



Management and Economic Mechanism for Ensuring the Competitiveness of Agribusiness in the Conditions of Ecological Sustainable Development on the Basis of Innovation and Investment

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Abstract: The purpose of the study is to provide theoretical and methodological substantiation of managerial and economic approaches to ensuring the competitiveness of agribusiness on an innovation-investment basis in conditions of significant risks and to provide tools for the practical implementation of the proposed approaches. It is indicated that the main way to ensure competitiveness is the adaptability of Ukrainian agribusiness not only to the challenges and conditions of coevolution, digital agriculture, and Economy 4.0, but also to direct threats caused by war and economic crisis. It is noted that these threats create uncertainty regarding the main factors influencing the competitiveness of Ukrainian agribusiness and the implementation of management actions to ensure the innovation and investment processes. Therefore, the main obstacle to investment in the innovation process is the uncertainty of risks, which, in particular, prevents an accurate assessment of the necessary costs. An approach to the mathematical formalization of operations with an uncertainty factor has been developed. Using the example of risks to the grain industry due to the increase in diesel fuel prices in 2026, the nature of the influence of risk uncertainty on the outcome is illustrated. Comparing the honey and dairy production industries, it is indicated that the obstacle to ensuring a competitive level is not only such an important function of the management and economic mechanism as marketing activities, but also a complex of technological, organizational, analytical, forecasting, financial, accounting, and other innovations. It is indicated that, in principle, the sustainable development of agricultural production through innovation and investment requires integrating institutional, general, and internal economic and social mechanisms, along with the introduction of dynamic management of the economic base, which is identified as a system-forming factor. This substantiated the interpretation of the scientific category of "management" as a complex-structured phenomenon, which includes not only a set of different levels of management, but also an array of connections between them. The competitiveness of agricultural sector products is not determined only by their price parameters; the purpose of applying a management and economic mechanism may be to achieve higher-level competitive advantages: achieving complementarity of the activities of an agricultural enterprise, that is, interaction with other market structures to form a holistic system or ensure increased functionality of this system. Belonging to the specified system can stabilize the activities of an agricultural enterprise and increase its competitiveness, which is important for such weak elements of innovative activity in the agricultural sector as small and medium-sized enterprises.

Keywords: managerial and economic mechanism, uncertainty assessment, competitiveness, adaptability of Ukrainian agribusiness, ecological and resource component

1. Introduction

Ensuring the competitiveness of Ukrainian agribusiness has become acute for both entrepreneurs and the scientific community due to the significant challenges posed by the war (Bazaluk, 2017; Kovalchuk et al., 2025; Nitsenko et al., 2025). The above-mentioned, to ensure the competitiveness of Ukrainian agricultural products, does not allow for fully relying on well-researched studies by specialists from other countries, in particular Fazli et al. (2025), since the conditions and threats of their activities are significantly different from those in Ukraine. Even with the same goals of optimal use of natural resources, environmental protection, and sustainable development (Yang & Solangi, 2024; Andriushchenko et al., 2024), the ways, methods, and means of their implementation will differ significantly.



According to risk analysis, which is a main factor in ensuring competitiveness through innovation and investment activities (Kyryliuk et al., 2021; Pivtorak & Dendebera, 2025; Böcskei et al., 2025), investors can make investment decisions despite significant risks by assessing the benefits of innovations. The factor of uncertainty, which makes it impossible to compare benefits and costs, is a greater obstacle to investment. The significance of the impact of uncertainty on the reduction of investments requires a review of traditional agribusiness management practices and a change in attitude towards innovation and investment activities not only as a means of ensuring the sustainability of production (Mykhailichenko et al., 2021; Turbovets, 2024), but also as a survival mechanism (Bozhyday & Kralia, 2026; Klymash et al., 2026). In view of the above, it is also necessary to revise the interpretation of the category of "sustainable development" of production, moving away from its identification with competitive stability and, accordingly, interpreting it mainly as a hedge against demand fluctuations (Andriushchenko et al., 2021; Materynska et al., 2025; Salohub, 2026). It is proposed to consider "sustainable development" of agribusiness as the result of the effective application of management and economic mechanisms to neutralize threats and their uncertainties, and to determine the optimal direction for innovation and investment activities. At the same time, if in previous periods the prerequisite for sustainable development of agribusiness was innovations, primarily aimed at intensification of production (Pivtorak & Dendebera, 2025), often without taking into account their environmental consequences, today, to meet the needs of consumers, the task of implementing sustainable development based on environmental innovations arises. And this is not only related to the destruction of the agroecosystem, which has long-term negative consequences. The environmental component of agribusiness today is directly related to competitiveness in foreign markets, thereby guaranteeing the enterprise's economic security.

Using a systemic approach, the category of "management and economic mechanism" is proposed to be considered as a complex of lower-level mechanisms: financial, management organization, corporate analysis, forecasting the consequences of management actions and their uncertainty, information support, etc., as well as a mechanism for forming connections between subsystems and elements of an integrated management and economic mechanism. Therefore, ensuring competitiveness should not focus on the functions of individual subsystems of this mechanism, in particular marketing and sales management (Ustik & Hirzheva, 2020; Bous-sakra et al., 2025) or highlighting any segment of the managerial and economic mechanism, for example, financial, giving it an exclusive role in ensuring sustainable development (Radchenko, 2019; Denysiuk et al., 2022).

To increase the level of competitiveness of Ukrainian agribusiness, scientists often suggest focusing on mechanization, automation (Havryliuk, 2025; Yatsenko et al., 2025), and digitalization with support for "output analytics" (Romaniuk, 2024; Nosova et al., 2024). As for analytics, digital decision support tools form mathematical approaches to determining the level of competitiveness of agribusiness (Chikov et al., 2023), which is impossible without taking into account the uncertainty of external influences, or even pointing to this uncertainty (Aksenko, 2025); scientists bypass the problem of mathematical formalization of the specified factor. There is also a problem that innovation and investment activity create a certain dichotomy in the use of the management and economic mechanism, because, although innovations are a condition for ensuring competitiveness, at the same time they create risks for the sustainable functioning of agribusiness, in particular, due to the uncertainty of results (Kucher et al., 2023; Jia, 2024). In conditions of war, competition for financial, material, and human resources also increases, which tends to decrease under significant military threats. With the occupation of Ukrainian territories, mining and burning of topsoil in the combat zone, even the country's land resources are significantly reduced. Competition for access to raw materials and labor also requires organizational changes in the conduct of agribusiness (Tetiu, 2025).

Scientists estimate the innovative activity of agricultural companies by the amount of expenses per hectare (Kvasha et al., 2024). At the same time, calculations based on data from Kucher et al. (2023) indicate that this indicator in Ukraine is 8 times lower than in Germany, 5.6 times lower than in France, and 3.8 times lower than in Poland. This creates a permanent lag in the competitive development of Ukrainian agricultural enterprises compared to European farmers. In specific areas of economic activity, the competitiveness of Ukrainian agribusiness on the European market decreased significantly (Bazaluk et al., 2020). Even internal investments by small- and medium-sized agribusinesses in innovative projects with long-term payback have significantly decreased (Zaremba et al., 2020). Large agroholdings, at the same time, are increasing their innovative activities, since their strategies are aimed at boosting competitiveness mainly in foreign markets rather than in the domestic market, which is narrowing. Therefore, for small and medium-sized agribusinesses, in conditions of limited support from the state budget (Cherneha, 2019; Bezuhla et al., 2022), lack of working capital (Lomov-skykh et al., 2021), and a decrease in the flow of foreign investment due to significant risks of war, the task of changing approaches in using the management and economic mechanism to ensure competitiveness arises.

The above determines the relevance of such areas of research into the managerial and economic mechanism for ensuring the competitiveness of Ukrainian agribusiness, its innovation and investment principles as: im-

proving the categorical apparatus of this area of scientific research, mathematical formalization of risk uncertainty, expanding the set of investment instruments for innovative activities of small and medium-sized agribusiness in Ukraine, using the managerial and economic mechanism in conditions of dynamic risk changes, ensuring the adaptability of Ukrainian agribusiness and the level of importance of this factor not only for its competitiveness but also for ensuring the appropriate level of its sustainability.

2. Methods

Based on the method of analytical generalization, the need to improve the categorical apparatus of this area of scientific research is substantiated, and changes are proposed to the basic scientific categories "sustainable development", "management", and "enterprise competitiveness". Using a systemic approach, the category "management and economic mechanism" is proposed as a complex of lower-level mechanisms. Among this complex, a particularly significant mechanism for connecting subsystems and elements of an integrated management and economic mechanism is highlighted.

The study's feasibility is related to the peculiarities of the environment in which Ukrainian agribusiness is forced to operate today. The application of the critical analysis method allowed for pointing out the weak elements of innovative activity in the agricultural sector – small and medium-sized enterprises and proposing an expansion of the set of investment instruments for them, and noting the importance of taking into account the increase in uncertainty of economic indicators due to the increase in anthropogenic load on the ecosystem. The proposal to rely on crowdfunding, crowdsourcing, crowdlending, and derivatives is practically significant in this regard, given changes in the price of the agricultural enterprise's underlying asset and the relevant forecast of the positive impact of the innovation process's results on the enterprise's future activities. The use of the critical analysis method also made it possible to establish that the main obstacle to investments in agribusiness innovation in Ukrainian realities today is not only the level of risks and the dynamics of their change, but, first of all, the factor of uncertainty of threats.

The use of the method of mathematical formalization of operations with the uncertainty factor indicated an approach not only to its consideration but also to assessing the possibility of exceeding the maximum local risk values, which act as a threat multiplier. The use of the graph theory method indicated the possibility of identifying the mutual influence of the elements of the uncertainty chain on the final result. From a practical perspective, an example of analyzing the mutual effects of uncertainty on the competitiveness of the grain sector of agribusiness due to the 2026 increase in diesel fuel prices is also provided.

3. Results

Promising innovations in agriculture require significant funds for their development and implementation. Such costs are often unaffordable for small and medium-sized agricultural enterprises of Ukraine. In times of crisis, this leads to the direction of the management and economic mechanism of this category of enterprises, especially in the agricultural sector, which is characterized by lower economic stability than in other industries, to innovative products with low added value, which not only does not provide the proper level of competitiveness, but also does not guarantee long-term sustainable development. Therefore, to develop innovations with significant added value, it is proposed to combine the efforts of groups of producers formed not only on the sectoral-regional principle, which is what the management of small and medium-sized Ukrainian agricultural enterprises is inclined to, but also on an inter-sectoral basis by including processing, marketing, logistics, and other related enterprises in the integration.

Inter-sectoral integration, the involvement of own financial resources in the innovation process, and dynamic management will determine the direction of the administrative and economic mechanism towards the rejection of the traditional hierarchical nature of relations within the triad of business-state institutions-society and their replacement with network relations. This necessitates revising the traditional view of the institutional component of the mentioned triad.

It is proposed that the institutional mechanism for promoting agricultural production should be understood as a complex of dynamically regulated financial, legal, structural-organizational, and economic levers, and a systemic management of tax, credit, budgetary, customs, and tariff instruments, which, in aggregate, should provide the prerequisites for sustainable development. The insufficient effectiveness of the institutional mechanism for promoting agricultural production is indicated, in particular, by the fact that, according to data from the Institute of Agrarian Economics of the NAAS of Ukraine, the level of budget funds allocated to the agricultural complex during the large-scale war decreased significantly. This is, in particular, a consequence not only of the loss of a significant part of the agricultural production infrastructure, but also of the fact that budget funds are often allocated in the last quarter of the year when they can no longer be used rationally.

The tasks of the institutional mechanism also include fostering an attractive environment for innovative investment. To do this, it is necessary to abandon reliance on declaratory legislative norms and to establish an effective legal mechanism to protect investments, create conditions for the guaranteed profitable use of bank capital in agricultural innovations, develop innovation and investment infrastructure, optimize the tax burden, etc.

Sustainable development of agricultural production, based on innovation and investment principles to ensure efficient management and economic activity, requires integrating institutional, general, and internal economic and social mechanisms, with the introduction of a flexible economic base as a system-forming factor. The above confirms the interpretation of the scientific category of "management" in the presented study as a complex-structured phenomenon, which includes both a set of different levels of management: national, regional, local, corporate, etc., and an array of connections between them: information and communication, subordination, reporting, etc. It is integration that provides grounds for considering the managerial and economic mechanisms for ensuring the competitiveness of agribusiness as a system.

Investment funds of the management and economic mechanism, primarily for small and medium-sized enterprises, should be aimed at using alternative traditional financial instruments. In particular, crowdfunding, crowdsourcing, crowdlending, and derivatives are offered, taking into account changes in the price of the underlying asset of the agricultural enterprise and the relevant forecast of the positive impact of the innovation process's results on the further activities of enterprises.

The general economic corporate mechanism deals with price and tax policy, clustering of production, formation of a system of land relations, scale of activity, research of market infrastructure and demand dynamics, analysis of promising areas of innovation, financial and credit support, etc.

The internal economic corporate mechanism deals with the specialization of individual areas of production and sales, tools and means of implementing innovations, concentration and distribution of resources between the specified areas, improvement of the quality of products and services of the enterprise, labor relations, personnel motivation, social aspects of both the enterprise team and the population in the place of production localization, etc.

The effectiveness of the management and economic mechanism can be determined by its various characteristics: system-element, functional, and process.

According to the system-element approach at the corporate level, the following tasks of the management and economic mechanism can be distinguished: choosing a direction of activity, determining the optimal size of organizational subsystems and the complex of connections between their elements, forming an effective production structure, detailing innovation and investment aspects of activity, forming the appropriate level and form of economic interest of stakeholders of the production and sales cycles.

With a process approach at the corporate level, one can distinguish the tasks of resource, marketing, logistical, technical, information, and personnel support, the introduction of innovations, adaptive regulation of the labor organization system, etc. (Yarmol et al., 2022; Dankevych et al., 2024; Tsarenok et al., 2024).

From a functional perspective, each element and subsystem of the corporate mechanism should be considered a means of adding value to the enterprise's products or services.

Innovations in agricultural production are often interpreted as technological (Salohub, 2026), with some focusing exclusively on introducing new products or services to expand their range and meet consumer needs. Thus, technological innovations are aimed at new technologies in crop production, animal husbandry, and horticulture, in particular, new technologies for soil cultivation or animal husbandry, more complete use of resources, etc. But relying exclusively on technological innovations does not provide the enterprise with sufficiently sustainable competitiveness. At the same time, process innovations provide an opportunity to optimize the enterprise's production and business processes, reduce costs, and improve sales and logistics activities, while social innovations contribute not only to the sustainability of the team but also to solving social problems in the local community where the enterprise is located. Social innovations can also improve inter-corporate and inter-industry interactions, strengthen ties with consumers, and improve the local community's employment structure, etc. Thus, the competitiveness of an enterprise, as an expansion of opportunities to meet consumer needs, which provides it with competitive advantages over other economic entities (Boyko & Boyko, 2019), needs to be revised. Therefore, it is proposed to interpret enterprise competitiveness as an integral economic category that combines a set of characteristics.

For the Ukrainian agricultural producer in previous periods, competitive advantages were provided by higher soil quality than, for example, in European countries, and a smaller share of workers' wages in the cost of production (Orel, 2019). This corresponded to the extensive model of agricultural production traditional in Ukraine, which, in general, did not contribute to the innovation and investment process. At the same time, the sustainability of agricultural production in modern conditions is ensured by the ability not only to introduce innovations but also to form the continuity of innovative activity, not stopping at the success of individual

innovations. This, accordingly, is a sign of an intensive agricultural production model. The reliance of Ukrainian agribusiness on an extensive model is the main factor determining its insufficient competitiveness in the markets of European and North American countries.

The activities of agricultural enterprises are characterized by a high level of risk, in particular because this activity is subject to weather conditions absent in other areas of production. At the same time, new risks have appeared for Ukrainian farmers – the outflow of personnel due to mobilization and forced displacement of the population, threats to logistics due to air strikes, significant volatility of the national market, etc. Therefore, for the sustainable development of agricultural enterprises, to achieve an appropriate level of competitiveness in foreign markets, their management is forced to introduce innovative technologies at an accelerated pace and to find opportunities to attract investments in crisis conditions (Prokopyshyn et al., 2022). This also increases the importance of not only technological, but also organizational, analytical and forecasting, financial and accounting, and other innovations.

The above gives grounds to propose a definition of a managerial and economic mechanism for ensuring the competitiveness of agribusiness on an innovation and investment basis as a well-founded formalization and implementation in the management strategy and tactics of a mutually agreed complex of means, motivations, tools, methods, projects, etc., aimed at forming an innovative type of production capable of ensuring not only the sustainability of the agricultural company but also the expanded nature of production and sales. With significant and dynamic changes in risks and their level of uncertainty, this requires highly adaptive, flexible management tactics, in particular in acquiring the necessary financial resources, which is caused by the lack of operating funds among Ukrainian farmers, primarily due to the imbalance of the national market and the instability of cash flows.

Obstacles to the implementation of this tactic are the habit of Ukrainian agrarian management to traditional methods of conducting activities, the lack of an appropriate level of awareness of the use of modern agricultural technologies, ignorance of the advantages of agricultural automation, information tools, the mechanism of precision agriculture, achievements of biotechnology, etc.

At the same time, the scale of the required changes requires not only a localized management and economic mechanism for ensuring competitiveness in individual enterprises, but also new approaches to the formation of the country's proper infrastructure: transport, land reclamation, energy, information and communication, etc., nationwide programs for financing enterprises for deep processing of both livestock, crop and horticultural products, as well as processing of secondary waste, and biofuel production. A promising nationwide approach is to establish a grant mechanism to finance agricultural startups, leveraging the widespread use of digital platforms and innovation accelerators. The use of innovations in agricultural production increases the importance of marketing mechanisms in managerial and economic activities. This is due, in particular, to the fact that innovative products are often consumer goods. Therefore, communication tools at the producer-consumer level should also be reviewed.

The organizational basis for developing and implementing innovations should be closer to the project process. The involvement of specialists can take the form of research institutes and individual scientists, due to the high bureaucratization of scientific institutions. The managerial and economic mechanisms of agribusiness should implement effective investment resource use by mobilizing, redistributing, and controlling their use to activate the innovation process.

To assess the operational benefits of an innovation project in the face of dynamic changes in risks and uncertainty of external influences, it is proposed to rely on a process approach, which allows assessing the nature of competitive advantages, that is, to identify the priority not only in obtaining immediate positive consequences of management actions, but also the expediency in acquiring competitiveness potential or other components of the enterprise's potential for further stable development. At the same time, to assess the integrated effectiveness of the management and economic mechanism of agricultural enterprises, it is worth combining functional, instrumental, and process approaches. Although scientists still consider the innovation component of the management and economic mechanism of competitiveness formation mainly as a means of ensuring a positive financial result (Gubko, 2020), therefore, according to popular belief, the main requirement for innovation and investment activity is that the income from the implementation of innovations should be higher than the costs incurred. At the same time, given the specifics of agribusiness, innovations can also be aimed at increasing the enterprise's economic potential, in particular through strategic planning to enhance its attractiveness in foreign markets or improve its prospects for sustainable development amid dynamic climate change. Innovations can also be aimed at improving the ecology at the location of the agricultural enterprise, which will, in particular, contribute to the prospects for the production of ecological products and to the formation of an environment for the further development of research in the field of agricultural production for sustainable, innovative development.

The competitiveness of agricultural products is not determined only by their price parameters. In conditions of significant dynamic risks, competitiveness can also be determined by an enterprise's ability to adapt to the challenges and conditions of coevolution, digital agriculture, and Economy 4.0. In particular, competitiveness in external markets is facilitated by adaptability to the norms and rules of business activity in these markets (Garbzhii, 2024). That is, the purpose of applying a management and economic mechanism can be to achieve higher-level competitive advantages. Also, scientists often ignore such an aspect of competitiveness as achieving complementarity in the activities of an agricultural enterprise, i.e., mutual complementation or interaction with other market structures to form a holistic system or ensuring an increase in the functionality of this system. Significant changes in risks and their levels of uncertainty require achieving a dynamic equilibrium to ensure sustainable development, which can also be seen as a factor of competitiveness.

The above also determines the goal of the management and economic mechanism: strengthening the competitiveness of agricultural production by ensuring the synergy of market environment determinants through innovative approaches to algorithmizing competitive strategies.

At the same time, in terms of innovation, Ukraine significantly lags behind the European Union countries, to whose markets Ukrainian agribusiness plans to expand exports. The Ukrainian agricultural sector is significantly behind its European neighbors in both R&D expenditures and the share of agricultural enterprises implementing innovations (see Fig. 1). This creates the prerequisites for a permanent lag in competitiveness for Ukrainian agribusiness.

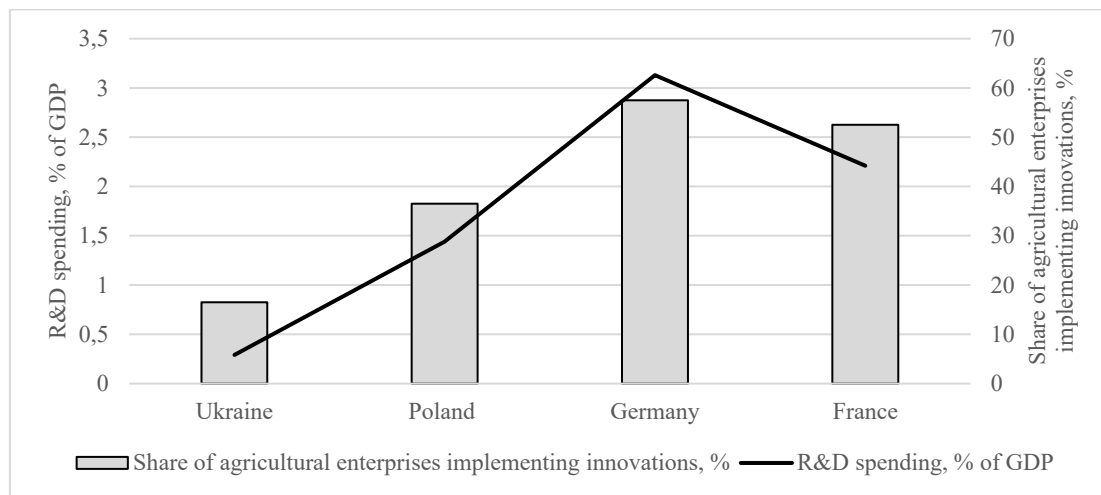


Fig. 1. Comparison of indicators of "R&D spending" and "Share of agricultural enterprises implementing innovations" for Ukraine and EU countries

Source: based on World Bank Group (2025), Food and Agriculture Organization (2026).

This is confirmed by a comparison of Ukrainian agricultural producers and producers in European countries in terms of the level of digitalization of the industry and the share of processed agricultural products in exports (see Fig. 2), which leads to a significant lag in terms of the level of added value and reduces the profitability of Ukrainian agribusiness. This is extremely important, because if previously digital innovations in agricultural production were mainly seen as the implementation of decision-making support systems and information and communication tools, nowadays ensuring competitiveness requires expanding the scope and forms of digitalization. In particular, this applies to continuous satellite surveillance of a selected geographical location for early detection of crop threats, relevant determination of crop productivity, integrated assessment of areas under individual crops of other farms, in other regions to assess the level of competition of their own products, etc. (Romaniuk, 2024, p. 364).

This requires the analysis of extremely large amounts of data, the use of neural networks, which requires high costs for the remuneration of specialists and the purchase of expensive computer equipment, but, first of all, it requires a radical change in the management and economic mechanism, a review of the priority areas for the use of investment resources.

Since the managerial and economic mechanisms of Ukrainian agribusiness in most types of agricultural activity do not ensure an increase in inter-industry interaction, this does not contribute to the sustainable competitiveness of agricultural enterprises, not only in the external but also in the domestic market. Therefore, to ensure the sale of their products, these enterprises are sometimes forced to reduce their prices even below cost (Minenko, 2021, p. 39).

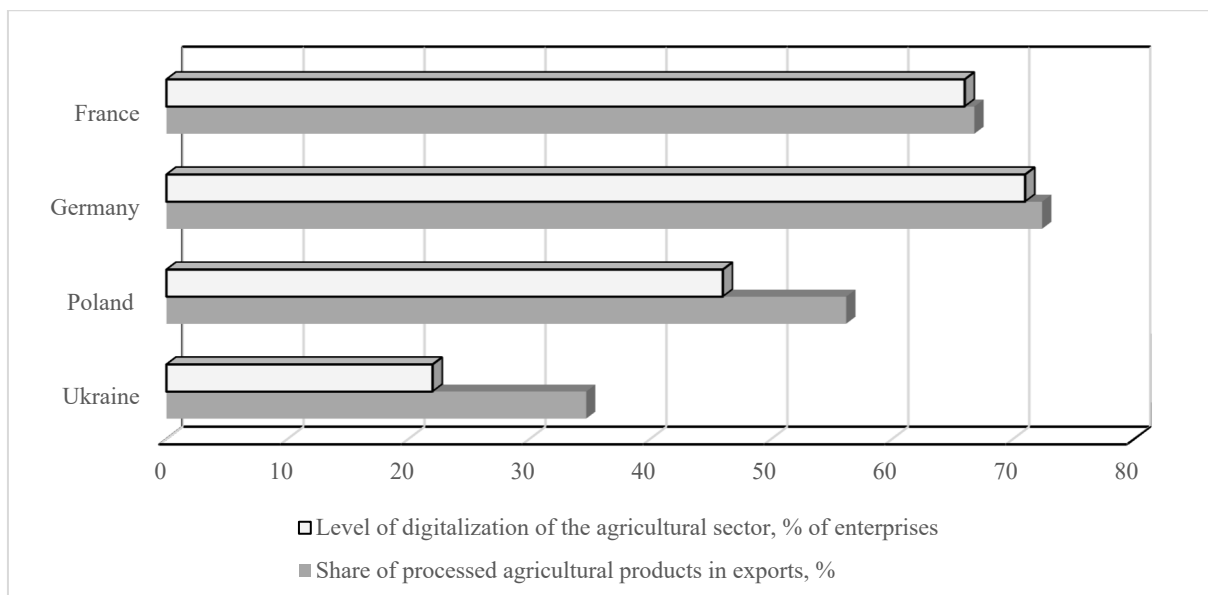


Fig. 2. Comparison of indicators "Level of digitalization of the agricultural sector" and "Share of processed agricultural products in exports" for Ukraine and EU countries

Source: based on Organisation for Economic Cooperation and Development (2026), Food and Agriculture Organization (2026).

This is confirmed by the trend of reducing the average multiplier for agricultural output by activity type. If this integral indicator of Ukrainian agribusiness in 2021 was 2,473 index points (i.p.), then, according to calculations based on data from the State Statistics Service of Ukraine (2025), it decreased to 1,734 i.p. The multiplier of goods output, as it is known, reveals the degree of interaction of each industry with other types of economic activity and, indirectly, indicates the level of innovation and investment in the industry aimed at creating added value. This is achieved in agribusiness, in particular, through interaction with the processing industry.

At the same time, some areas of Ukrainian agribusiness show greater levels of integration with processing and other compatible production processes than others. A clear example of this is the managerial and economic mechanism of dairy production. The share of dairy processing in exports today exceeds 85% (see Fig. 3).

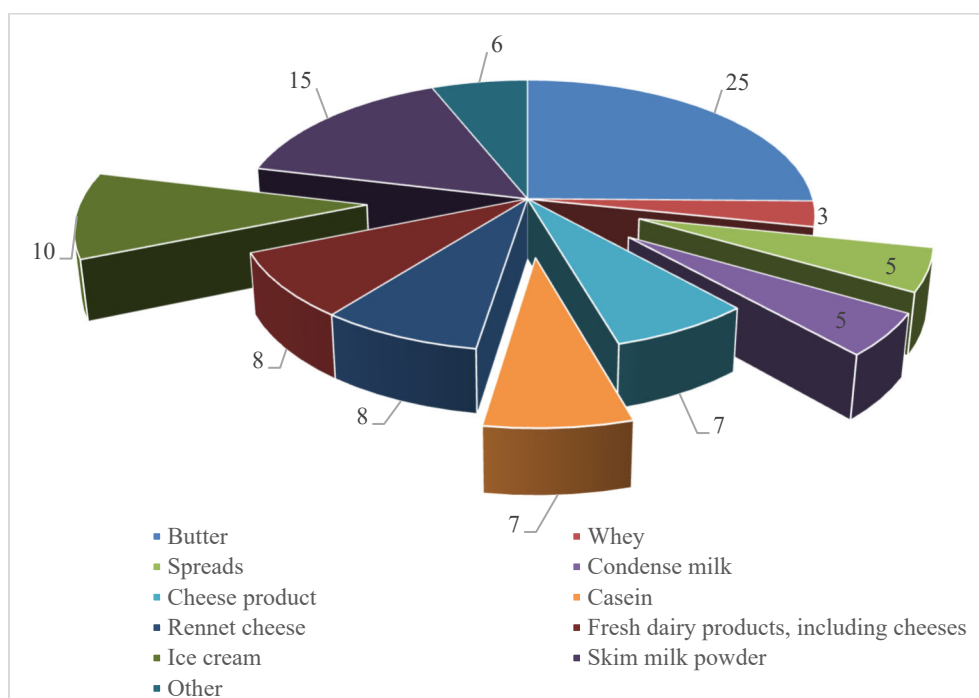


Fig 3. Share in exports of various types of dairy products of Ukraine, %
Source: based on the official site AgroPortal (2026).

In the difficult circumstances of wartime, the management of the dairy industry of Ukraine has used a wide range of innovations to increase its competitiveness, primarily:

- Robotization and automation of production. Thus, robotic milking not only improves technological indicators (milking time, milk quality) but also improves cow maintenance, thereby increasing milk yield. This is also facilitated by automated systems for monitoring animal condition and productivity. The advantages also include the impact of automation on integrating dairy production into farm processes and on stabilizing milk quality, which is extremely important for processing enterprises.
- Innovations in the storage and processing of dairy products are also aimed at extending the shelf life of dairy products and maintaining milk quality. In particular, this is facilitated by the use of membrane technologies to separate commodity components from raw materials, the implementation of intelligent technologies, etc.
- Eco-packaging of dairy products and the use of biodegradable materials, the introduction of QR codes and chip markers with freshness sensors, in particular in accordance with EU regulations (Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulation (EC) No. 834/2007). This direction of innovative activity not only contributes to brand formation but also meets modern environmental requirements for packaging's life cycle.
- Digitalization of production, logistics and sales, the use of decision support systems, production analytics for demand forecasting, optimization of technological and business processes to increase business profitability. These measures will ensure the implementation of the "Farm to Fork Strategy", the competitiveness of which has been proven by European agribusiness.
- Products with added functionality: probiotics and vitamins, functional products with high added value (yogurts, cheeses, etc.).
- Flexible functional production, for example, custom-made production of special product batches with specified functionality. This not only contributes to the formation of a brand but also allows the range of products to expand in line with dynamic changes in demand, ensuring forecasted sales of dairy products.

But the main direction of innovation, which increases the competitiveness of agricultural production, is the improvement of the management and economic mechanisms of dairy agribusiness.

With the traditional definition of niche types of agricultural activity as the most competitive and innovative in the realities of Ukraine, this is not always true. Indeed, such niche types of agricultural activity as the production of elite seeds; plants with unique characteristics; cultivation of rare varieties; specialization that ensures the competitiveness of agribusiness; the supply of products from a given assortment and quality to selected groups of consumers, etc., are innovative and investment-attractive. Such agribusiness activity is based on a focusing strategy.

At the same time, such a niche agricultural activity as the production of honey for the domestic market indicates neglect of its management and of innovative marketing approaches, as well as a refusal to change the organization of sales. With a certain increase in the domestic market in the volumes of organized food retail of honey (trading chains, shops, supermarkets) and a decrease in the share of resales, the share of sales "from hand to hand" remains unchanged, reaching 60% of the sales volume (see Fig. 4). Even such promising types of market entry as online sales, cooperation between small and medium-sized producers in expanding sales volumes and directions, etc., remain out of the attention of honey producers. This indicates the stability of agribusiness practices in Ukraine and the unwillingness to change the management and economic mechanisms, even to expand the business.

The insufficient efficiency of the management and economic mechanisms of Ukrainian agribusiness, in particular its low adaptability to challenges, is evidenced, for example, by changes in the performance indicators of the organic sector of the agricultural industry (see Table 1). Thus, even during periods of relatively sustainable development of this segment of the agricultural industry, in particular 2016–2021, significant changes in the volume of exports of organic products are characteristic, which is not a sign of the sustainability of production or the effectiveness of its management. This is also evidenced by significant fluctuations in export volumes in 2018–2019. In 2018, this indicator increased by 35% from the average value for the period 2016–2021 and decreased by 16.9% the following year.

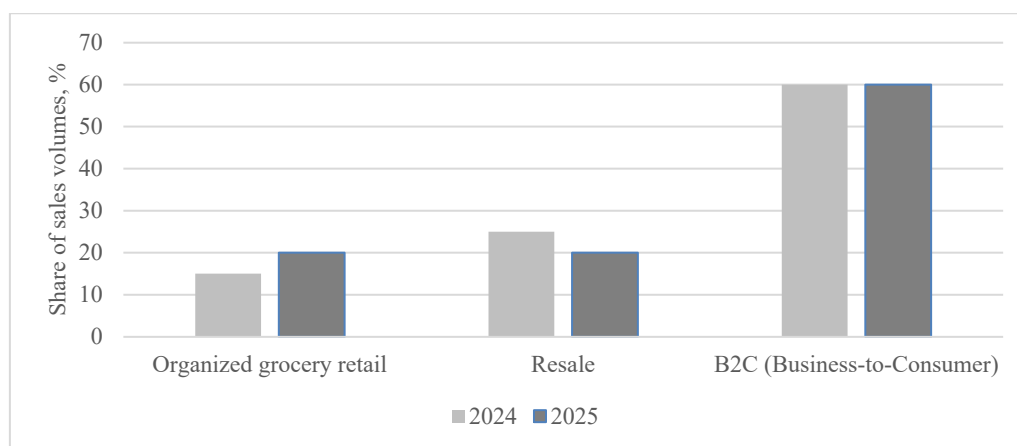


Fig. 4. Marketing directions in the domestic market of honey producers

Source: based on Honey of Ukraine (2026).

Table 1. Factors of organic agribusiness in Ukraine

Year	Number of certified organic market operators in Ukraine, units	Total area of organic agricultural land, ha	Export volumes of organic products, million Euros
2016	426	411200	66
2017	504	420000	65
2018	635	429100	192
2019	617	468000	168
2020	549	462200	174
2021	528	422300	188
2022	462	563600	208
2023	462	263 619	110
2024	436	350000	121
2025	436	349000	130

Source: based on the official site of the information portal OrganicInfo (2026), the official site of the Federation of Organic Movement of Ukraine (2026).

One of the reasons for this is insufficient financing for environmental innovations and the traditional disregard by Ukrainian agricultural producers, especially small enterprise managers, for the importance of considering the connection between environmental and economic factors for long-term positioning in the agri-food market. In particular, this requires a review of the methods and practices of management and economic mechanisms for assessing the feasibility of using natural resource potential without relying on innovative environmental technologies. Thus, the criteria for the effectiveness of the innovation and investment process and for ensuring the sustainability of activities should not only be maximizing returns on costs and increasing sales volumes, but also increasing the environmental competitive potential of an agricultural enterprise and promoting environmentally balanced development of agribusiness. The problem with the use of natural resource potential is significant pollution of land resources. This determines the level of ecological and economic crisis across the entire Ukrainian agricultural complex, not just organic, dairy, and other niche sectors. The impact of the crisis is manifested in a significant decrease in soil productivity and, accordingly, the efficiency of their use. This is a factor in the long-term decrease in the competitiveness of Ukrainian agricultural producers in foreign markets.

The areas of application of the management and economic mechanism for the greening of sustainable development of agricultural holdings include: reducing the level of waste from production activities by reusing them, in particular, to obtain biogas for own needs; ecological packaging (minimizing packaging processes, using packaging materials that are easily recycled or biodegradable); creating teams that are engaged in the implementation of environmental initiatives; water conservation by implementing water recycling systems and using drought-resistant plants in crop rotations to reduce the need for irrigation.

The competitiveness of Ukrainian agribusiness on the European market is reduced by insufficient attention to reducing product carbon footprints. Recommended measures for this may include: the use of renewable energy, since more than 6% of carbon emissions are caused by the consumption of fossil fuels on dairy farms; optimal animal rations reduce the amount of methane, which is a consequence of their digestion; the use of

technologies for processing waste resources and manure for biogas production reduces methane emissions into the atmosphere; the use of closed storage facilities and biogas plants for manure processing allows methane to be captured and converted into renewable energy; the use of drip irrigation not only saves water resources but also reduces the use of fuel for pumping them. Differentiated fertilizer application and carbon (regenerative) agriculture are also effective means of reducing the carbon footprint.

Anthropogenic load on the ecosystem at the enterprise's location also creates an additional level of uncertainty for both the production process and the marketing and sales processes for agricultural products, especially in markets in Europe and North America.

A significant problem for the competitiveness of Ukrainian agribusiness is the withdrawal of a significant part of agricultural land from circulation. In particular, hostilities lead to the destruction of the fertile soil layer. Ukrainian scientists have proposed measures to return land to circulation, in particular by using wild plants, primarily honey-bearing ones, to revive beekeeping, raspberry bushes, hazel, etc. (Pyrko & Deineha, 2025).

Although this indicates insufficient work by management to ensure the competitiveness of its agribusiness in foreign markets, at the same time, the growth of the export volume indicator in the period 2023–2025, with the stabilization of the indicator "Total area of organic agricultural land" indicates signs of the systemic impact of the innovation and investment factor in the structure of the management and economic mechanism of the Ukrainian organic sector.

As indicated above, the level of investment in innovative agricultural production is affected not only by the magnitude of the risk but also by the level of its uncertainty. The effects of war significantly increase the uncertainty in agribusiness, since, according to Carl von Clausewitz, during war three-quarters of the factors underpinning management actions are hidden in the "fog of uncertainty".

According to Borkovych (2025), the level of uncertainty in Ukrainian agribusiness today reaches 67%. This requires mathematical formalization of uncertainty.

To form a mathematical approach, uncertainty in this study is considered as an unpredicted deviation of the risk factor in the presence of the data set $\bar{\Psi}$, 3 on which the forecast was formed not only by deterministic or stochastic factors, but also by fuzzy and uncertain parameters. These parameters not only directly determine the level of uncertainty of the risk factor, but can also form a chain of influence on the result through intermediate links. In the links of this chain, uncertainty can both increase and decrease.

Under the influence of uncertainty, two surfaces are formed that limit the region of the existence of risk in the system state space – its maximum values $\vec{\psi}_{max}$ and minimum values – $\vec{\psi}_{min}$. Since the parameters that form these surfaces are unknown a priori (undefined or fuzzy), we apply the operator method to transform the data array that determines each local risk (Nitsenko et al., 2025).

To do this, with a preliminary expert assessment of the change in uncertainty at intermediate levels of influence on the result, we form the final data set that determines the i -th local risk $\bar{Y}_i \in \bar{\Psi}_i$. In this set, we allocate an array of uncertain data $\bar{Y}_u \in \bar{Y}_i$.

Then, in the system state space, the subregion in the existence of the i -th risk R_u that is determined by uncertainty is defined as

$$R_u = \iint \varphi(\vec{\psi}_{max}, \vec{\psi}_{min}) \frac{\gamma(\bar{Y}_u|\bar{Y}_i) \vec{\psi}_i}{\int \gamma(\bar{Y}_u|\bar{Y}_i) \vec{\psi}_i d\bar{Y}_i} d\bar{Y}_u d\bar{Y}_i \quad (1)$$

The region of maximum values of the integral risk R_u^* for the modification of the Nitsenko et al (2025) approach implemented in the presented study is calculated as

$$R_u^* = \iint g(\vec{\psi}_{i max}) \frac{\gamma(\bar{Y}_u^*|\bar{Y}_i^*)}{\int \gamma(\bar{Y}_u^*|\bar{Y}_i^*) d\bar{Y}_i^*} d\bar{Y}_u^* d\bar{Y}_i^* \quad (2)$$

where \bar{Y}_u^* – an array of uncertain data of the integral risk, \bar{Y}_i^* – an array of data of all local risks, g – the probability of intersection of the maximum values of local risks. The specified probability is estimated by statistical analysis of the distribution of risks in the space of system states. This is especially important because the specified intersection is a risk multiplier. Functional dependencies γ are determined by sequential enumeration of data from past periods.

The adaptive capacity of the management and economic mechanisms to challenges can help prevent an increase in the uncertainty of innovation outcomes. To illustrate this thesis, let us consider the impact of uncertainty on the competitiveness of the grain direction of agribusiness due to the increase in the price of diesel fuel in 2026 (see Fig 5).

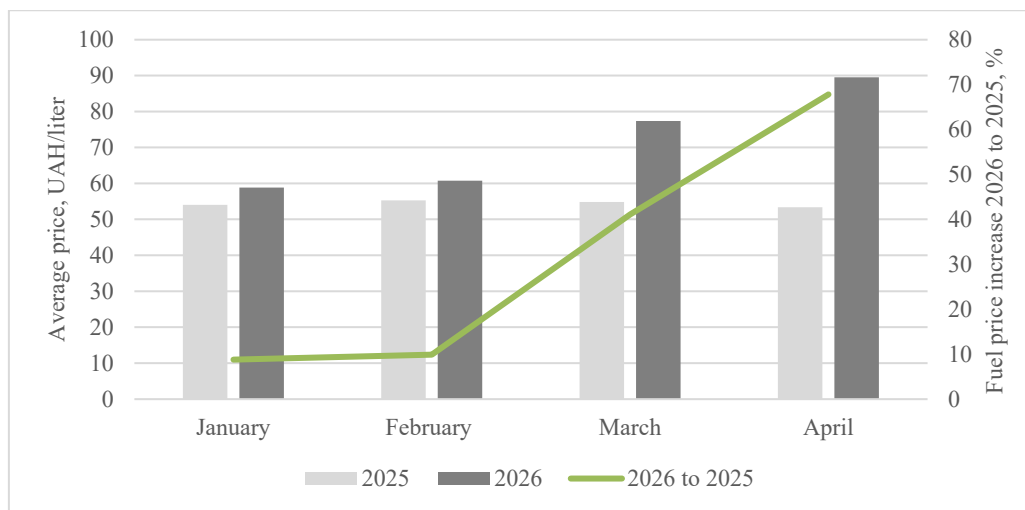


Fig. 5. Diesel fuel price hike

Source: formed by the authors using the information portal MINFIN (2026).

The increase in diesel fuel prices is a factor in the formation of uncertainty intervals for factors that reduce the competitiveness of the grain component of Ukrainian agribusiness (see Table 2).

Table 2. Areas of uncertainty of the risk factor in grain crop production

No.	Risk factor	Risk factor uncertainty interval
1	Rising production costs	by 15–30%
2	Decreasing grain yields	by 10–20%
3	Need for dynamic crop rotation	by 15–20%
4	Decreasing grain crop areas	by 15–25%
5	Increasing grain crop costs	by 15–30%

Source: formed by the author's calculations.

Let us consider the uncertainties of risk factors in the production of grain crops. These factors form a tree-shaped graph, the branches of which are the uncertainties of local risks, and the "root" is the uncertainty of the integral result.

The uncertainty in reducing grain yields (see Table 2, line 2) is due to a decrease in mechanized processing, primarily the number of cultivations, driven by higher fuel costs. The uncertainty in changing crops (see Table 2, line 3) will consist, for example, in a decrease in the area of corn crops, which requires a significant number of mechanized operations, primarily processing, drying grain, etc., and, accordingly, an increase in the share of wheat in the total volume of grain crops, since wheat requires 1.7 times less mechanized operations than corn. In general, the factors specified in Table 2 cause uncertainty in the growth of grain crop costs in 2026 relative to 2025 of 15–30%. Thus, the specified uncertainties will form changes in the total costs of the grain sector of agribusiness in the range of UAH 640–700 billion. According to the mathematical formalization given above, this will lead to an unacceptable maximization of the values of the integral risk $R_{\mathbf{u}}^*$, which will result in a 40–100% decrease in profit. Reaching the upper part of the specified interval will mean the need for a significant part of small and medium-sized farms to sell the crop even below its cost, which will lead to a significant reduction in grain production in the following years, i.e., a long-term decrease in the competitiveness of the agricultural sector of Ukraine in this sector of the global market. The rapid introduction of technological innovations to address the consequences of diesel fuel price increases is extremely complicated. Certain adjustments can be made through organizational and managerial innovations, in particular to improve logistics, dynamic marketing in local markets, etc.

4. Discussion

Today, the use of managerial and economic mechanisms to ensure the competitiveness of agribusiness on an innovative and investment basis in Ukraine is peculiar. At the same time, the spread of approaches to improving agricultural management measures amid significant and dynamic changes in external conditions and the uncertainty of threats is also important for other countries worldwide. This is facilitated by the fact that the

scientific community has not yet attached importance to the factors of uncertainty for investments in agribusiness (Agbola et al., 2024). The significance of the impact of uncertainty on the reduction of investments requires a revision of the traditional practice of using managerial and economic mechanisms for ensuring competitiveness and a change in attitude to innovative and investment activities not only as a means of ensuring the sustainability of production, as indicated in the article by Turbovets (2024), but also as a survival mechanism. At the same time, the impact of uncertainty on agribusiness results is significantly increasing due to insufficient attention by Ukrainian agricultural producers to the ecological and resource components of enterprises' competitive potential. Still, even while studying the risks of agricultural innovations, part of the scientific community continues to ignore risks to the natural environment (Shulha, 2026).

In the new conditions, the assessment of the effectiveness of ensuring sustainable development of agribusiness requires significant clarification, for example, by prioritizing factors such as greenhouse gas emissions (a parameter more typical of industry) and biodiversity conservation (Suduk et al., 2025). The irrelevance of such an approach is especially evident during a war, when sustainability is based primarily on adaptive capacity to challenges and on the improvement of a holistic management system, which is determined primarily by reducing the level of uncertainty for businesses regarding the main influencing factors.

Scientists also often continue to believe that the main asset for capital investment in agribusiness is land resources (Zaremba et al., 2025). Given the effectiveness of new areas of innovation: agroponics, modern approaches to animal husbandry, this statement needs to be revised. Therefore, in the presented article, innovation and investment principles are understood as an integral holistic subsystem of the management and economic mechanism.

Rudenko and Dobizha (2026) rightly point out that when studying investments in innovation, scientists mainly focus on sources of financing, bypassing comparisons of the complexity and cost of their attraction and their effectiveness of use. Investment in such areas of the management and economic mechanism as: dynamic regulation of directions, volumes and nomenclature of exports, pace and density of enterprise integration into foreign markets; development of the territory where production is localized; minimization of risks and reduction of uncertainty in agribusiness activities; expansion of opportunities not only for attracting capital but also for attracting management experience, intellectual capital and innovative solutions. This shifts views on innovations in agribusiness from primarily a means of operationalizing profit (Cheng et al., 2025).

5. Conclusions

Proposed measures aim to improve the methodological foundation of this area of scientific research, in particular by changing the categorical apparatus. It is substantiated that scientific categories such as "sustainable development", "management", "enterprise competitiveness", and "management and economic mechanism" in new conditions and with new challenges require changes, as proposed in this study. The category "management and economic mechanism" is proposed to be considered as a complex of lower-level mechanisms. Among this complex, the mechanism for forming connections between subsystems and elements of an integrated management and economic mechanism is highlighted as particularly significant.

It is substantiated that ensuring competitiveness on an innovative and investment basis should not focus on the functions of individual subsystems of this mechanism.

It is indicated that the lack of attention to the environmental component of agribusiness in past periods has led to a decrease in soil productivity and the efficiency of its use. Therefore, taking this component into account can ensure the acquisition of competitiveness in foreign markets and guarantee the enterprise's sustainable development. At the same time, this requires revising the methods and practices of management and the economic mechanism for assessing the feasibility of using natural resource potential without relying on innovative environmental technologies.

The need to account for increased uncertainty across the production and marketing/sales processes due to the increase in anthropogenic loading on the ecosystem is indicated.

To implement innovations with significant added value by small and medium-sized businesses, it is proposed to combine the efforts of groups of enterprises formed not only on the sectoral-regional principle, but also on an inter-sectoral basis, by including processing, logistics, sales, and other related enterprises in the integration process. It is indicated that inter-sectoral integration, the involvement of own financial resources in the innovation process, and dynamic management will contribute to the rejection of the hierarchical nature of relations in the triad business-state institutions-society and to their replacement with network ones, thereby changing the relations among micro-level and meso-level structures. It is proposed to expand the view of innovations in agricultural activities beyond ensuring financial results, taking into account the increase in the enterprise's economic potential, the growth of its attractiveness in foreign markets, the improvement in the implementation of the corporate management structure at the meso-level, etc. Since the factors of connection

between the management and economic mechanisms of an agricultural enterprise and the mechanisms of the mesolevel are largely uncertain, it is relevant to assess the management and economic mechanisms in terms of their adaptability to challenges, taking into account uncertainty and reducing it. Approaches to such assessment are proposed, in particular, success in interaction within the framework of the innovation ecosystem, improving the management of the acquisition of competitive advantages, introducing measures to neutralize challenges, indicating resources and reserves, ensuring synergy of market environment determinants through the use of innovative approaches in the algorithmization of competitive strategies, etc.

The use of a wide range of alternative traditional investment attraction tools is proposed, in particular crowdfunding, crowdsourcing, crowd lending, and derivatives.

It is indicated that at present the obstacle to investment in innovation in Ukrainian agribusiness is not so much the level of risks and the high dynamics of their change, but, first of all, the factor of uncertainty of threats, because certainty allows investors to compare the costs of innovations and the benefits from them, and uncertainty leads to the inability to assess losses. A mathematical formalization of operations with a factor of uncertainty is proposed. Using the example of risks to the grain direction of agricultural activity due to the increase in diesel fuel prices in 2026, the nature of the impact of risk uncertainty on the result is illustrated. At the same time, there are changes in the use of management and economic mechanisms to ensure the competitiveness of individual areas of Ukrainian agribusiness in foreign markets. An example of this, in particular, is the production of dairy products, where innovations and close integration with processing enterprises have increased the share of processing in exports to over 85%. This, accordingly, contributed to the growth in the added value of Ukrainian dairy products, providing additional competitive positions for Ukrainian agribusiness in foreign markets.

References

- Agbola, B., Yusuf, S., & Oluwalaiye, T. (2024). Agribusiness Risk Management in Nigeria-A Conceptual Analysis. *Texila International Journal of Management*, 01, 1–10. <https://doi.org/10.21522/TIJMG.2015.10.01.Art010>
- Aksenko, P. (2025). Main components of the organizational and economic mechanism for the development of agricultural formations in conditions of market uncertainty. *Collection of Scientific Papers "Scientific Notes"*, 39(2), 123–134. http://doi.org/10.33111/vz_kneu.39.25.02.10.068.074
- Andriushchenko, K., Buriachenko, A., Liezina, A., Lavruk, O., Korzhenivska, N., & Slavina, N. (2024). The impact of labor resources on the economic security of an enterprise in the sustainable development concept. *Technology Audit and Production Reserves*, 6(4(80)), 21–31. <https://doi.org/10.15587/2706-5448.2024.318702>
- Andriushchenko, K., Datsii, O., Lavruk, O., Dmytrenko R., Kutashov, I., Vinichenko, I., Mishchenko, D., Kakhovych, Y., Pivovarov, K., & Ortina, G. (2021). Development of a matrix of food industry capacity for making management decisions in the formation of sustainable development of agroecosystems. *Eastern-European Journal of Enterprise Technologies*, 2(13(110)), 16–27. <https://doi.org/10.15587/1729-4061.2021.227805>
- Bazaluk, O. (2017). *The Theory of War and Peace, Geophilosophy of Europe*. Newcastle upon Tyne: Cambridge Scholars Publishing. ISBN: 1-4438-9883-X
- Bazaluk, O., Yatsenko, O., Zakharchuk, O., Ovcharenko, A., Khrystenko, O., & Nitsenko, V. (2020). Dynamic Development of the Global Organic Food Market and Opportunities for Ukraine. *Sustainability*, 12(17), 1–20. <https://doi.org/10.3390/su12176963>
- Bezuhla, L., Koshkalda, I., Perevozova, I., Kasian, S., & Nataliia, H. (2022). Marketing Management of the Regional Ecotourism Infrastructure. *International Journal of Industrial Engineering and Production Research*, 33(1) URL: <http://ijiepr.iust.ac.ir/article-1-1370-en.html>
- Böcskei, E., Veit, A., & Tóth, M.G. (2025). Green Growth in the EU: Innovation, Investment, and the Path to Sustainability. *Intellectual Economics*, 19(2), 11–45. <https://doi.org/10.13165/IE-25-19-2-01>
- Borkovych, V. (2025). Regional Aspects of Financial Support for the Sustainable Development of the Agro-Industrial Complex under Contemporary Conditions of Uncertainty. *Current Issues in Economic Sciences*, 11. <https://doi.org/10.5281/zenodo.1546560>
- Boussakra, A., Abdeslam, S., & Boukheit, S. (2025). Urban and Rural Sustainability as a Pathway to Achieving Sustainable Development. *Ukrainian Policymaker*, 16, 13–28. <https://doi.org/10.29202/up/16/2>
- Boyko, V., & Boyko, L. (2019). Modern approaches to defining the concept of "competitiveness of agricultural enterprises". *Financial Space*, 3(35), 23–31. [https://doi.org/10.18371/fp.3\(35\).2019.190153](https://doi.org/10.18371/fp.3(35).2019.190153)
- Bozhyday, I.I., & Kralia, V.G. (2026). Strategic Development Management of Agricultural Enterprises: Organizational and Economic Principles and Tools. *Economic Achievements: Prospects and Innovations*, 28. <https://doi.org/10.5281/zenodo.19250964>
- Cheng, W., Shao, J., Cui, L., & Song, W. (2025). The impact of highway construction on the profits of agricultural enterprises: Evidence from China. *Agricultural Economics*, 56(6), 856–873. <https://doi.org/10.1111/agec.70037>
- Cherneha, I.I. (2019). The strategic aspects of socio-economic mechanism formation of the entrepreneurial activity in the agricultural sector economy. *Bulletin of the V.V. Dokuchaev KhNAU Series "Economic Sciences"*, 4(2), 73–80. <https://repo.btu.kharkov.ua/handle/123456789/7005>

- Chikov, I., Khaietska, O., Okhota, Yu., Titov, D., Prygotsky, V., & Nitsenko, V. (2023). Modeling of the synthetic indicator of competitiveness of agricultural enterprises: a methodological approach to the use of neural network tools. *Financial and Credit Activity: Problems of Theory and Practice*, 5(52), 222–242. <https://doi.org/10.55643/fcaptop.5.52.2023.4149>
- Dankevych, A., Stoyanova-Koval, S., Polova, O., Los, Z., Burdeina, N., & Kazak, O. (2024). State of economic security and directions of restoration socio-economic development and food security in the conditions of war. *Financial and Credit Activity Problems of Theory and Practice*, 2(55), 441–460. <https://doi.org/10.55643/fcaptop.2.55.2024.4170>
- Denysiuk, O., Svitlyshyn, I., Tsaruk, I., Vikarchuk, O., & Dankevych A. (2022). Diversification in the enterprises' activities for sustainable development in the agricultural sector. *Rivista di studi sulla sostenibilita*, XII(2), 85–102. <https://doi.org/10.3280/RISS2022-002007>
- Fazli, Q.S., Delya, M.I., Almuchty, M.A., Hafizah, I., & Wiranatakusuma, D.B. (2025). Mapping the Evolution of Agricultural Economics: A Bibliometric Analysis of the Nexus Between Economic Growth, Environmental Sustainability, and Econometric Modeling. *Ekonomikalia Journal of Economics*, 3(2), 106–118. <https://doi.org/10.60084/eje.v3i2.345>
- Fedyrets, O. (2021). The essence and principles of the formation of the organizational and economic mechanism of the development of agricultural enterprises. *Economy and society*, 28. <https://doi.org/10.32782/2524-0072/2021-28-56>
- Food and Agriculture Organization, FAO (2026). *Agro-Informatics*. <https://www.fao.org/agroinformatics/en>
- Gubko, V. (2020). Organizational and economic mechanism of financial and economic efficiency management at agricultural enterprise. *Actual problems of innovative economy*, 2, 62–66. <https://doi.org/10.36887/2524-0455-2020-2-11>
- Honey of Ukraine (2026). *Sales channels. Domestic market*. <https://medukraine.com.ua/>
- Havryliuk, Yu. (2025). Strategic management of innovation development of agricultural enterprises in the context of current marketing trends. *Ukrainian Journal of Applied Economics and Technology*, 10(2), 289–294. <https://doi.org/10.36887/2415-8453-2025-2-56>
- Jia, X. (2024) Legal Framework for Coordinated Development of International Trade and Ecological Protection. *Future Human Image*, 21, 16–24. <https://doi.org/10.29202/fhi/21/2>
- Klymash, N., Bagatska, K., Melnychuk, O., Zhuk, O., Kondratiuk, O., Edeh, F. O. (2026). Determinants of investment potential in the context of ensuring the economic sustainability of enterprises. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*, 2, 167–175. <https://doi.org/10.33271/nvngu/2026-2/167>
- Kovalchuk, S., Perevozova, I., Abdullaieva, A., Tanasiichuk, A., Zhuk, I., Vyshniuk, S., & Garmatiuk, O. (2025). Marketing Mechanism for the Adaptation of Ukrainian Enterprises to Wartime Conditions Amid Geopolitical and Economic Challenges. *European Journal of Sustainable Development*, 14(2), 241. <https://doi.org/10.14207/ejsd.2025.v14n2p241>
- Kucher, L., Kucher, A., Khareba, V., Demydchuk, L., & Skhidnytska, H. (2023). Development of innovation activities of agrarian enterprises: towards agribusiness 4.0. *Agricultural and Resource Economics*, 9(4), 252–286. <https://doi.org/10.51599/are.2023.09.04.11>
- Kvasha, S., Pavlenko, O., & Vakulenko, V. (2024). Competitiveness of Ukrainian agricultural products in foreign markets. *Economy and Society*, 68. <https://doi.org/10.32782/2524-0072/2024-68-198>
- Kyryliuk, I., Kyryliuk, Y., Proshchalykina, A., Zos-Kior, M., & Dovbush, V. (2021). Organisational and economic drivers for safety provision and quality upgrading of core livestock products in Ukraine. *Journal of Hygienic Engineering and Design*, 36, 49–66. <https://keypublishing.org/jhed/jhed-volumes/jhed-volume-36-fqs-4-iry-na-kyryliuk-yevhenii-kyryliuk-alina-proshchalykina-%D0%BCykola-zos-kior-vita-dovbush-2021-organizational-and-economic-drivers-for-safety-provision-and-quality-u/>
- Lomovskykh, L., Ponomarova, M., Chip, L., Krivosheya, E. & Lisova, O. (2021), Management and organizational and economic conditions of strengthening the marketing activity of the enterprise and maintaining efficient agrobusiness. *Financial and credit activity: problems of theory and practice*, 2(37), 263–270. <https://doi.org/10.18371/fcaptop.v2i37.230255>
- Materynska, O., Klymchuk, O., Kronivets, T., Romanchuk, L., & Burlaka, N. (2025). Sustainable development management: basic principles and tools of influence. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*, 4, 217–226. <https://doi.org/10.33271/nvngu/2025-4/217>
- Minenko, S. I. (2021). Strategic directions of increasing the competitiveness of agricultural enterprises of Ukraine on the international market. *Aktualni Problemy Innovatsiinoi Ekonomiky ta Prava*, 3, 39–44. <https://doi.org/10.36887/2524-0455-2021-3-7>
- Mykhailichenko, M., Lozhachevska, O., Smagin, V., Krasnoshtan, O., Zos-Kior, M., & Hnatenko, I. (2021). Competitive strategies of personnel management in business processes of agricultural enterprises focused on digitalization. *Management Theory and Studies for Rural Business and Infrastructure Development*, 43(3), 403–414. <https://ejournals.vdu.lt/index.php/mtsrbid/article/view/2519>
- Nitsenko, V., Tepluk, M., Velychko, O., Koliadenko, S., Hanzhurenko, I., Melnichenko, O., Moskvichenko, I. (2025). Revitalization of stevedoring activities, risk management and relocation of logistics processes in Ukrainian agribusiness. *Scientific Journal of Silesian University of Technology. Series Transport*, 126, 171–188. <https://doi.org/10.20858/sjsutst.2025.126.11>
- Nitsenko, V., Vlasenko, T., Stakhov, A., Golubkova, I., Gerasymchuk, N., & Petrychenko, O. (2025). Threats to shipping in the black sea and their global impact. *Zeszyty Naukowe. Transport/Politechnika Śląska*. <https://doi.org/10.20858/sjsutst.2025.128.9>

- Nosova, O., Grytsenko, A., & Lypov, V. (2024). Cooperative digital platforms in the renewable energy sector. *Intellectual Economics*, 18(1), 214–230. <https://doi.org/10.13165/IE-24-18-1-10>
- Orel, A.M. (2019). Features of competitive potential of agricultural enterprises. *Bulletin of Sumy National Agrarian University*, 4(82), 64–68. <https://doi.org/10.32845/bsnau.2019.4.12>
- Organisation for Economic Cooperation and Development (2026). *Agriculture and Fisheries*. <https://www.oecd.org/en/topics.html>
- Pivtorak, V., & Dendebera, O. (2025). Development of innovative entrepreneurial activity in agriculture: problems, regulatory preconditions, and directions for intensification. *Economy and society*, 82. <https://doi.org/10.32782/2524-0072/2025-82-64>
- Prokopyshyn, O., Polehenka, M., & Zhydovska, N. (2023). Innovative strategies for Ukrainian agribusiness development in the postwar period. *Bulletin of the Lviv National Ecological University. Series "Economics of the Agricultural Complex"*, 30, 33–37. <https://doi.org/10.31734/economics2023.30.033>
- Pyrtko, S. & Deineha, I. (2025). Ecologization as a tool for increasing agricultural competitiveness enterprises. *Ekonomika ta Suspilstvo*, 71. <https://doi.org/10.32782/2524-0072/2025-71-69>
- Radchenko, O.D. (2019). Financial potential of sustainable development of the agricultural sector. *Economics of AIC*, 1, 27–38. <https://doi.org/10.32317/2221-1055.201901027>
- Romaniuk, O. (2024). Innovation as a driver of the competitiveness of agricultural enterprises on the global market. *Modeling the Development of the Economic Systems*, 3, 362–367. <https://doi.org/10.31891/mdes/2024-13-50>
- Rudenko, V.V., & Dobizha, N.V. (2026). Financial Instruments for Stimulating Investment and Innovation in Technical and Technological Provision of Crop Production. *Current issues of economic sciences*, 22. <https://doi.org/10.5281/zenodo.19709344>
- Salohub, V. (2026). Competitive conditions of target product sales markets and the innovative potential for the development of agricultural enterprises. *Ukrainian Journal of Applied Economics and Technology*, 11(1), 358–361. <https://doi.org/10.36887/2415-8453-2026-1-68>
- Shulha, O. (2026). Directions of transformation of the management system of economic security of the agricultural sector in the system of sustainable development. *Baltic Journal of Economic Studies*, 12(1), 89–99. <https://doi.org/10.30525/2256-0742/2026-12-1-89-99>
- Site of information portal MINFIN (2026). Prices for gasoline, diesel fuel, gas at gas stations in Ukraine. <https://index.minfin.com.ua/ua/markets/fuel/>
- State Static Service of Ukraine (2025). Economic statistics / Economic activity / Enterprise activity. <https://ukrstat.gov.ua/>
- Suduk, N., Kovtunyk, B., & Sliusarenko, N. (2025). Methodology for the research, development and implementation of investment support mechanisms for the sustainable development of the agricultural sector in Ukraine. *Economy and society*, 74. <https://doi.org/10.32782/2524-0072/2025-74-40>
- Tetiu, A.P. (2025). Analysis of the Current State of Investment Activity of Agro-Industrial Enterprises in Ukraine. *Economics: time realities. Scientific journal*, 1(77), 71–79. <https://doi.org/10.15276/ETR.01.2025.9>
- The official site AgroPortal (2026). *Record export figures: a window of opportunity for Ukrainian milk*. <https://agroportal.ua/publishing/infografika/rekordni-pokazniki-eksportu-vikno-mozhливостey-dlya-ukrajinskoji-molochki>
- The official site of Federation of Organic Movement of Ukraine (2026). *Organic in Ukraine*. <http://www.organic.com.ua>
- The official site of information portal OrganicInfo (2026). *Infographic*. <https://organicinfo.ua/infographics/>
- Tsarenok, A., & Smolina, O. (2024). Environmental Aesthetics as a Structural Part of Environmental Philosophy. *Philosophy and Cosmology*, 32, 107–116. <https://doi.org/10.29202/phil-cosm/32/8>
- Turbovets, S.B. (2024). Institutional foundations of innovative development of agricultural enterprises in the context of European integration. *Journal of Strategic Economic Research*, 4(21), 69–83. <https://doi.org/10.30857/2786-5398.2024.4.7>
- Ustik, T., & Hirzheva, O. (2020). Architectonics of the mechanism of information support of strategic management of marketing and sales in the agricultural enterprise. *Actual problems of innovative economy*, 1, 64–70. <https://doi.org/10.36887/2524-0455-2020-1-11>
- World Bank Group (2025). *Research and development expenditure (% of GDP)*. <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>
- Yang, Z., & Solangi, Y.A. (2024). Analyzing the relationship between natural resource management, environmental protection, and agricultural economics for sustainable development in China. *Journal of Cleaner Production*, 450, 141862. <https://doi.org/10.1016/j.jclepro.2024.141862>
- Yarmol, L., Dolynska, M., Stetsyuk, N., Andrusiak, I., & Muraviova, I. (2022). Legal security of environmental safety under the conditions of marital state in Ukraine. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*, 5, 110–115. <https://doi.org/10.33271/nvngu/2022-5/110>
- Yatsenko, O., Iatsenko, O., & Yaremko, K. (2025). Competitive environment and agritraders leadership in the global grain market. *Collection of Scientific Papers "Scientific Notes"*, 41(4), 408–426. http://doi.org/10.33111/vz_kneu.41.25.04.29.203.209
- Zaremba, O., Sakhno, A., Chesnik, N., Nitsenko, V., Chikov, I., Zakharova, T., & Boltovska, L. (2025). Capital Investments in Sustainable Development of Land Resources of Ukrainian Agrarian and Industrial Complex Enterprises: Assessment, Modeling, Optimization. *Rocznik Ochrona Srodowiska*, 27, 722–737. <https://doi.org/10.54740/ros.2025.058>