feasibility of integrating behavioural approaches into the design of state financial support instruments for the agricultural sector.

MATERIALS AND METHODS

This study was applied interdisciplinary in nature and was conducted between 2022 and 2024. Its aim was to determine how behavioural factors influenced the financial decisions of agricultural producers in conditions of economic instability. The study was based on the principles of behavioural economics, which made it possible to explain the economic decisions made by farmers not only through the classical model of rationality, but also taking into account cognitive limitations, emotional reactions and social context. The main behavioural anomalies were identified, such as the status quo effect, availability heuristics, anchoring, overconfidence and delayed decision-making. To this end, the works of K. Kuznetsova (2023), who highlighted the evolution of behavioural economics in an applied dimension, G. Shi (2023), who systematised the areas of application of behavioural concepts in financial policy, and N. Raj (2024), who analysed the impact of biases on economic decision-making in agriculture. The work of E. Monteiro & J. Joseph (2023), who highlighted the importance of framing and informational context in the effectiveness of behavioural interventions, was also taken into account. These authors were selected due to the deep empirical basis of their research and its relevance to the Ukrainian context.

The empirical part was based on the analysis of official statistics, in particular data on the volume and structure of lending to the agricultural sector of Ukraine in 2022-2024 (Maliy *et al.,* 2025; Verkhovna Rada of Ukraine, 2025), including the "Affordable Loans 5-7-9%" programme (PrivatBank, n.d.). In addition, the study covered statistics on budget financing and the effectiveness of fund utilisation (AgroPolit, 2023; INGO, 2024). The level of involvement of farmers in state support programmes, in particular grant initiatives in the field of greenhouse farming, horticulture and processing, was assessed (Processing grants: In 2024..., 2025).

To assess the level of innovation activity among agricultural producers, the spread of digital technologies among agricultural enterprises was analysed based on data on the use of information technology (IT) solutions, in particular FieldAlytics Mobile (n.d.), Cropwise Sustainability (n.d.), AGMRI (n.d.), FarmLogs (n.d.). The study examined how access to IT solutions correlates with the investment openness of farms. Particular attention was paid to studying behavioural barriers to participation in agricultural insurance programmes, which were identified through secondary data analysis, including compensation levels, insurance coverage, and types of products used.

Relevant international experience in implementing behavioural approaches to agricultural development policy was also examined, in particular examples of initiatives implemented in Ukraine within the framework of the USAID (USAID project conducts financial..., 2019) and SEED (Agravery, 2022) programmes. The analysis took into account the types of influence tools, channels of communication with the target audience, cultural characteristics of perception, mechanisms for building trust in state and donor structures, as well as institutional prerequisites for adapting practices. This allowed for a comparative analysis of approaches to encouraging farmers to participate in support programmes based on choice architecture, simplifying access, and increasing institutional trust.

RESULTS AND DISCUSSION

Theoretical foundations for the application of behavioural economics in financial policy

Behavioural economics has emerged as a scientific approach that combines economic theory with advances in psychology, sociology, neuroscience, philosophy and other related disciplines. Its main goal was to investigate how real people make economic decisions, taking into account psychological constraints, emotions, cognitive biases, and social context (Shi, 2023). Elements of behavioural approaches can be found in the works of A. Smith (1790): the author drew attention to people's tendency to be overly confident, exaggerate benefits and underestimate risks. However, behavioural economics only began to take shape as an independent scientific movement in the mid-20th century. D. Kahneman & A. Tversky (1979) made a significant contribution to its development when they formulated prospect theory in 1979. This theory showed that people value losses more than gains, even if they are of equal magnitude, and make decisions based not on absolute benefits, but on relative changes relative to a certain reference point.

H.A. Simon (1972) made a significant contribution to the formation of behavioural economics by developing the theory of bounded rationality. He proved that in real life, economic agents are not capable of making completely rational decisions due to limitations in the amount of information, time and cognitive resources. His ideas became the basis for rethinking the decision-making process in complex conditions. M. Allais (1988) went down in economic history for formulating the Allais paradox, which contradicted the basic postulates of traditional expected utility theory. This paradox demonstrated that in real situations, people's behaviour often does not correspond to the assumptions of rational choice, confirming the existence of systematic deviations in thinking. L. Festinger (1957) contributed to the psychological basis of behavioural economics by creating the theory of cognitive dissonance. It describes how the contradiction between beliefs and actions leads to internal discomfort, which stimulates a change in behaviour or a reassessment of decisions. This provided a new understanding of the motivation and adaptation of economic agents to an unstable environment. Their work laid the foundation for the creation of new economic models in which the individual is portrayed not as an ideal "*homo economicus*" but as a person with psychological limitations, emotions, and subjective assessments (Kuznetsova, 2023).

One of the main differences between behavioural economics and neoclassical economics is the approach to modelling behaviour. While classical economics is based on the assumption that people act rationally, have complete information and seek to maximise their own benefit, behavioural economics recognises that in real life, decisions are influenced by emotions, stereotypes, biases and even unconscious

automatic reactions. It pays particular attention to phenomena such as the recency effect, the anchoring effect, the status quo, time biases, etc. (Raj, 2024). Comparative characteristics of behavioural and neoclassical economics are summarised in Table 1.

Table 1. Comparison of neoclassical and behavioural economics according to key criteria

Criterion	Neoclassical economics	Behavioural economics
Human model	Abstract, rational, homo economicus	Realistic, taking into account irrationality
Decision-making	Complete information, utility maximisation	Limited rationality, cognitive biases
Influence of external factors	Minimal, individuals act independently	Significant, social and emotional influences are taken into account
Methodology	Theoretical models, normative approach	Experimental research, empirical approach
Explanation of behavioural deviations	Randomness or external shocks	Systematic psychological patterns

Source: compiled by the authors based on G. Shi (2023), K. Kuznetsova (2023), N. Raj (2024)

The comparison presented in Table 1 shows fundamental differences between neoclassical and behavioural economics: the former is based on the assumption of complete rationality of individuals and independence from external influences, while the latter takes into account real psychological and social constraints that determine economic behaviour. Behavioural economics provides a more flexible and realistic understanding of the decision-making process, relying on empirical research and systematic analysis of deviations that were considered random within traditional approaches. At the methodological level, behavioural economics uses mainly experimental approaches, field research, surveys and modelling based on empirical data. It does not simply record deviations from "rational behaviour" but attempts to explain them as regular patterns that repeat themselves in different conditions. This is what allows for the development of more adaptive economic policies that take into account real patterns of human behaviour, particularly in matters of saving, investing, consumption, or interaction with state financial mechanisms (Raj, 2024). Thus, behavioural economics has become not an alternative but an important addition to neoclassical theories, especially in the context of the practical implementation of financial policy. Its evolution is a gradual transition from abstract postulates to empirically confirmed models of behaviour, which allows for a more accurate consideration of the reactions of economic agents, including the agricultural sector, to state financial instruments. This creates new opportunities to improve the effectiveness of financial policy by integrating behavioural mechanisms into economic management practices.

Modern financial policy in the agricultural sector faces the need to adapt to the real behaviour of farmers, which often does not correspond to the assumptions of traditional economics about rational consumers. Behavioural approaches make it possible to take into account the psychological, social and cognitive factors that influence financial decision-making, thereby increasing the effectiveness of policy instruments and promoting sustainable agricultural development. One of the key areas is taking into account the psychological characteristics of farmers' behaviour. In particular, farmers often tend to avoid risk, are resistant to change and have low confidence in new financial instruments. Understanding these barriers allows for the development of policies that meet their expectations, habits and limitations (European Commission, 2024).

So-called "nudges" are widely used – soft interventions that encourage desired behaviour without coercion. For example, automatic registration of farmers in crop insurance

programmes with the option of subsequent withdrawal significantly increases participation rates, as it overcomes inertia and the status quo effect. SMS reminders, bonuses for timely submission of applications or payment of fees, and simplification of bureaucratic procedures are also effective. Another important area is reducing cognitive load. Complex forms, lengthy procedures and unclear conditions of financial support programmes often discourage farmers, especially small ones. Simplifying access to loans, subsidies, or insurance programmes significantly increases participation. Personalised information support plays a special role here – digital platforms and mobile applications that provide recommendations based on weather conditions, local characteristics, and farming history. Such tools not only facilitate decision-making but also build trust in government initiatives (Cai, 2019).

Social and cultural aspects also play an important role. For example, in many communities, it is not individual economic calculations that are decisive, but social pressure, traditions and group expectations. Therefore, effective financial instruments must take into account local norms of behaviour, the structure of cooperation in cooperatives, and the level of trust in institutions. The practice of involving local leaders, farmer demonstrations, network effects, and peer-to-peer learning has shown positive results in promoting new farming models. It is also important to combine mandatory and voluntary measures. Policies that combine regulation with voluntary incentive schemes make it possible to reach both innovation-open farmers and conservative actors who respond primarily to formal requirements. Framing information in a way that resonates with farmers' values, as well as timely communication at key decision-making moments, is another factor in increasing effectiveness (Monteiro & Joseph, 2023).

Reducing income volatility, particularly through decoupled payments or stabilisation mechanisms, increases readiness to adopt new financial instruments. The use of experimental methods, behavioural models and cutting-edge technologies such as artificial intelligence and blockchain allows for the analysis of typical farmer responses and the development of flexible, individualised policies. Prospect theory allows for the asymmetric perception of losses and gains to be taken into account when designing subsidy and insurance programmes. Framing information, particularly phrasing messages in terms of opportunity costs, has proven effective in encouraging agricultural producers to participate. Field experiments with nudges – SMS reminders, automatic participation with the right to opt out – show an increase in participation in support programmes. Such approaches take into account behavioural barriers and contribute to the effectiveness of reforms in the field of sustainable development of the agricultural sector (Chen *et al.*, 2023). The integration of behavioural approaches into agricultural financial policy not only takes into account the real barriers to the acceptance of change, but also creates conditions for increasing the effectiveness of reforms, the sustainability of farming decisions and the sustainable development of the agricultural sector (Dessart *et al.*, 2019).

The study by E. Mesa-Vázquez *et al.* (2021) focused on global scientific activity in the field of behavioural economics in the agricultural sector. The authors conducted a bibliometric analysis covering three decades of research and recorded a steady growth in interest in behavioural approaches in the context of sustainable development, ecology, management, and consumer behaviour. At the same time, it was emphasised that despite the growing number of publications, this topic is still in its infancy. In contrast, this study focused on the practical implementation of behavioural mechanisms in Ukraine's financial policy, especially in the context of war. Particular attention was paid to specific tools, such as nudges, simplifying access to support, reducing cognitive load and taking into account the local context, which made it possible to move from theoretical conclusions to applied solutions.

Another perspective was presented by E. Atis *et al.* (2024), who focused on the problem of climate change and farmers' behaviour in response to environmental challenges. The focus is on the influence of biases, fear of change, the status quo effect, and the use of "green nudges" to encourage sustainable agricultural

practices. In contrast, the authors of this study examined the financial behaviour of agricultural producers in a crisis environment, proposing tools for adapting financial policy. Despite the difference in objectives – climate responsibility in E. Atis *et al.* and financial stability in the Ukrainian context – both studies demonstrated the effectiveness of behavioural approaches, particularly in terms of social impact and incentive interventions.

Thus, behavioural economics has become an important tool in rethinking approaches to financial policy-making, particularly in the agricultural sector. Taking psychological, cognitive and social factors into account allows for a flexible response to real barriers to decision-making. A comparison of international studies with the national context of Ukraine has shown that it is the integration of behavioural mechanisms – from nudges to social learning – that can significantly increase the effectiveness of state support instruments and ensure the sustainable development of the agricultural sector.

Behavioural factors in the economic activity of agricultural entities

Making financial decisions in conditions of uncertainty is a complex process for agricultural producers, combining the influence of economic, institutional and behavioural factors. In a crisis environment caused by war, market volatility and unpredictable government policy, subjective perception of risk, level of trust in institutions and availability of financial instruments play a decisive role. In 2022, more than 43,600 farmers took advantage of the "Affordable Loans 5-7-9%" programme (PrivatBank, n.d.), attracting 95.5 billion UAH, of which 24.7 billion UAH was provided under state guarantees. In 2023, 14,000 farmers received loans totalling 78.8 billion UAH, of which 10,900 received loans through the "5-7-9%" programme, with a total volume of 44.5 billion UAH (Maliy *et al.,* 2025). In 2024, 13,088 farms participated in the programme, attracting more than 104.5 billion UAH, including 8,511 enterprises (mainly small and medium-sized enterprises (SMEs)) for a total of 44.8 billion UAH (Verkhovna Rada of Ukraine, 2025). Figure 1 shows the dynamics of funds attracted by farmers in 2022-2024.

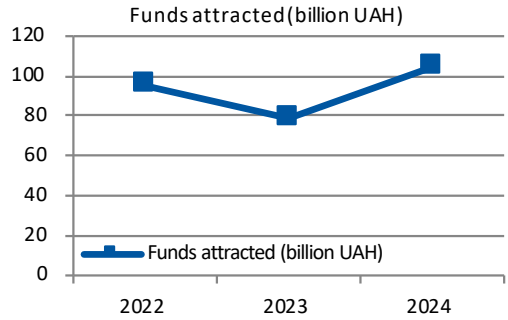

Figure 1. Dynamics of funds attracted by farmers in 2022-2024

Source: compiled by the authors based on O.G. Maliy *et al.* (2025), Verkhovna Rada of Ukraine (2025)

The graph in Figure 1 shows that in 2022, the volume of financing amounted to 95.5 billion UAH, while in 2023, there was a decline to 78.8 billion UAH, reflecting the effects of economic instability and high risks. However, in 2024, there was a significant increase to over 104.5 billion UAH, indicating a partial recovery in lending activity, increased confidence in financial instruments, and the effectiveness of state support programmes. Overall, the trend points to the agricultural sector adapting to conditions of uncertainty and a gradual restoration of access to financial resources.

Despite these positive indicators, budget financing statistics point to a persistent problem of underutilisation of funds. In 2024, 4.2-4.9 billion UAH was allocated to the agricultural sector, but only about 1 billion UAH was allocated directly to targeted programmes for the agro-industrial complex. (AgroPolit, 2023). The same situation persists in 2025: despite the allocation of over 6 billion UAH, including 4.726 billion UAH for subsidies per hectare and 1.37 billion UAH for grants, the effectiveness of the use of these resources remains unknown due to delayed application stages and delays in payments (State support for agribusiness ..., 2025). Another example of uncertainty is the insurance sector. Before the war, in 2021, more than 1,000 farmers participated in the index insurance programme, insuring 1.2 million hectares, of which more than half received compensation. In 2024, the market is gradually recovering – as of March, 250,000 hectares had already been insured. Most farmers

consider an insurance rate of 5% to be acceptable, which indicates the need for state support to overcome barriers to entry into insurance programmes (INGO, 2024).

Thus, financial decision-making in Ukraine's agricultural sector remains vulnerable to a number of external and internal factors. Behavioural barriers, low trust in institutions, programme complexity, payment delays and limited financial literacy contribute to the overall indecision of agricultural producers. For financial policy to be effective, it must not only provide access to resources, but also overcome psychological, informational and procedural constraints through simplification, personalisation and risk support.

Risk perception mechanisms and the influence of the social environment on the investment behaviour of agricultural producers are shaped not only by economic factors, but also by personal perceptions, the level of trust in institutions and social interaction. One of the key indicators of real investment activity in the agricultural sector is the involvement of farmers in state support programmes. Between 2022 and 2024, agricultural producers submitted more than 1,500 grant applications for investments in greenhouses, orchards and processing enterprises, totalling more than 7 billion UAH. In particular, 1,156 applications were approved under the programme for processing enterprises, and in 2024, 375 grants were paid out for almost 1.8 billion UAH. As part of support for horticulture and greenhouse farming, 211 grants worth 925 million UAH have been issued since 2022, covering over 2,000 hectares of orchards and 50 hectares of greenhouses. This indicates significant demand among agricultural producers for the development of production and storage of products, despite the existing risks and difficult economic situation (Processing grants: In 2024..., 2025).

However, even with such instruments available, most farmers act cautiously. This is because the risk in a farmer's perception is often not reduced to a rational assessment of probabilities, but is interpreted through the prism of past experience, information background or attitude towards institutions. The social environment is of particular importance – the opinions of colleagues, local leaders or consultants have a significant impact on the willingness to invest. In this context, cooperatives become an important point of influence: about 15-20% of agricultural producers in Ukraine are members of agricultural groups or cooperatives. Despite their relatively small share, it is participation in such forms of association that promotes more active investment, both in shared infrastructure (logistics, storage, processing) and in individual farms. Cooperation reduces risks, optimises costs and improves access to loans and grants. At the same time, institutional barriers, in particular a weak legislative framework and a lack of mutual trust between participants, hinder the spread of the cooperative movement (AgroPortal, 2024).

Another important factor influencing investment behaviour was the rapid introduction of digital solutions in farms. In 2024, about 79% of Ukrainian farmers reported actively using IT technologies in their activities. In particular, 60% use navigation systems, 70% use telematics, 59% use drones, and 22% have already implemented elements of artificial intelligence to predict crop yields. These data, obtained from a survey (iFarming, 2024) of more than 2,800 agricultural producers throughout Ukraine, indicate a high level of adaptation to innovation, which correlates positively with a willingness to invest even in conditions of uncertainty. Information obtained through digital channels or examples of successful application of technologies in neighbouring farms often has a greater impact on farmer behaviour than formal instructions or regulatory documents. Thus, the investment behaviour of agricultural producers in conditions of risk is shaped by both the subjective perception of possible losses and the social context, which includes examples from colleagues, participation in cooperatives, the level of digital maturity and the availability of adapted information. Support for investment should be based not only on financial incentives, but also on reducing information barriers, strengthening local trust, and promoting cooperative and digital development models.

Policy approaches that take behavioural aspects into account were at the heart of both this study and the work of L.A. Reisch (2021). L.A. Reisch focused on the global level – on shaping food systems through changing consumer behaviour. The author emphasised the importance of

choice architecture, social norms and cognitive biases in achieving sustainable nutrition. This study, on the other hand, focused on behavioural barriers to financial decision-making by farmers during wartime, emphasising the use of nudges and digital solutions. Despite their different scales, both studies reject the model of the rational individual in favour of behavioural adaptation of policies to reality. A different approach was demonstrated by M. Tagliabue (2023), who, unlike the practical orientation of the Ukrainian study, delves into the philosophical and ethical aspects of behavioural interventions. The author analysed the relationship between classical and behavioural rationality, considering the legitimacy of nudges from the point of view of paternalism. The same work demonstrates how these tools are implemented in a crisis, in particular by simplifying access to support programmes. Thus, M. Tagliabue's theoretical framework finds practical application in the Ukrainian context.

The targeted application of behavioural approaches in agricultural policy was also considered by Z. Dorner (2023), who studied pricing policy for agricultural emissions in New Zealand. His analysis showed how perceptions and behavioural responses can change the effectiveness of policies. This echoes the present study, where farmers' behavioural barriers were also recognised as critical. However, Z. Dorner focused on the design of environmental regulation mechanisms, while the Ukrainian example directly concerned financial behaviour in the area of subsidies and loans. Researchers G. Bazzan *et al.* (2022) studied agricultural policy within the European Union, analysing the integration of environmental instruments within the "Farm to Fork" strategy. Institutional coordination, which ensures policy coherence, was key to their work. In turn, this study focused not on structural restructuring, but on how to adapt policy to the behaviour of individual agricultural producers through psychologically sound interventions. Both works support a multi-instrumental approach, but implement it at different levels – systemic and local.

Another area of application of behavioural economics was analysed in a systematic review by Z. Zamani *et al.* (2022), which addressed the topic of healthcare. The authors criticised the ineffectiveness of information campaigns without changing the choice environment and emphasised the universality of cognitive biases. This study agrees with this thesis and, based on it, demonstrates how behavioural mechanisms work in the farming environment. However, while Z. Zamani *et al.* limited themselves to a generalised theoretical analysis, the Ukrainian study showed practical application in a specific field. A.S.S. Ferreira da Costa (2024) focused on classical approaches to financial risk management, such as insurance, diversification, and the introduction of precision farming. She worked with the macro level and the global context, particularly Brazil. The Ukrainian study, on the other hand, showed how behavioural factors – fear of loss, trust, social pressure – can determine the effectiveness of financial decisions. The two authors' approaches complement each other: one provides the tools, the other explains why these tools work or do not work in real-life conditions.

Financial decision-making by agricultural producers in conditions of uncertainty depends on economic, political and behavioural factors, such as risk perception, trust in institutions and social influence. Despite the existence of government programmes, statistics show low participation by farmers, particularly due to delays in payments and underutilisation of budget funds. Behavioural factors also influence insurance and investment decisions, particularly through emotional risk perception and social pressure. Despite the difficult situation, some farmers are adapting to innovations, particularly through digitalisation.

Proposals for adapting financial policy to take account of the behavioural patterns of agricultural entities

Financial policy in Ukraine's agricultural sector must take into account not only macroeconomic parameters, but also the actual behaviour of farmers, including their cognitive characteristics, psychological barriers and social influences. In crisis conditions, agricultural producers demonstrate restraint in the use of financial instruments, even under formally favourable conditions. This indicates the need to rethink support mechanisms, taking into account behavioural patterns.

One effective tool is the use of nudges (nudge interventions), which encourage desired behaviour without coercion. For example, automatic enrolment in insurance programmes or grant initiatives with the option of subsequent withdrawal significantly increases participation rates. Similarly, SMS reminders about deadlines, bonuses for timely submission of applications, and benefits for regular participants can overcome the inertia and status quo effect inherent in the agricultural environment. An important step is to simplify the procedures for accessing financial programmes. The complexity of paperwork, long processing times and the need for numerous references create cognitive overload, which reduces participation even among interested farmers. Reducing bureaucratic barriers, introducing electronic document management and transparent online forms significantly increase the accessibility of support programmes, especially for small and medium-sized farms (Krawiec *et al*., 2021).

To increase confidence in financial policy, transparency mechanisms need to be implemented. This includes regular publication of data on the number of applications submitted and approved, payment amounts, examples of successful cases, and independent programme audits. The low level of trust in institutions, confirmed by sociological studies, largely explains the reluctance of agricultural producers to participate in government initiatives, even when there are financial benefits. Personalised information campaigns allow for local farming characteristics, climatic conditions, enterprise size, and farmers' experience to be taken into account. Digital tools make it possible to generate individual recommendations on programme selection, application deadlines, and available financing options. This not only facilitates decision-making but also increases trust by giving farmers a sense that their individual interests are being taken into account (Anjani, 2023).

Farmers' decisions are significantly influenced by their social environment. The involvement of local opinion leaders, agricultural consultants, successful examples from neighbouring farms, and support for cooperation as an organisational form contribute to the spread of financial instruments. In 2022-2024, a number of practical cases were implemented in Ukraine, demonstrating the effectiveness of educational programmes to improve the financial literacy of agricultural producers within the framework of the United States Agency for International Development (USAID) AGRO (USAID project conducts financial..., 2019) and Supporting Entrepreneurs for Environment and Development (SEED) (Agravery, 2022). In 2022, the USAID AGRO programme, in cooperation with Aggeek, organised training and advisory sessions for micro, small, and medium-sized enterprises (MSMEs) in eight regions of Ukraine (including Zaporizhzhia, Dnipropetrovsk, and Cherkasy regions), where farmers received practical knowledge on financial planning, lending, the use of fintech solutions, and resource management. As part of the programme, agricultural producers were also trained in the use of digital platforms such as AgroApp (n.d.), AgriAnalytica (AgriAnalytica, n.d.), and UTEKA (n.d.), which increased the availability of financing (State Agricultural Register, 2022).

The SEED (Supporting Entrepreneurs for Environment and Development) programme, implemented by the United Nations Global Compact in Ukraine with the support of the PepsiCo Foundation, covers agricultural producers and entrepreneurs in Kyiv, Lviv, Odesa, Kharkiv and other regions. The 27-hour training includes modules on project management, financial literacy, marketing, SMM, legal issues, as well as a mandatory course on anti-corruption through the Diia. Business and Diia.Education platforms. The programme provides participants with mentoring support and the opportunity to receive grants of up to 100,000 UAH. Between 2022 and 2024, at least several hundred farmers will have completed the SEED training, many of whom will have been able to start or restart their own agribusinesses. (Global Compact Network Ukraine, n.d.).

The digitisation of the agricultural sector has significantly expanded the range of state support tools. In 2023-2024, GPS navigation will be implemented by 60-70% of farmers, telematics by approximately 70%, drones by 50-60%, and Customer Relationship Management/Enterprise Resource Planning (CRM/ERP) systems by 30-40% (mainly medium and large farms). This allows for the optimisation of resource use,

reduction of losses, and informed decision-making (National Bank of Ukraine, 2020). Platforms such as FieldAlytics Mobile (n.d.), Cropwise Sustainability (n.d.), AGMRI (n.d.), FarmLogs (n.d.), as well as locally developed mobile applications, in particular the Kyivstar and Minagropolitika applications, are actively used in Ukraine. They provide agricultural producers with access to weather forecasts, crop analytics, cultivation recommendations, production planning, and real-time reporting. In particular, at the "Agro-Region" group of companies (Agro-Region, n.d.), Cropwise Operations is used not only by the agronomy service for crop rotation planning and crop control, but also by the dispatch department for forming daily work plans for equipment with the possibility of online monitoring via trackers. The system sends notifications in case of deviations from the plan, and a service log is kept for repairs and maintenance of equipment. Thanks to this, the company receives detailed reports on machine performance and a complete history of plant protection products and fertilisers applied, which is stored in one place for analysis (Agro-Region, 2024).

Digitalisation and behavioural economics are intertwined through a common goal: to improve the effectiveness of decisions by taking into account real human behaviour. Digital technologies make it possible to identify behavioural patterns, simplify decision-making, reduce cognitive load, and personalise interventions. Through analytics, framing, and automation, digital services facilitate the implementation of behavioural approaches in financial and agricultural policy, enhancing the impact of tools such as nudges through adaptive information delivery and user-friendly interfaces. Behavioural barriers are also significant in the area of agricultural insurance. Despite the introduction of state support in 2024, agricultural insurance covers only 3-5% of crops. The reasons for this are the complexity of the products, lack of trust, and low awareness. The adaptation of insurance instruments involves the creation of simple products with a fixed rate (up to 5%), state compensation for part of the cost, and transparent payment terms, which will increase farmers' willingness to participate (INGO, 2024).

Financial literacy education programmes are an important prerequisite for improving the quality of financial decisions. The National Strategy for Financial Literacy Development until 2030 (Government portal, 2024) provides for the creation of training courses, workshops, online platforms and awareness campaigns. Initiatives such as the Financial Knowledge Centre "Talan" (Financial Knowledge Center..., n.d.), Junior Achievement Ukraine (Junior Achievement..., n.d.), and various programmes by the National Bank of Ukraine (NBU) collectively create a foundation for strengthening financial culture among agricultural producers.

The introduction of adaptive financial policy should be based on a comprehensive approach that integrates behavioural economics, digital tools, educational activities, and institutional changes. It is important that support programmes are not only economically beneficial but also psychologically comfortable for farmers – simple, predictable, accessible, and socially supported. Only under these conditions will the state be able to achieve a high level of involvement of agricultural producers, strengthen trust in institutions and form a sustainable financial environment in Ukrainian agriculture. A summary of the proposed areas of adaptation is presented in Table 2.

Table 2. Key areas for adapting financial policy, taking into account the behavioural patterns of farmers

Adaptation area	Description of the proposal
Use of nudges (nudge tools)	Automatic enrolment in programmes with the option to opt out; reminders, bonuses for timely participation.
Simplification of access to programmes	Reduction in the number of documents, electronic applications, shorter processing times.
Increased transparency and trust	Regular reporting on programme results; creation of independent verification mechanisms.
Personalised information campaigns	Provision of recommendations taking into account local conditions, weather factors and economic history.

Table 2, Continued

Adaptation area	Description of the proposal
Social support through opinion leaders and cooperation	Involvement of cooperatives, consultants, examples from neighbours; support for local initiatives.
Integration of digital platforms and analytics	Use of mobile applications, chatbots, personal accounts with analytics and advice.
Adaptation of insurance product design	Creation of simple and understandable products with partial state support and flexible conditions.
Financial literacy education programmes	Inclusion of topics such as cognitive biases, emotional perception of risk, and behavioural strategies in training materials for farmers.

Source: compiled by the authors based on J.M. Krawiec *et al.* (2021), P. Anjani (2023)

Table 2 summarises the main areas of financial policy adaptation that take into account the behavioural characteristics of agricultural producers. The proposed interventions cover both structural and communication elements, from simplifying procedures to introducing digital solutions, social influence and educational programmes. This comprehensive approach not only expands access to financial instruments but also increases farmers' confidence, motivation, and willingness to make informed decisions in uncertain conditions. Integrating behavioural principles into policy creates the conditions for a sustainable and inclusive financial environment in the agricultural sector.

The study by K. Louhichi & D. Merisier (2024) focused on the income stabilisation tool (IST), which the authors examined through the prism of economic modelling and its impact on income and environmental diversification in France. In contrast, this study was not limited to evaluating a single instrument, but covered a wider range of behavioural barriers that inhibit the financial activity of agricultural producers – from risk perception to the influence of the social environment. While the French study demonstrates the mechanism for implementing a financial instrument, the Ukrainian study explains why farmers may reject it even if there are formal benefits.

Another dimension is revealed in the study by R. Finger *et al.* (2024), where behavioural factors were considered in the context of sustainable plant protection policy. The authors criticised traditional economic models for ignoring social norms and biases that influence farmers' willingness to reduce pesticide use. This approach resonates with the Ukrainian experience, which has also shown that financial policy is only effective when it is adapted to the actual behaviour of farmers. Both studies operate in different spheres – environmental and financial – but are united by a common criticism of rationalist models.

The analysis by P. Shukla *et al.* (2023) provided a systematic review of the use of behavioural interventions in agriculture, showing their moderate effectiveness when used alone, but significantly greater potential when combined with economic measures. This thesis is directly reflected in this study, where the combination of nudges and digital services with support programmes demonstrates positive results. At the same time, P. Shukla *et al.* emphasised methodological limitations and ethical issues, while this work focused on the practical implementation of tools against the backdrop of war, without delving into theoretical controversy.

K. Gaber *et al.* (2024) offered a different perspective, focusing on the digital transformation of fruit growing in Germany. The authors identified a gap between the available tools and farmers' expectations, as well as uneven access to digital solutions. The Ukrainian study also touched on digitalisation, but focused more on farmers' willingness to use the tools, which is determined by behavioural factors, rather than on the functionality of the tools themselves. Thus, both approaches address the same challenge – how to adapt technology to the needs of farmers – but from different angles: technical and psychological.

An important methodological perspective is also demonstrated by the work of N. El Benni *et al.* (2023), which assesses agricultural policy within the EU. The authors focused on the use of models, qualitative data and the need for

close interaction between science and policy. In contrast, this study focused on the practical implementation of behavioural tools in a crisis environment. This difference highlights the complementarity of the approaches: N. El Benni's study outlined a framework for objective policy evaluation, while this work provided examples of their adaptation to the actual behaviour of farmers.

During the period 2022-2024, which was characterised by economic instability, full-scale war, inflationary fluctuations and increased risks in the financial environment, Ukraine's agricultural financial policy required not only economic justification but also profound behavioural adaptation. Farmers made decisions influenced by cognitive biases, emotions, past experience, and social context, which limited the use of even effective government tools. The introduction of nudge interventions, simplified procedures, personalised information, social support through local networks, digitalisation, and educational programmes are shaping a new policy paradigm that is flexible, accessible, and psychologically comfortable for farmers. The integration of such approaches will not only increase the level of farmer participation in support programmes, but will also contribute to strengthening financial stability, trust in institutions and the long-term development of Ukraine's agricultural sector.

CONCLUSIONS

In conditions of prolonged economic instability and high risks, Ukraine's agricultural financial policy has demonstrated limited effectiveness, due not only to macroeconomic factors but also to behavioural barriers among agricultural producers. Statistics confirm that although more than 43,600 farmers took advantage of the "Affordable Loans 5-7-9%" programme in 2022 for a total amount of 95.5 billion UAH, by 2023 activity had declined to 14,000 borrowers and 78.8 billion UAH. Only in 2024 was there an increase, when 13,088 farms received over 104.5 billion UAH, of which 8,511 were small and medium-sized enterprises. This positive trend indicates a gradual adaptation to conditions of uncertainty, but does not eliminate the problems of uneven access and underutilisation of the potential of state programs.

Underutilisation of budget funds remains a systemic problem. Of the 4.2-4.9 billion UAH allocated in 2024, only about 1 billion UAH was directed directly to targeted programmes. In 2025, the situation remained unchanged. With a plan of over 6 billion UAH, the efficiency of use remained low due to delays and complex procedures. In the insurance sector, the figures also indicate weak coverage. In 2024, only 250,000 hectares were insured, which is five times less than in pre-war 2021. Despite this, the growth of digitalisation is creating the conditions for change. In 2024, 79% of farmers used IT solutions, 60% used GPS, 59% used drones, and 22% used artificial intelligence elements. This indicates a readiness for innovation, which, combined with well-designed behavioural interventions, can significantly increase policy effectiveness. Participation in cooperatives also contributes to investment activity. 15-20% of farmers who are members of associations show a higher willingness to invest in infrastructure and new technologies.

The study confirmed the need to take behavioural factors into account when formulating financial policy in the agricultural sector. The use of approaches such as stimulating action, simplifying procedures, providing individualised information support, developing digital services and strengthening the social environment will not only expand access to financial resources, but also increase trust in institutions and ensure the sustainable development of agriculture in Ukraine. The limitation of this study was that it was based mainly on available statistical data and did not include the results of an independent empirical survey of farmers. The prospect for further research is an in-depth analysis of the behavioural patterns of agricultural producers using experimental methods and field data to improve financial policy instruments.

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Біхевіористична економіка як інструмент удосконалення фінансової політики в аграрному секторі України

Анотація. Метою даного дослідження було визначення впливу поведінкових чинників на процес прийняття фінансових рішень агровиробниками в умовах економічної нестабільності в Україні. Методологія ґрунтувалася на міждисциплінарному підході з використанням концепцій поведінкової економіки, що дозволило проаналізувати ухвалення економічних рішень через призму когнітивних упереджень, соціального контексту та емоційних факторів. Було проаналізовано статистичні дані за 2022-2024 роки щодо кредитування, страхування, участі агровиробників у грантових програмах та рівня цифровізації в аграрному секторі. Зокрема, за цей період програмою «Доступні кредити 5-7-9 %» скористалося понад 13 тисяч агровиробників, які залучили 104,5 млрд грн, а понад 1 500 фермерів подали заявки на гранти на суму понад 7 млрд грн. Окрему увагу приділено дослідженню впливу соціального середовища, зокрема участі у кооперативах, що охоплюють 15-20 % фермерів. Також встановлено, що у 2024 році понад 79 % аграріїв використовували IT-рішення, включаючи Global Positioning System, дрони та елементи штучного інтелекту. У процесі дослідження було ідентифіковано ключові поведінкові аномалії, зокрема ефект статус-кво, надмірну самовпевненість, прив'язку та відкладання рішень. Дослідження засвідчило, що, попри формальну доступність державних програм, рівень їхнього освоєння залишається низьким, що пов'язано з недовірою до інституцій, складністю процедур і відсутністю адаптованої інформації. Отримані результати підтвердили доцільність інтеграції поведінкових інструментів – таких як nudge-інтервенції, цифрові сервіси, персоналізовані повідомлення – для підвищення ефективності фінансової політики в аграрному секторі. Практичне значення дослідження полягає у можливості застосування його результатів для удосконалення механізмів державної фінансової підтримки аграрного сектору шляхом впровадження поведінкових інструментів у програмне забезпечення, комунікаційні стратегії та процедури прийняття рішень

Ключові слова: біхевіористичні методи; фінансова політика; поведінкові чинники; сільське господарство; управління; поведінкові бар'єри

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Financial risks of Ukrainian enterprises: Analysis, management, and ways to minimise them in conditions of economic instability

Abstract. The study aimed to identify the main financial risks for Ukrainian enterprises caused by economic instability. The research methodology included an analysis of secondary data for 2022-2024, in particular, statistical indicators of inflation, exchange rates and unemployment rates. The main results of the study revealed significant trends that have a substantial impact on the financial stability of enterprises in Ukraine. In 2022, inflation reached 26.6%, which significantly increased costs for enterprises. In 2023, inflation fell to 5.1%, but rising exchange rates and interest rates remained a major challenge for businesses. At the end of 2024, inflation rose again to 10.7%, causing further increases in product prices and reducing consumer purchasing power. Currency fluctuations had a particularly high impact on businesses, notably the 34.1% devaluation of the hryvnia in 2022, which created significant difficulties for export-oriented businesses. In addition, it was found that enterprises that used diversification strategies and financial derivatives were able to reduce the negative impact of currency risks. Furthermore, the study identified that currency hedging can reduce exchange rate fluctuations by 15-20% compared to other strategies. The findings of the study indicate that enterprises that use a comprehensive approach to financial risk management, in particular through hedging, diversification and effective use of state support, can maintain financial stability even in times of crisis. The practical significance of the study is determined by the development of effective recommendations for managing financial risks of enterprises in conditions of economic instability, which ensures their financial stability and adaptation to changes in the macroeconomic environment

Keywords: hedging; inflation; unemployment; interest rates; loans

INTRODUCTION

Financial risks are one of the main problems for Ukrainian businesses in times of economic instability. In particular, businesses in Ukraine are facing serious challenges due to the economic crisis, inflation, political instability, and global economic changes. In such conditions, financial risks can significantly affect the stability and viability of enterprises, leading to increased costs,

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reduced profitability, reduced opportunities for attracting investment, and even bankruptcy. The research relevance is determined by the need to develop effective financial risk management mechanisms that will help enterprises adapt to new conditions, minimise financial losses and ensure economic stability at various stages of their activities.

The problem of managing financial risks of enterprises in conditions of economic instability is relevant due to rapid changes in financial markets and risks associated with the uncertainty of the economic environment. I. Tomashuk & I. Tomashuk (2022) studied the system of financial risk management and its impact on the financial security of enterprises, considering the nature of financial risks and their classification. The study proposed a risk assessment algorithm that includes both quantitative and qualitative methods. However, despite a significant contribution to the development of theoretical aspects, the issue of the practical application of these methods in enterprises in the context of modern economic crises requires further study.

The management of financial risks in a company undergoing transformational change is a substantial topic for scientific research, as these risks can significantly affect the financial stability and security of companies. A.V. Nechyporenko (2023) investigated theoretical and methodological approaches to financial risk management, studying the factors of financial risks and the specifics of managing them in conditions of change. The study identified the key stages of financial risk management and proposed conceptual principles for their neutralisation. However, despite the results achieved, the issue of a more in-depth analysis of the impact of external and internal factors on the financial risks of enterprises requires further research, particularly in the context of the practical implementation of the proposed concepts in various sectors of the economy.

The financial security of enterprises is a substantial aspect of ensuring stable business development in conditions of economic instability. K. Pavlov *et al.* (2022) studied the financial security of Ukrainian enterprises, in particular, their current state and main problems. The study identified the key factors affecting the financial stability of enterprises and proposed ways to solve these problems. However, the impact of external threats, such as war and economic instability, on financial security requires further study. Financial instability and bankruptcy are substantial challenges to the sustainable development of enterprises. L. Burkova *et al.* (2023) studied financial risk management as a component of preventing financial instability and bankruptcy of enterprises. The study analysed methods of financial risk management based on the specific characteristics of enterprises in a state of financial crisis. The study developed approaches to determining maximum acceptable risks and their application in management practice. However, the issue of improving financial risk management methods in connection with new global economic challenges, such as political and environmental crises, requires further research.

Management of financial risks of enterprises in conditions of martial law is a substantial topic, as martial law creates a significant level of uncertainty and instability. L.T. Shevchuk *et al.* (2024) studied the peculiarities of financial risk management and corporate restructuring under martial law, emphasising the need to develop a comprehensive approach to identifying and minimising risks. They proposed risk management strategies such as diversification and hedging, as well as the importance of responding quickly to changes in the market environment. However, the issue of developing specific approaches to financial restructuring in conditions of high uncertainty and limited resources requires further research.

Managing financial risks and business stability is essential to ensuring economic security. Z.-M. Zadorozhnyy *et al.* (2024) determined that effective risk management depends on the ability of businesses to adapt to changing economic conditions. However, there are shortcomings in applying these strategies during global crises, especially war. The financial stability of Ukrainian enterprises in conditions of systemic instability is one of the main problems faced by businesses during war. A. Kornyliuk & R. Kornyliuk (2024) studied the impact of a full-scale invasion on the financial stability of enterprises, particularly in the agro-industrial, construction,

energy and metallurgical sectors. The study demonstrated that, despite significant losses in 2022, some sectors began to recover in 2023, demonstrating revenue growth and improved return on assets. However, low bank loan utilisation and high debt burdens remain challenges that require further research to ensure a stable economic recovery.

The financial crisis in Ukraine, caused by political instability, military aggression, the devaluation of the hryvnia and inflation, significantly affected the country's economy. A. Pohrebnyak *et al.* (2024) examined these factors, analysed macroeconomic indicators and found that the decline in gross domestic product (GDP), rising unemployment, capital flight and increased public debt are the main consequences of the crisis. The study also suggested ways to overcome these consequences, in particular through stabilisation of the political situation and economic reforms. However, the effectiveness of the proposed measures in the context of the ongoing war requires further study. The study was to investigate the impact of economic instability on the financial risks of Ukrainian enterprises. The research objectives were to analyse the main financial risks faced by enterprises in conditions of economic instability and to develop recommendations for financial risk management, incorporating the specifics of Ukrainian business and current economic challenges.

MATERIALS AND METHODS

This study was a quantitative and qualitative analysis of the financial risks of Ukrainian companies, such as Myronivsky Hliboproduct, in conditions of economic instability, in particular, the impact of macroeconomic factors on the financial stability of the business. The analysis was based on secondary data such as fluctuations in the hryvnia exchange rate (Centre for Economic Strategy, 2023; BBC, 2023; MinfinMedia, n.d.a), inflation (National Bank of Ukraine, 2023; 2024; n.d.a), unemployment rate (Number of registered unemployed, n.d.) and interest rates (National Bank of Ukraine, n.d.b; MinfinMedia, n.d.c) to develop recommendations for minimising financial risks and ensuring business sustainability. The study covered a wide range of economic changes that took place in Ukraine between 2022 and 2024, particularly in the context of war and economic turbulence.

The materials for this study were based on scientific works, as well as on open economic data provided by various sources. Scientific studies were used to examine the financial risks of enterprises, including works by W. Du *et al.* (2016), Y. Konchitchki & J. Xie (2023), and A.S. Atichasari *et al.* (2023), which cover the analysis of risks in the financial activities of enterprises in conditions of economic instability. In addition, data from open sources provided by the National Bank of Ukraine were considered, in particular, comments on the inflation rate for 2023-2024, which assessed changes in the macroeconomic situation in the country and its impact on business activity in times of crisis. The study examined the main types of financial risks faced by enterprises in Ukraine, such as credit, currency, inflation, liquidity and interest rate risks. To research the impact of economic instability on the financial stability of enterprises, data for 2022-2024 on currency exchange rate fluctuations, interest rates, and unemployment rates in Ukraine were collected and analysed to further describe the macroeconomic environment and its impact on business.

To study the use of financial instruments for reduction of financial risks, examples of diversification were analysed using the example of Myronivsky Hliboproduct (MHP) (MHP, n.d.) and financial derivatives using the example of Southwest Airlines (Exbase, n.d.). MHP was chosen because of its active diversification strategy, which includes expanding its business in the agricultural sector, developing ready-made food production, and international expansion. Southwest Airlines, in turn, was chosen because of its active use of financial derivatives to hedge fuel costs, which are a relevant component of the company's expenses. These companies differ in terms of industry affiliation and risk management methods. Analysis of the application of these instruments demonstrated how companies can use different methods to minimise financial risks and ensure stability in conditions of economic instability, as well as identify specific strategies for adapting to changes in global financial markets. The study also developed

ways to minimise financial risks for companies and ensure their sustainability.

RESULTS AND DISCUSSION

The main types of financial risks for enterprises are key factors determining their financial stability and success. Enterprises are forced to adapt to changing internal and external conditions, which will be particularly relevant in the period 2022-2024. Economic instability includes issues such as high inflation, currency fluctuations, rising energy and material costs, and changes in legislation that directly affect the financial stability of companies. The first type of financial risk is credit risk, which arises from the possibility that a counterparty or borrower will be unable to meet its financial obligations to the company. Credit risk can be caused by the counterparty's financial difficulties, insolvency or bankruptcy. This risk is particularly relevant for companies that actively work with suppliers, partners and consumers who use credit terms to conduct transactions. A high level of credit risk can lead to significant financial losses, particularly due to outstanding debts or the need to write off bad debts (Du *et al.*, 2016).

The second relevant type is currency risk, which arises due to fluctuations in the exchange rates of the national currency against foreign currencies. Companies that conduct foreign economic activity or have obligations in foreign currency may suffer significant losses due to unpredictable changes in exchange rates. For example, if the exchange rate of the national currency against a foreign currency changes sharply, this can lead to an increase in the cost of imported goods, services or loans, as well as complicate the fulfilment of obligations to foreign creditors. This is particularly relevant for companies that work with international partners or have significant external debts (Nihro & Allawi, 2020).

Inflation risk is another type of financial risk that reflects the possibility of losses due to the depreciation of money, which causes an increase in prices for goods and services. Inflation can significantly reduce the real value of a company's assets, affect the size of salaries, increase production and supply costs, and reduce the purchasing power of consumers. In conditions of high inflation, companies are forced to raise prices for their products or services, which in turn can lead to a decline in demand (Konchitchki & Xie, 2023).

Liquidity risk is another relevant element of financial risk. It arises when a company does not have sufficient liquid assets to meet its short-term financial obligations in a timely manner. If a company does not have sufficient cash reserves or quickly realisable assets to cover its current liabilities, this can become a significant problem. Liquidity risk can lead to delays in payments to suppliers, employees or creditors. This will negatively affect the company's image and its ability to obtain financing in the future (Ekadjaja *et al.*, 2021).

The risk of interest rate changes also significantly affects the financial stability of a company. Changes in interest rates can alter the cost of credit resources for a company with significant debt obligations. As rates rise, the cost of servicing debt increases, which can affect the company's profitability and its ability to meet its financial obligations. This is particularly relevant for companies that actively borrow to finance their activities. The last type of risk is operational risk, which arises from internal problems within a company, such as ineffective management, errors in business processes, disruptions in technological processes, or human factors. This type of risk can include both financial and non-financial aspects that directly affect the productivity and stability of the enterprise (Atichasari *et al.*, 2023). All these types of financial risks are relevant components of a company's financial stability. To manage them successfully, it is necessary to use a comprehensive approach that includes both identification and minimisation of each risk using effective financial management, insurance and hedging tools.

Assessment of macroeconomic factors affecting financial risks is an essential component of corporate financial management strategy. In conditions of economic instability and global crises, Ukrainian enterprises in various industries, particularly in the agricultural, manufacturing and energy sectors, face numerous problems that require constant adaptation to changing macroeconomic conditions. Enterprises in the agricultural sector are forced to cope with changes in raw material prices, currency fluctuations and

instability in foreign markets, which leads to difficulties in exporting products and an increase in the cost of production materials. Industrial companies, in turn, face high energy costs and the need to modernise their production facilities to remain competitive in the context of global changes in the energy market. In addition, inflationary processes and changes in legislation often necessitate adjustments to business strategies and reassessment of financial plans to ensure stable operations (Nehrey & Trofimtseva, 2022).

Inflation is one of the most relevant macroeconomic factors affecting the financial risks of enterprises. High inflation leads to an increase in production costs, which negatively affects the margins of enterprises. Rising prices for raw materials, energy and other resources automatically increase costs, which can be difficult for many enterprises, especially those that are unable to quickly raise prices for their products. In addition, inflation reduces the real purchasing power of consumers, which can lead to a decrease in demand for the enterprise's goods and services. This creates additional financial risks, as enterprises may suffer losses due to a decrease in sales or the need to adjust prices (Nowicki *et al.*, 2024). In December 2022, consumer inflation stood at 26.6% year-on-year, which significantly increased costs for many businesses (National Bank of Ukraine, 2023). Inflation in Ukraine fell to 5.1% in 2023 (National Bank of Ukraine, 2024). However, in 2024, core inflation accelerated to 10.7% (National Bank of Ukraine, n.d.a), which again poses new challenges for businesses in terms of increased costs and the need to adjust their financial strategies. Figure 1 shows inflation fluctuations in Ukraine for the period 2022-2024.

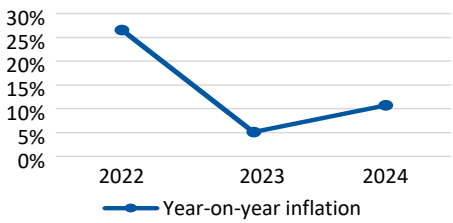

Figure 1. Annual inflation in Ukraine for 2022-2024

Source: compiled by the author based on National Bank of Ukraine (2023; 2024; n.d.a)

Currency fluctuations are another significant macroeconomic factor affecting the financial risks of enterprises, especially those engaged in foreign economic activity. Companies that have foreign currency liabilities or work with international partners may face serious difficulties due to exchange rate fluctuations. If the national currency depreciates, the cost of imported products or services may increase significantly, which increases the overall financial costs of the company. For example, the Ukrainian metallurgical company ArcelorMittal is forced to import natural gas, ligature materials and specialised equipment (GMK Centre, 2024). In 2023, MinfinMedia (n.d.b). On the other hand, changes in exchange rates can also create opportunities for companies that have export revenues in foreign currency, but the risk of significant fluctuations also remains (Nihro & Allawi, 2020). Figure 2 below shows the dynamics of the hryvnia exchange rate against the USD for the period 2022-2024.

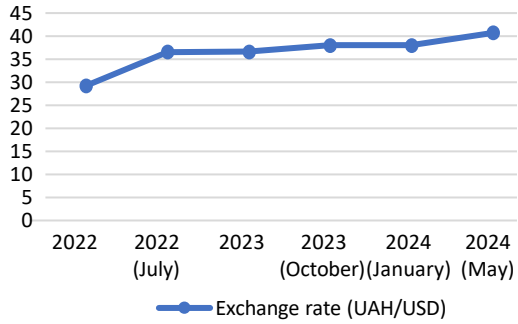

Figure 2. Exchange rate of the hryvnia to the USD for 2022-2024

Source: BBC (2023), MinfinMedia (n.d.a)

In 2022, at the start of the Russian full-scale invasion, the National Bank of Ukraine (NBU) fixed the exchange rate at 29.25 UAH/USD. In July 2022, the exchange rate was lowered to 36.57 UAH/USD due to market destabilisation and increased demand for currency. Overall, the UAH devalued by 34.1% over the year (MinfinMedia, n.d.a). In 2023, the exchange rate remained at 36.6 UAH/USD for most of the year, which was lower than the forecasts of the government (42.2 UAH) and experts (37.9 UAH) (Centre for Economic Strategy, 2023). In October 2023, the NBU switched to a managed flexibility regime,

which led to a gradual decline in the exchange rate to 38 UAH/USD by the end of the year. Overall, the UAH depreciated by 3.9% in 2023 (Centre for Economic Strategy, 2023). At the beginning of 2024, the exchange rate was 38 UAH/USD. By May 2024, the exchange rate had reached 40.7 UAH/USD, which is in line with budget forecasts. The UAH devalued by 9.1% in the first half of 2024, which is associated with an increase in demand for currency and intensive interventions by the NBU (BBC, 2023).

Interest rates are another critical factor affecting the financial risks of enterprises. Changes in interest rates can significantly alter the cost of credit resources for an enterprise. High interest rates increase debt servicing costs, which in turn reduces the financial flexibility of the enterprise and its ability to invest. When interest rates rise, enterprises with significant debt obligations may experience difficulties in making payments, which can lead to default. At the same time, low interest rates can increase demand for credit, but the risks increase if companies unreasonably increase their debt obligations (Msomi, 2023). In June 2022, the NBU's discount rate was raised to 25% due to economic turmoil caused by the Russian full-scale invasion (National Bank discount..., n.d.a). In 2023, the NBU's discount rate fell to 15.5% in March 2023 as a result of the stabilisation of the economic situation. Commercial bank deposit and lending rates also gradually declined, reflecting the NBU's policy of reducing the burden on businesses (National Bank of Ukraine, n.d.b). In 2024, the NBU's discount rate remained at 15.5% until March 2024, when it was raised again to 18.5% for overnight loans and to 15.5% for overnight deposit certificates. Commercial bank deposit rates continued to decline, indicating a gradual recovery of confidence in the economy (MinfinMedia, n.d.c).

Unemployment is another significant macroeconomic factor that directly affects the financial stability of enterprises. High unemployment reduces the purchasing power of the population, leading to a decrease in demand for goods and services. Furthermore, high unemployment can lead to social tensions, which can negatively affect the business climate and create additional financial risks for enterprises. For example, an increase in social spending by the state to support the unemployed may contribute to an increase in the tax burden on enterprises. According to the results for 2024, the average unemployment rate in Ukraine fell to 14.3%. In 2023, the unemployment rate was 17.4%, and in 2022, it was 18.5%. Figure 3 shows the fluctuations in the unemployment rate in Ukraine for 2022-2024 (Number of registered unemployed, n.d.).

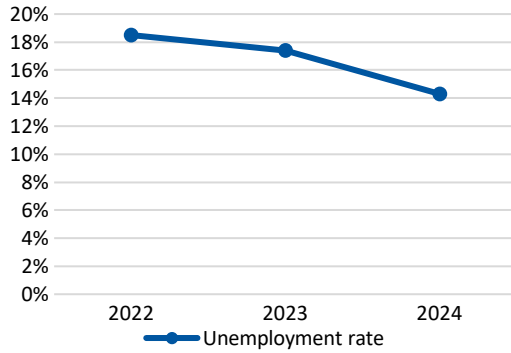

Figure 3. Unemployment rate in Ukraine for 2022-2024

Source: compiled by the author based on the Number of registered unemployed (n.d)

Figure 3 illustrates the dynamics of the unemployment rate in Ukraine for the period from 2022 to 2024. In 2022, the unemployment rate was about 18.5%, which was caused by economic instability and the negative impact of the war on the labour market. In 2023, there was a decrease in the unemployment rate to 17.4%, which may indicate a partial recovery of the economy and improved employment conditions. The continuation of the downward trend in unemployment to 14.3% in 2024 indicates a gradual improvement in the labour market situation. High unemployment has a significant impact on demand for companies' products. High unemployment leads to a decrease in the purchasing power of the population, as most consumers do not have a stable income. This, in turn, reduces demand for goods and services produced by enterprises, which can lead to a decrease in production and job losses. This situation creates a negative cycle that delays economic recovery and worsens the overall state of the labour market.

Political and social instability also significantly affects the financial stability of businesses.

Changes in the political situation, such as increased political instability due to military conflicts in eastern Ukraine or changes in the country's leadership, can lead to significant costs for businesses as they are forced to adapt their strategies to new conditions or spend resources on security and asset protection. Changes in legislation, such as the introduction of new tax laws or reforms in corporate taxation, can result in additional costs for businesses, as they will need to change their financial reporting, increase their legal expenses, or implement new business processes to comply with the new requirements. The introduction of new regulations, such as changes in environmental standards or occupational safety requirements, may require businesses to invest in new equipment, technologies, or change production processes to comply with the new requirements, which entails additional costs.

Sanctions imposed on individual companies or industries can significantly increase costs, as companies have to find new suppliers, change supply chains, and cover financial losses from restricted access to international markets. For example, after sanctions were imposed on Russian companies and their partners in Ukraine, many Ukrainian enterprises were forced to seek alternative sources of raw materials, which increased production costs. In addition, high levels of political instability can undermine investor confidence, making it more difficult for enterprises to access finance. This, in turn, may limit their development opportunities or even lead to financial problems (Tan, 2024). Thus, macroeconomic factors have a significant impact on the financial stability of enterprises. Changes in the economic situation can create both new opportunities and additional risks for businesses. To operate successfully, enterprises need to continuously assess these factors and adapt their financial strategies to new conditions to ensure long-term stability and competitiveness.

The present study, by S. Zhou (2023), examined the impact of external factors on stability, particularly economic factors. S. Zhou addressed the impact of sanctions on political stability, while the present study focused on the impact of macroeconomic factors such as inflation, currency fluctuations, interest rates and unemployment on the financial stability of enterprises. A common feature was that both studies analysed external factors and their impact on stability. S. Zhou used a two-phase analysis to assess the impact of sanctions, while this study focused on internal economic changes. S. Zhou addressed political sanctions and their impact on public policy and the economy, while this study analysed macroeconomic factors at the enterprise level.

The present study and the study by Z. Virglerova *et al.* (2022) addressed the impact of macroeconomic factors on the financial stability of enterprises. However, the study by Z. Virglerova *et al.* emphasised a systematic approach to financial risk management, especially in crises. The study highlighted hedging and risk diversification strategies as the main methods of adaptation for enterprises. In contrast, this study addressed a broader range of macroeconomic factors, such as unemployment and political instability, and analysed their impact on demand and the financial strategies of enterprises. This study and the study by S.A. Athari *et al.* (2023) analysed different aspects of the impact of economic factors on financial stability. The study by S.A. Athari *et al.* examined the impact of macroeconomic and political risks on the stability of the banking sector, analysing the relationship between economic instability and access to credit. In turn, this study emphasised the impact of financial risks, such as credit, currency, inflation and liquidity risks, on enterprises in Ukraine, especially in the context of war and economic instability.

Financial risk management is an essential aspect of any company's operations, as it reduces the potential negative impact of financial fluctuations and ensures the stability and sustainability of the enterprise. For example, effective currency risk management through hedging can reduce financial losses from exchange rate fluctuations by 20-30%, depending on the level of risk and the instruments used. The establishment of clear credit risk control mechanisms can reduce the probability of late payments and reduce the level of unpaid loans by 15-25%. At the same time, the success of these measures depends on the timeliness of their implementation, the correct choice of hedging instruments,

and the company's ability to adapt to changes in the economic environment (Arenas & Scudiero, 2023). The main strategies for managing financial risks include the use of various instruments and methods for reduction of the impact of risks on the company's financial results. The main strategies include hedging, diversification, the use of financial derivatives, insurance, and active monitoring of financial risks.

The first hedging strategy involves using financial instruments to minimise risks associated with fluctuations in exchange rates, interest rates or commodity prices. This can be done by entering into contracts to buy or sell currency, commodities or financial assets at a fixed price in the future. Hedging is used by companies to fix the level of risk at a certain stage and protect themselves from unpredictable financial losses. For instance, an exporting company can use currency futures or options to fix the exchange rate to avoid losses in the event of a depreciation of the national currency (Arenas & Scudiero, 2023).

Another popular strategy is diversification, which involves spreading investments or assets across different financial instruments or markets. This reduces risk by ensuring an offset of losses in one market or business area by gains in another. Diversification can be conducted both within a single country and on international markets. It reduces dependence on individual markets or products and decreases the likelihood of significant financial losses due to local or global economic shocks. Myrivsky Hliboproduct (MHP) is actively implementing a strategy of geographical and product diversification, which reduces its dependence on individual markets and industries (MHP, n.d.). During 2018-2023, MHP expanded its presence in the international market, in particular through the acquisition and development of subsidiaries. For example, Perutnina Ptuj, MHP's subsidiary in South-Eastern Europe, increased its production from 88,000 tonnes in 2018 to 146,000 tonnes in 2023, while its revenue grew from 271 million EUR to 532 million EUR, an increase of 96% over this period. As of 2024, MHP has production facilities in the Netherlands, the United Kingdom, the UAE, Saudi Arabia and other EU countries, further enhancing its geographical presence and financial stability. Product diversification has also become a substantial aspect of MHP's strategy. The company has transformed itself from a poultry producer into a competitive producer in the food industry, expanding its range to include grain crops, vegetable oils, semi-finished products and high-value-added products, which has been a strategic focus. At the end of 2024, MHP's export revenue amounted to 1.7 billion USD, which is 42.5% of Ukraine's total food exports, underscoring its leadership in the industry (Propozitsiya, 2024). This demonstrates the successful implementation of the diversification strategy and the company's stable financial growth. Technological innovations, in particular the transition to the production of premium-segment branded products, have reduced dependence on fluctuations in raw material prices, which is a substantial factor in ensuring long-term financial stability. In addition, MHP is developing its ready-made food line, offering consumers value-added products such as minced meat, cutlets and other semi-finished products. The company is actively expanding abroad, opening new enterprises in Slovakia, Slovenia, Serbia, Croatia, Bosnia and Herzegovina, as well as in the Middle East and North Africa. In 2024, the company entered into a partnership with a Saudi company to build a poultry farm in Saudi Arabia (Ekonomichna pravda, 2024). MHP is also involved in vegetable growing, cultivating potatoes, beets, carrots and onions, which is a new stage in the company's development for expansion of product range (Tarasovsky, 2024).

The use of financial derivatives is another substantial strategy for managing risk. Derivatives, such as futures contracts, options and swaps, concluding agreements that provide the right, but not the obligation, to conduct transactions with financial assets in the future under certain conditions. These instruments reduce the risks associated with changes in market prices, interest rates, exchange rates, and so on. Derivatives can be useful if a company wants to protect itself against price fluctuations in raw materials or financial assets (Arenas & Scudiero, 2023). Southwest Airlines is a prime example of a company that effectively uses financial derivatives to hedge its fuel costs. The use of fuel derivatives significantly reduces costs and mitigates the impact of fuel price fluctuations. In

2024, the company saved 1.2 billion USD by hedging its fuel costs. This result was made possible by the work of Southwest Airlines' team of traders, who forecast oil price fluctuations and entered into agreements with banks to fix optimal fuel prices. In the second quarter of 2024, Southwest expected to pay 3.30-3.40 USD per gallon of jet fuel, while its competitors paid 3.70-4.02 USD per gallon (Inc, 2022). This provided a significant competitive advantage in the market, as the company was able to lock in more favourable fuel prices, reducing its operating costs. This helps the company maintain stability in its financial operations and protect itself from risks associated with fuel price fluctuations (Exbase, n.d.).

Insurance is another tool for minimising financial risks. It can cover businesses for potential losses from accidents, natural disasters, or other unexpected situations. Insurance companies offer different types of insurance that can cover risks from fires, theft, technical failures, and third-party liability. The choice of insurance depends on the specifics of the company's activities and the types of risks it may face. Monitoring financial risks is a substantial part of a risk management strategy. This includes continuous analysis of financial indicators, tracking market changes, assessing current risks, and forecasting future changes. Companies use specialised software tools to analyse and forecast risks, which can be used to respond to changes in a timely manner and make corrective decisions. One example of such tools is @Risk (Lumivero, n.d.) from Palisade, which can be sued risk analysis and Monte Carlo simulation to assess the probabilities of different scenarios and make informed business decisions. This software is used to manage financial and operational risks in areas such as finance, energy, and manufacturing. Another example is RiskWatch (n.d.), which is used to assess and manage corporate risks, safety and health in enterprises. It can be used by organisations to integrate risk management into decision-making processes and ensure more effective monitoring of changes in the external environment (Kagan, 2024).

In general, effective financial risk management requires a comprehensive approach that includes both internal strategies and external tools to minimise risks. The use of hedging, diversification, financial derivatives, insurance and active monitoring ensures that companies remain financially stable and can successfully adapt to market changes. Assessing the effectiveness of management approaches in a crisis is a substantial aspect of ensuring the stability and development of enterprises in difficult economic situations. Crisis phenomena, such as economic, political or natural disasters, require company management to adapt quickly, be flexible in decision-making and be ready to implement new strategies to remain competitive. The effectiveness of management approaches during this period is determined by how quickly a company can respond to changes, preserve its resources, and adapt to new market conditions (Nalçacığılı & Özyilmaz, 2020).

One of the key aspects of assessing the effectiveness of management approaches is the ability to make quick decisions based on an analysis of the current situation and future trends. In times of crisis, it is necessary to employ a set strategy that includes both short-term and long-term goals. Companies usually resort to crisis management methods that involve both minimising risks and the possibility of using the crisis to their advantage. At the same time, it is necessary to ensure effective communication within the company and with other external partners, which helps maintain trust and ensure stability. Financial risk management can be used to maintain liquidity and avoid financial difficulties (Mizrak, 2024). During a crisis, it is necessary to maintain flexibility in financial operations, ensure the availability of reserves, and take measures to minimise debt obligations. Risk management includes not only financial strategies, but also the assessment and minimisation of other risks, such as reputational or operational risks.

The introduction of innovative technologies can also be a substantial management approach during a crisis. The use of new technologies improves the ability of companies to adapt to change, reduce costs, improve productivity, and maintain competitiveness. The digitisation of business processes, automation of production, and use of online platforms can be used by companies not only to survive during a crisis, but also to become more efficient and flexible.

For example, the use of online platforms for sales and customer interaction can be used by companies to quickly change sales channels and reach a wider audience, which is a crucial strategy for maintaining revenue during a crisis. In addition, process automation using ERP (Enterprise Resource Planning) systems can be used for effective management of inventory, finances, production processes, and interaction with suppliers and customers. The use of big data and analytics can also be used by companies to predict market changes, adapt their strategies, and reduce the risks associated with economic fluctuations. All these technologies not only help minimise the negative impact of the crisis but also create new opportunities for the company's growth and development in a constantly changing market (Vărzaru & Bocean, 2024). The effectiveness of management approaches in crisis conditions depends on the ability of the enterprise to adapt to new challenges, maintain stability and find new development opportunities even in unfavourable conditions. Smart resource management, strategic planning, timely decision-making and the application of innovative approaches are key factors for ensuring success in times of economic instability.

The present study and the study by L. Kulhanek & A. Sulich (2018) had similarities and differences in their approaches to financial risk management. Both studies emphasised the importance of effective risk management for business stability, but from different perspectives. This study emphasised practical tools such as diversification, hedging, the use of derivatives, and active monitoring to mitigate risks during financial shocks. At the same time, the study by L. Kulhanek & A. Sulich focused more on a strategic approach to risk management and the analysis of internal and external factors affecting the financial stability of enterprises. The main difference was that this study focused on specific risk mitigation techniques, while L. Kulhanek & A. Sulich analysed broader strategic management, including macroeconomic factors. Both studies agreed on the need for financial risk management but had different approaches to its implementation.

The present study and the study by R. Abaidoo & E.K. Agyapong (2023) had common aspects, but also significant differences. Both studies analysed the impact of macroeconomic factors on financial stability. The study by R. Abaidoo & E.K. Agyapong highlighted inflation uncertainty and macroeconomic instability, particularly their impact on the efficiency of financial institutions. The study examined how inflation and economic instability can affect the ability of financial institutions to function properly, increasing the risks of a decline in real purchasing power and the growth of financial difficulties. The main similarity between the studies was the analysis of macroeconomic risks affecting the stability of financial systems. At the same time, the main difference was in their focus: one study focused on climate risks, while the other analysed inflationary and economic factors affecting financial institutions.

Ways to minimise financial risks and ensure business stability are a substantial topic for managers and business owners, especially in times of economic instability. To achieve stability in changing macroeconomic conditions and internal crises, enterprises must implement a number of strategies to minimise the impact of financial risks, adapt to new conditions and ensure sustainable development. In this regard, the following strategies can be recommended to minimise financial risks and ensure business sustainability.

The assessment of a company's financial risks is the first step in ensuring its financial stability and taking measures to minimise these risks. Liquidity management is relevant as a company's ability to pay on time determines its reputation and ability to continue operating. This requires compliance with financial regulations and regular monitoring of liquidity. Risk hedging is a substantial strategy as it protects the company from changes in exchange rates, interest rates or the cost of raw materials. The use of financial derivatives such as options, futures contracts and swaps can reduce the impact of these changes on the company's financial results. Companies can also use diversification, which can be used to spread risks across different areas of their business. Expanding the product range or entering new markets can reduce dependence on a single source of income and minimise financial losses in the event of negative changes in one of the markets. A

substantial aspect is ensuring financial flexibility. To do this, companies should develop reserve funds and use access to inexpensive sources of financing, including loans and investments. This will ensure the necessary level of cash to cover expenses in crises without having to stop operations. In times of economic instability, managers must respond quickly to changes in the market environment and adapt management strategies to new conditions. One substantial approach is flexibility in decision-making. Organisations must be prepared to adapt quickly, both at the strategic level and in operational management.

Cost optimisation is one area of focus. Reviewing production costs, managing inventory efficiently and finding more cost-effective suppliers can all be part of this. In times of economic uncertainty, it is necessary to maintain control over costs and improve operational efficiency. Investing in innovation is another substantial element. Businesses that use innovative technologies and digitise their operations gain a competitive advantage in times of instability. The use of internal business management, digital platforms for customer interaction, and production automation can significantly reduce costs and increase profitability. Managers must also monitor macroeconomic changes and their impact on the company's activities. Regular assessment of risks arising from changes in legislation, the political situation and macroeconomic conditions can be used to react more quickly to threats to the financial stability of the enterprise.

For businesses, government support and structural reforms are significant means of reducing financial risk. In Ukraine, several programmes and initiatives for supporting businesses, especially in times of economic instability, in particular through financial support, tax breaks and access to cheap loans. One of the most effective programmes is the "Affordable Loans 5-7-9%" programme (PrivatBank, n.d.b), which was introduced to support small and medium-sized businesses. It can be used by businesses to obtain loans with state subsidies on interest rates, which significantly reduces financial risks and facilitates access to financing. The programme covers a wide range of enterprises, including the agro-industrial sector, manufacturing and infrastructure. Another significant programme is the "ERDF – European Regional Development Fund" (Ministry of Economy of Ukraine, 2024), which provides grants and investments for infrastructure development, production modernisation and innovative projects. Support programmes within this fund help enterprises attract investment for modernisation and improve competitiveness in the international market. There is also a programme to support exporters through UkrExport (PrivatBank, n.d.a). It provides preferential loans and insurance for export contracts, which can be used by enterprises to expand their sales markets abroad while minimising the risks associated with foreign operations. These programmes have become effective in reducing financial risks for Ukrainian enterprises, helping them adapt to changing economic conditions and ensure financial stability in difficult times.

In times of crisis, the government can help businesses maintain financial stability and continue operating by providing subsidies, preferential loans or tax holidays. Reforms in the financial sector are also relevant. This includes improving the banking system and lowering interest rates on loans for small and medium-sized businesses. This will reduce the financial burden on the company and ensure access to the resources necessary for development. In addition, tax reforms can help companies adapt to new economic circumstances. Transparent and stable tax rules will help companies plan their finances and minimise tax risks. Table 1 highlights strategies for minimising the financial risks of enterprises.

Table 1. Strategies for minimising financial risks for businesses

Strategy	Strategy description	Application examples
Hedging	Use of financial instruments to minimise currency and other risks	Reduction of currency risk by 15-20% using futures
Diversification	Distribution of investments among different products or markets	10-15% increase in income through expansion of investment portfolio

Table 1, Continued

Strategy	Strategy description	Application examples
Cost optimisation	Cost control and reduction of inefficient expenditure	10-15% reduction in costs through lower raw material or energy expenses
Innovation investments	Introduction of new technologies to reduce costs	20-25% increase in production efficiency through automation
Macroeconomic changes monitoring	Assessment of the impact of changes in market conditions on the company's activities	Assessment of the impact of economic changes on company revenues and expenses by 5-10%
Government support	State programmes to support businesses in times of crisis	Reduction of costs by 10-15% through government subsidies or tax breaks

Source: compiled by the author

Table 1 shows that hedging is one of the most effective strategies, as it reduces currency risk by 15-20%. For companies operating in international markets or with significant import costs, the use of currency futures can be critical to the stability of financial performance. This reduces the impact of exchange rate fluctuations and ensures a more predictable financial situation. Diversification reduces financial risks by spreading assets or expanding markets. Increasing revenues by 10-15% by expanding the investment portfolio is a significant factor that reduces corporate dependence on a single market segment and avoid significant losses when market conditions change. This strategy provides flexibility and adaptability to new economic conditions. Government support is also a relevant strategy, especially for businesses in times of crisis. Subsidies, tax breaks and preferential loans can reduce costs by 10-15%. In times of economic instability, these programmes are relevant tools for maintaining the financial stability of companies and helping them adapt to changing conditions.

Cost optimisation and investment in innovation are also effective strategies, but their impact is more long-term. Cost optimisation can reduce raw material or energy costs by 10-15%, which has a positive impact on profitability. However, this strategy requires constant monitoring and updating of processes to achieve sustained efficiency. Investing in innovation reduces costs and increases production efficiency, but this process requires significant initial investment and time to implement. Monitoring macroeconomic changes is a substantial strategy for assessing potential risks, but its effectiveness depends on the ability to respond quickly to changes in market conditions. This strategy helps identify threats to the enterprise in a timely manner, but it requires regular updates and analysis to make the right management decisions.

Therefore, hedging, diversification and state support are the most effective strategies for minimising financial risks and ensuring the sustainability of enterprises in conditions of economic instability. Cost optimisation and investment in innovation are also relevant, but their effect is more pronounced in the long term. Thus, effective management of financial risks of enterprises requires a comprehensive approach that includes both internal risk minimisation strategies and active interaction with the state to obtain the necessary support. Financial risk management is not only a task for enterprise management but also essential for ensuring macroeconomic stability.

The present study and the study by H. Ahmad *et al.* (2023) shared a common emphasis on business sustainability, but their approaches to the topic differed. The study by H. Ahmad *et al.* focused on the impact of ESG (environmental, social and governance) factors on business stability and financial performance. The study emphasised the importance of transparency in reporting on these factors, which can improve investment performance and help build sustainability through technological change and gender diversity in management structures. Both studies agreed that adapting to changes in the external environment is relevant for maintaining business stability. However, one concentrated on integrating ESG factors into business strategy, while the other addressed financial risk management to minimise economic losses. The study by A. Loi (2023) emphasised the role of

investment strategies, particularly diversification and innovation, in enhancing the economic potential of enterprises and reducing risks. In the context of Ukrainian realities, this complements the present study, as alongside hedging and derivatives, attracting investment can ensure long-term business sustainability in conditions of economic instability.

The study by A.C. González Calzadilla *et al.* (2022) and the present study shared a common focus on risk management, but the approaches and contexts were different. The study by A.C. González Calzadilla *et al.* addressed the risks arising from the international activities of small and medium-sized enterprises (SMEs) in Spain, particularly economic, political and legal risks. The study emphasised the significance of internationalisation strategies for improving business performance. Although both studies examine the impact of external factors on business stability, A.C. González Calzadilla *et al.* prioritised the risks of international operations, while this study emphasised financial risks in the context of the domestic economic environment. Both studies emphasised the importance of effective risk management for maintaining business stability. They also highlighted the need to develop strategies for adapting to change, but each addressed different aspects of risk management, particularly through diversification and innovation.

Research has confirmed that effective financial risk management is the basis for ensuring business stability in times of economic instability. Consideration of macroeconomic factors such as inflation and currency fluctuations has become a crucial element in the development of adaptive financial strategies to support business resilience in a changing economic environment.

CONCLUSIONS

The study showed that effective financial risk management is critical for businesses in times of economic instability. In conditions of high inflation, currency devaluation and rising interest rates, businesses face serious challenges in maintaining their financial stability. In particular, the inflation rate in Ukraine in 2024 was 10.7%, which led to a significant increase in production costs and the need to adjust product prices, creating additional difficulties for businesses. In addition, the 34.1% devaluation of the national currency in 2022 significantly complicated the foreign economic activity of enterprises, increasing the cost of imported goods and raw materials. Interest rates, which were raised in crises, also had a significant impact on the ability of enterprises to obtain loans, increasing debt servicing costs.

Diversification, hedging and state support are substantial tools for reducing the impact of negative factors on business activities. Diversification reduces dependence on a single market or product, helping to increase revenues by 10-15% by entering new markets or expanding the investment portfolio. Hedging, in particular through futures contracts or options, reduces currency risk by 15-20% and ensures stable financial results in export and import operations. State support, in particular through subsidies, tax breaks and preferential loans, makes it possible to reduce costs by 10-15%. Successful adaptation of enterprises to market changes and timely strategic decisions makes it possible not only to maintain stability, but also to ensure sustainable growth even in difficult economic conditions. Enterprises that effectively use risk management tools can not only overcome financial difficulties but also reach new levels of development and strengthen their market positions.

A substantial element is liquidity management, which can be used by companies to ensure access to the necessary financial resources in times of crisis. Flexibility in financial operations, the availability of reserves and the minimisation of debt obligations help companies avoid defaults and maintain stability in difficult economic conditions. The introduction of innovative technologies has also become a crucial strategic approach for enterprises during the crisis. The use of new technologies can be used for cost reduction, increased productivity, and improved quality of products and services. The digitalisation of business processes, automation of production, and implementation of online platforms for product sales help companies maintain contact with customers and quickly adapt to market changes.

In general, to ensure stability in conditions of economic instability, it is necessary to implement

a comprehensive approach to financial risk management, which includes both internal strategies and cooperation with government agencies to obtain support. Interaction with the state may include financial support programmes for small and medium-sized businesses, which ensure financial stability even in times of crisis. Successful adaptation of enterprises to market changes and timely strategic decisions makes it possible not only to maintain stability but also to ensure sustainable growth even in difficult economic conditions. Enterprises that effectively use risk management tools can not only overcome financial difficulties but also reach new levels of development and strengthen their market positions. The prospects for research lie in a deeper study of the impact of financial risks on the long-term sustainability of enterprises, particularly in the context of global economic turmoil. One limitation is the possibility of changes in external economic factors, which may affect the application of the proposed financial risk management strategies.

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Фінансові ризики українських підприємств: аналіз, управління та шляхи мінімізації в умовах економічної нестабільності

Анотація. Метою дослідження було визначення основних фінансових ризиків для українських підприємств, спричинених економічною нестабільністю. Методологія дослідження включала аналіз вторинних даних за 2022-2024 роки, зокрема статистичних показників інфляції, валютних курсів та рівня безробіття. Основні результати дослідження виявили важливі тенденції, що суттєво впливають на фінансову стійкість підприємств в Україні. Протягом 2022 року інфляція досягла 26,6 %, що призвело до значного зростання витрат для підприємств. У 2023 році інфляція знизилася до 5,1 %, проте підвищення валютних курсів та процентних ставок залишалося важливим викликом для бізнесу. В кінці 2024 року рівень інфляції знову збільшився до 10,7 %, що спричинило подальше зростання цін на продукцію та знизило платоспроможність споживачів. Особливо високий вплив на підприємства мали коливання валютних курсів, зокрема девальвація гривні на 34,1 % у 2022 році, що створило значні труднощі для експортно-орієнтованих підприємств. Додатково було виявлено, що підприємства, які використовували стратегії диверсифікації та фінансові деривативи, змогли знизити негативний вплив валютних ризиків. Крім того, виявлено, що хеджування валютних курсів може знизити коливань курсів на 15-20 % у порівнянні з іншими стратегіями. Висновки дослідження вказують на те, що підприємства, які використовують комплексний підхід до управління фінансовими ризиками, зокрема через хеджування, диверсифікацію та ефективне використання державної підтримки, можуть зберегти фінансову стійкість навіть у кризові періоди. Практичне значення дослідження полягає у розробці ефективних рекомендацій щодо управління фінансовими ризиками підприємств в умовах економічної нестабільності, що дозволяє забезпечити їхню фінансову стійкість і адаптацію до змін у макроекономічному середовищі

Ключові слова: хеджування; інфляція; безробіття; процентні ставки; кредити

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