DOI https://doi.org/10.30525/978-9934-26-684-3-35

CHAPTER 35
CONCEPTUAL VECTORS OF STRENGTHENING THE ECONOMIC SECURITY OF THE AGRICULTURAL SECTOR: FROM IDENTIFICATION OF THREATS TO SUSTAINABLE FUNCTIONING

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INTRODUCTION

Transformational processes that have engulfed the global and national economic systems dictate the need to rethink fundamental approaches to ensuring the security of the agricultural sector. The current stage of development is characterized not simply by the variability of market conditions, but by a profound paradigm shift: from a linear model of production intensification to the concept of sustainable development. In this context, the convergence of economic security and the principles of sustainable development becomes not only a scientific theory, but a strategic imperative for survival. Enterprise security today cannot be considered in isolation from environmental responsibility and social stability, since it is these factors that determine the long-term viability of business in the context of a global green transition. The relevance of the study is enhanced by the unprecedented level of turbulence caused by military aggression, energy crises and logistical collapses. Identification and classification of threats to the economic security of the agricultural sector in modern conditions requires a fundamentally new level of analysis, taking into account not only traditional financial risks, but also specific exogenous shocks: from cyber threats and blocking of export corridors to the destruction of production assets and mining of territories. Classical approaches to the typification of threats need to be adapted to cover the range of challenges associated with the implementation of CBAM mechanisms, climate change and migration processes.

The central element of the security management system is the objectivity of assessing the current state of business entities. The methodological toolkit for assessing the level of economic security of agricultural enterprises should be transformed into a multidimensional system of indicators that would allow measuring not only the static financial condition, but also dynamic resilience – the ability of the system to recover after destructive influences. The integration

of quantitative analysis methods with expert assessments and digitalization tools allows for the formation of an effective analytical basis for making management decisions aimed at preventing crisis phenomena and ensuring the strategic sustainability of the agricultural sector of Ukraine.

35.1. Convergence of Economic Security and the Sustainable Development Paradigm

The convergence of the theory of economic security and the sustainable development paradigm is based on a profound change in the ontological understanding of stability. The traditional perception of security as a passive tool for counteracting instantaneous exogenous shocks is evolving towards maintaining dynamic equilibrium, where the key factor of stability is the ability of the system to self-renew without exhausting internal resources. Sustainable development in this context acts not simply as an ecological guideline, but as a necessary condition for long-term economic survival. The points of contact between these concepts lie in the plane of the regenerative approach: economic security guarantees the availability of resources today, while sustainable development ensures their accessibility and quality for future periods.

Ensuring the economic security of the agricultural sector should be considered within the framework of the sustainable development paradigm, which is the dominant conceptual guideline for the formation of national economic policy. The concept of sustainable development, according to classical approaches, is defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. In the agricultural sector, this concept requires an integrated and balanced combination of three equal components: economic, social and environmental.

The economic component of sustainable development involves achieving sustainable economic growth, increasing the level of productivity and competitiveness of agricultural production, as well as ensuring its long-term financial stability. Critical analysis shows that the focus on exclusively short-term profit maximization, which is often accompanied by extensive use of resources, is not compatible with sustainability, as it leads to the depletion of production potential.

The social component is focused on improving the quality of life of the rural population, ensuring food security, creating decent working conditions and preserving social infrastructure in rural areas. The disadvantage of modern practice is often insufficient attention to social aspects, which is manifested in

the strengthening of differentiation between large agricultural formations and small farms, as well as in the outflow of labor resources from rural areas.

The environmental component requires optimizing the use of natural resources, minimizing the negative impact of agricultural activities on the environment, preserving biodiversity and increasing adaptability to climate change. Here a fundamental contradiction is revealed: intensive agricultural production, aimed at achieving economic efficiency, is often a source of pollution of soils and water bodies, which directly threatens the ecological sustainability of the sector in the long term.

In this context, the role of economic security of the agricultural sector is a necessary condition for achieving sustainable development goals. Economic security provides the necessary level of sustainability of the agricultural sector, which allows it to function effectively, overcome crisis phenomena and make investments in long-term environmental and social programs without the risk of losing its economic potential. Without a guaranteed level of economic security, sustainable development initiatives remain declarative, as the producer, in conditions of economic instability, is forced to prioritize short-term economic goals, ignoring long-term sustainability principles.

The transformation of the perception of security from short-term protection to long-term maintenance of equilibrium reflects the shift from a survival strategy to a resilience strategy. In the classical paradigm, security was often achieved through intensive exploitation of natural assets for quick financial results, which created the illusion of security. However, modern evidence suggests the opposite. According to FAO, about 33% of the world's soils have already been degraded, posing threats to food security worth more than US $ 400 billion each year [1]. This confirms the thesis that ignoring the principles of sustainability (ecological and social limits) generates new, larger-scale systemic threats, which subsequently undermine the economic foundation of any state.

The justification for the thesis that it is impossible to achieve sustainable development goals without economic security is based on the financial determinism of environmental and social investments. An economically unprotected enterprise or industry in a state of crisis is unable to introduce expensive technologies of precision agriculture, decarbonization or social security for workers. A low level of economic security forces producers to focus on monoculture farming and excessive use of pesticides for the sake of quick liquidity, which directly contradicts the principles of sustainable development.

[1] Agroecology and the Transition to Sustainable Food Systems. URL: https://worldfoodsystem.ethz.ch/outreach-and-events/past-events/agroecology-lectures-2021.html

Thus, economic security acts as a material foundation for development, while sustainable development becomes a safeguard against the self-destruction of the system in the future.

Thus, modern methodological convergence suggests considering the economic security of the agricultural sector as the ability to maintain a development trajectory in which meeting current needs does not create risks for future food sovereignty. Any security strategy that does not take into account environmental and social limits is strategically short-sighted, since it only postpones the onset of a crisis, making it more destructive in the end.

Awareness of the theoretical convergence of security and development allows us to shift the emphasis from abstract models to the applied plane of implementation of global initiatives, where the agricultural sector appears not simply as an object of protection, but as a key subject in achieving general civilizational progress. If theoretical unity creates a methodological basis, then the practical implementation of the Global Sustainable Development Goals requires the agricultural sector to have a high level of economic sustainability, which becomes a necessary tool for the transformation of the world food system.

The role of the agricultural sector in the implementation of the UN 2030 Agenda is crucial, as it is directly responsible for achieving Goal 2 (No Hunger) and Goal 12 (Sustainable Consumption and Production). The economic security of the agricultural sector ensures the continuity of food chains, which is critical for the physical and economic availability of food. According to the UN State of Food Security Report, in 2024 the number of people facing chronic hunger exceeded 730 million, confirming the direct relationship between the financial sustainability of agricultural producers and global humanitarian stability. Only an economically secure agricultural sector is able to generate sufficient production to meet the needs of the growing population of the planet, while minimizing food losses at the production and processing stages.

The mechanisms through which the economic sustainability of agricultural enterprises is transformed into social welfare are based on the reproductive function of capital. A stably functioning farm acts as the main employer and investor in the development of rural areas, ensuring the filling of local budgets and financing of social infrastructure. Moreover, economic security creates a financial precedent for the preservation of ecosystems. When an enterprise has a sufficient margin of safety and access to investment capital, it gets the opportunity to abandon extensive management methods in favor of no-till technologies, precise fertilizer application and renewable energy. Thus, the economic capacity of the producer becomes a guarantor of environmental

responsibility, since the poverty of the agricultural sector always leads to the depletion of natural resources for the sake of instant survival.

Modern agrarian policy becomes the main means of balancing between economic efficiency and environmental responsibility. The state, through the mechanisms of strategic security management, should create incentives under which environmentally responsible business behavior becomes economically profitable. This is achieved by introducing green subsidies, preferential taxation for organic producers, and strict legal regulation of the use of pesticides. This approach allows to level the conflict between the desire for maximum profit and the need to preserve the environment. The effectiveness of such a policy depends on the integration of security indicators into the overall strategy of national development, which turns the agricultural sector into a driver of a sustainable future.

In parallel, the recognition of the agricultural sector as an instrument for implementing global sustainable development goals requires a transition from the analysis of macroeconomic indicators to the study of the direct material basis of the industry – land resources. If economic stability ensures the financial viability of the system, then environmental security, based on sustainable land use, forms its biological and resource sustainability, without which any economic growth will be temporary and self-destructive.

The relationship between the preservation of soil fertility and the economic stability of the industry is a fundamental law, where the state of natural capital directly determines the level of cost and competitiveness of products. Fertile soil is not only a means of production, but also a natural buffer that is able to accumulate moisture and nutrients, leveling out fluctuations in yield. According to scientific estimates, the loss of only 1% of humus content leads to a decrease in potential grain yield by 5-7 centners per hectare, which on a country scale is transformed into billions of losses and loss of export capacity. Thus, soil degradation is considered a hidden form of economic depreciation of assets, which undermines the financial stability of agricultural enterprises in the long term.

Modern risks arising from excessive intensification of production and climate change are taking on the character of systemic threats. The drive to maximize profits through monoculture farming and excessive chemical inputs is disrupting natural soil renewal cycles. Combined with climate turbulence – increased drought frequency and uneven rainfall distribution – this is leading to increased water and wind erosion. According to FAO, the annual loss of topsoil through erosion globally is estimated at billions of tons, making agricultural

production critically vulnerable to any external shocks [2]. Thus, soil degradation is considered a hidden form of economic depreciation of assets, which undermines the financial sustainability of agricultural enterprises in the long term.

Modern risks arising from excessive intensification of production and climate change are becoming systemic threats. The desire to maximize profits through monoculture farming and excessive chemical loads disrupts natural soil renewal cycles. Combined with climate turbulence – an increase in the frequency of droughts and uneven distribution of precipitation – this leads to increased water and wind erosion. According to FAO, the annual loss of fertile soil due to erosion on a global scale is estimated at billions of tons, which makes agricultural production critically vulnerable to any external shocks [3].

The transition to regenerative agriculture and decarbonization is now not only an environmental requirement, but also a strategic tool for mitigating external economic threats. In particular, the introduction of carbon import adjustment mechanisms (for example, CBAM in the EU) creates new barriers for products with a high carbon footprint. Agricultural enterprises that ignore the principles of decarbonization risk losing access to premium markets or facing additional tax burdens. Regenerative practices, such as sowing cover crops and minimal tillage, allow carbon to be deposited in the soil, turning environmental responsibility into an economic asset. This approach ensures the ecological immunity of the agricultural sector, making it resilient to new regulatory requirements of global trade.

Therefore, environmental security within sustainable land use appears as an integral part of the overall system of economic security. Preserving the natural potential of the land becomes the main investment in future profitability, ensuring that the agricultural sector remains competitive in a world where environmental standards are becoming an integral part of economic relations.

Ensuring ecological balance and preserving natural assets creates the necessary material basis for the functioning of the agricultural sector, but the viability of any system is determined primarily by its human potential and social integrity. The transition from a technocentric to a human-centric security model allows us to consider rural areas not only as production sites, but as the foundation of national stability, where social stability acts as a guarantor of long-term economic progress and internal resilience of the state.

[2] Agroecology and the Transition to Sustainable Food Systems. URL: https://worldfoodsystem.ethz.ch/outreach-and-events/past-events/agroecology-lectures-2021.html

[3] FAO. The State of Food Security and Nutrition in the World 2025. URL: https://openknowledge.fao.org/bitstreams/e612e779-ec47-44c2-a3e0-499569c3422d/download

Another important point is the conceptualization of inclusive development in the agricultural sector, which acts as a powerful tool for strengthening national security, since it is aimed at overcoming deep inequality between the city and the countryside. Inclusion involves the involvement of broad segments of the rural population in economic processes, which minimizes the risks of social marginalization and political instability. The orientation of agricultural policy exclusively on the interests of large integrated structures leads to the formation of depressed rural areas, where high economic efficiency of production is accompanied by the degradation of the social sphere. In the long term, this reduces the level of national resilience to external destabilizing factors due to the destruction of local economic ties.

The fundamental condition for sustainable development is the preservation of human potential and the development of rural infrastructure. The personnel shortage caused by migration processes and rural depopulation is one of the key threats to the economic security of the agricultural sector. The modern high-tech agricultural sector requires specialists with a high level of qualification, but their attraction and consolidation directly depends on the availability of high-quality educational, medical and digital services.

Infrastructure facilities perform the function of an institutional stabilization factor that ensures the maintenance of the working population and the continuity of the reproduction of the human resource in the industry. In this regard, state financing of the development of transport networks and social facilities in rural areas should be identified as strategic investments in the security infrastructure of the state, guaranteeing the stability of the food system in critical conditions.

Special attention deserves support for small farms and family farms, which are the basis of social stability in the regions. Unlike large corporations, small agribusiness demonstrates higher adaptability to local challenges and contributes to the diversification of the rural economy. Small farms ensure self-employment of the population and form flexible food supply chains at local levels. The interaction of large and small businesses creates a balanced ecosystem, where the economic power of the former is combined with the social sustainability of the latter.

The role of social stability in preventing the degradation of agrarian regions lies in the formation of a high level of public trust and solidarity. A cohesive rural community is able to mobilize resources more quickly in crisis situations, ensuring local food autonomy and maintaining order. Thus, investments in the social sphere are an essential component of any economic security strategy, since without people, the land loses its geopolitical and economic meaning.

The formation of a socially sustainable environment in rural areas creates the necessary human foundation for implementing changes, but the implementation of a sustainable development strategy and ensuring long-term economic security require appropriate technological tools. In the modern global context, such tools are the innovation and technological vector, based on the synergy of security interests and the requirements of the European Green Deal. This convergence turns environmental constraints into drivers of technological modernization, where reducing the resource intensity of production becomes the main factor in increasing the competitiveness of the agricultural sector.

The impact of the European Green Deal [4] on the modernization of the Ukrainian agro-industrial complex is multifaceted and defines a new paradigm for the development of the industry. For Ukraine, as one of the leading players in the global food market, adaptation to the Farm to Fork and Biodiversity strategies is not only a matter of environmental responsibility, but also a prerequisite for maintaining access to EU markets. The Green Deal stimulates the transition from extensive production expansion to intensification based on knowledge and innovation. European environmental standards become a powerful external incentive for the renewal of fixed assets and the introduction of environmentally friendly technologies, which ultimately increases the overall resilience of the national economy.

Digitalization and precision agriculture are key technological solutions that simultaneously enhance economic security and meet the criteria of sustainable development. Thanks to the use of satellite data, UAVs and sensor systems, producers are able to optimize the application of fertilizers, plant protection products and fuel. The economic effect of the implementation of precision agriculture is manifested in a reduction in production costs by 15-25%, which is critical for maintaining financial sustainability in conditions of volatility in resource prices [5].

From the perspective of sustainable development, these technologies minimize the chemical load on soils and water resources, ensuring the ecological safety of territories. Thus, the digital transformation of the agricultural sector overcomes the traditional conflict between the economy and ecology, turning them into complementary elements of sustainability.

The development of bioenergy in the agricultural sector creates an additional contour of economic security by ensuring the energy autonomy of

[4] The European Green Deal. URL: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

[5] Купінець Л.Є., Жавнерчик О.В. Екологічна безпека аграрного землекористування: теорія і механізми забезпечення: монографія. Одеса : ІПРЕЕД НАНУ, 2016. 316 с.

enterprises. The use of crop by-products and livestock waste for the production of biogas or solid biofuels allows agribusiness to reduce dependence on imported energy carriers and stabilize the cost of products. At the same time, this contributes to the decarbonization of the industry and the reduction of greenhouse gas emissions, which is fully consistent with the EU climate goals.

Adaptation of domestic legislation to EU environmental standards carries both significant challenges and unique opportunities. The main challenge is the need for significant investments in the modernization of treatment facilities, laboratories and certification systems, which can be burdensome for small and medium-sized producers. However, this process creates opportunities for attracting international green investments and participation in global carbon markets. Harmonization of legislation in the field of pesticide use and waste management removes technical barriers to trade and forms the image of Ukraine as a reliable supplier of safe and environmentally friendly products. As a result, the innovation and technological vector in combination with the European Green Deal forms a new face of the agricultural sector, where economic power is based on the principles of environmental responsibility and technological excellence. In connection with the above, it is advisable to develop an integrated model that ensures the coordination of current economic sustainability with long-term goals of global sustainable development. The specified model will function as a complex open system in which ensuring security and implementing the principles of sustainable functioning act as complementary directions that form the basis for agrarian resilience. This approach allows transforming the management system from a linear response to threats to a comprehensive maintenance of the viability of the industry. Within this paradigm, the economic interests of business entities are considered inextricably linked to environmental and social constraints, which guarantees the preservation of the functional capabilities of the agricultural sector in the long term.

The integrated model of sustainable safe development of the agricultural sector is based on methodological convergence, where economic security acts as an internal stabilizer of the system, and sustainable development is its strategic trajectory. Within this concept, security is considered not as a static state of security, but as a dynamic ability of the system to accumulate resources for the transition to higher levels of technological and ecological structure. This approach allows to level the traditional contradiction between financial profitability and environmental responsibility, turning the latter into a factor of capitalization and market stability. Such integration ensures the systemic resistance of the agri-food system to global turbulences, since it simultaneously

strengthens both the material base of production and its socio-institutional environment.

The effective functioning of this model requires the development and implementation of a multi-level monitoring system based on a set of indicators capable of reflecting the balance of development. These indicators should cover all three dimensions of the integrated model: economic (reproduction capacity), environmental (preservation of natural potential) and social (development of human capital). In modern conditions, metrics that allow assessing the effectiveness of decarbonization and resource conservation per unit of gross product, which allows tracking real progress in achieving climate goals without harming food independence, are of particular importance.

The practical implementation of this model allows the state and business to move to predictive management, where each investment decision is assessed through the prism of its impact on the overall resilience of the system. In particular, the indicator of greenhouse gas emissions per unit of output becomes not just an environmental report, but an indicator of technological excellence and the enterprise's readiness to work in the conditions of carbon restrictions of the global market. Thus, the integrated model transforms the agricultural sector from a passive consumer of resources into an active creator of a stable and safe future, where economic power is harmoniously combined with environmental cleanliness and social justice. In addition, the formation of such a model is a response to the global challenges of the 21st century, offering a path of development where security is a guarantee of stability, and sustainable development is a guarantee of inexhaustible opportunities for future generations.

35.2. Identification and Classification of Threats to the Economic Security of the Agricultural Sector in Modern Conditions

In conditions when the agricultural sector of Ukraine operates in a mode of permanent overcoming of the consequences of military aggression, climatic anomalies and logistical blockades, classical methods of identifying threats require radical rethinking. Extreme uncertainty, which has become the new norm for the domestic agricultural sector, requires a transition from static observation to dynamic detection of hidden destructive factors capable of instantly destroying the production and financial stability of enterprises.

Methodological approaches to defining the concept of «threat to the economic security of the agricultural sector» in the context of modern crises have evolved from a simple fixation of external losses to an understanding of the threat as a set of conditions and factors that impede the implementation of

the strategic interests of the industry. In conditions of turbulence, a threat is identified not only as an active action (for example, a missile strike on an elevator), but also as a critical accumulation of internal vulnerabilities that lead to a loss of system adaptability. The modern paradigm considers a threat as a probable event with a high level of destructive force that occurs at the intersection of institutional weakness and production destabilization.

The prerequisites for the emergence of risks that are transformed into real threats are today directly related to the vulnerability of the institutional and production environment. Institutional vulnerability is manifested in the imperfection of legislative protection of land ownership rights, limited access to preferential lending and volatility of the tax field. Production vulnerability is due to high depreciation of fixed assets, dependence on imports of critical resources and a shortage of qualified personnel. If these factors coincide, a potential risk (for example, fluctuations in world prices) is transformed into a real threat of financial insolvency of the enterprise.

In conditions of extreme uncertainty, the time lag between the emergence of a risk and its transition to the threat phase has significantly decreased. This justifies the critical importance of early detection of destructive factors. For agricultural production, which has a rigidly deterministic time structure (biological growth cycles of plants and animals), a delay in identifying a threat even by several weeks can lead to an irreversible loss of the entire production cycle. For example, untimely detection of the threat of fuel shortage before the start of the harvesting campaign devalues all previous investments in sowing and caring for crops.

The justification for early detection is based on the implementation of weak signal monitoring systems. In the modern agricultural sector, this is implemented through the use of satellite monitoring of crops, automated financial controlling systems, and analysis of geopolitical forecasts. This approach allows you to transfer the security system from the mode of eliminating consequences to the mode of preventing destructive scenarios, which is the only way to maintain production continuity in a multifactorial crisis.

Systematization of destructive factors is a key prerequisite for the formation of an effective strategy for protecting the agricultural sector. In this regard, the classification of threats is of particular importance, since it allows for the differentiation of response measures depending on the nature of the origin of the threat and the depth of its potential impact on the reproductive processes in the agricultural sector. The division of threats into external and internal is

methodologically justified, which allows for the definition of the boundaries of responsibility between state regulation and the level of enterprise management.

External threats are generated outside the agrarian system and include macroeconomic instability, volatility of world markets and geopolitical conflicts. Internal threats are caused by the imperfection of the structure of the agricultural sector itself: technological backwardness, low energy efficiency and lack of financial liquidity of business entities.

To develop specific management solutions, threats are classified according to the main areas of their manifestation. Over the past five years, there has been an intensive convergence of different types of threats, which enhances the overall cumulative effect on economic security.

Analysis of the hierarchical structure of threats allows us to identify factors that require priority attention. Critical factors, such as financial insolvency due to loss of assets or logistical collapse, require immediate state intervention in the form of tax breaks, direct subsidies, or ensuring the safety of export routes. In contrast, long-term systemic risks, in particular environmental degradation or the aging of the rural population, require the implementation of strategic adaptation programs, the results of which will become apparent within 5-10 years.

A special place in the hierarchy is occupied by environmental safety, which during 2022-2025 transformed from a purely natural issue into a factor of economic viability. Land mining and destruction of irrigation systems (for example, the Kakhovka hydroelectric power station) have created a threat of complete loss of the production potential of individual regions, which requires an integrated approach (in particular, combining technological modernization with international financial assistance)[6]. Thus, a comprehensive classification of threats allows the system of economic security of the agricultural sector to act preventively, ensuring the stability of the industry even under conditions of critical uncertainty.

Let us consider in more detail the exogenous threats, which in modern conditions play a decisive role in shaping the architecture of economic security of the agricultural sector. The global turbulence that has engulfed world markets in recent years has turned the external environment into a source of permanent threats, where geopolitical restrictions directly correlate with the financial capacity of domestic agricultural producers. The global situation exerts double pressure on the economic stability of the agricultural sector: on the one hand,

[6] Економічна безпека України в умовах високих воєнних ризиків та глобальної нестабільності: експ.-аналіт. доп. / [Базилюк Я., Власенко Р., Власюк О. та ін.]; за заг. ред. Я. Жаліла. Київ : НІСД, 2025. 104 с.

there is high volatility in prices for energy and mineral fertilizers, which leads to inflation of costs in the production cycle, and, on the other hand, prices for the main types of agricultural products on world exchanges are subject to significant fluctuations under the influence of global reserves and macroeconomic expectations. This creates a situation where the increase in production costs is not always compensated by a corresponding increase in export prices, which undermines the profitability and financial security of enterprises.

Analysis of risks associated with foreign trade reveals critical vulnerability of export potential. The loss of traditional sales markets as a result of military operations and the blockade of ports forced producers to seek alternative routes through the western borders, where they faced the introduction of non-tariff barriers. Protests by farmers in the EU countries in 2023-2024 and the corresponding export quotas and licensing became a manifestation of geopolitical restrictions that destabilize sales. An additional threat is the restriction of access to international financial resources. Due to the high risks of the country, foreign investors and banks set strict limits on lending to Ukrainian agribusiness. Negative dynamics of grain prices make the development of domestic processing (flour, oil, bioethanol) the only way to save the profitability of the industry.

The constant threat of destruction of grain elevators, port infrastructure and processing plants makes investments in the agricultural sector of the economy highly risky. This leads to the disadvantage of long-term investments and the reorientation of business to short-term operations, which contradicts the concept of sustainable development.

Exogenous threats are systemic in nature and cannot be eliminated only by the efforts of individual enterprises. Geopolitical destabilization requires an active role of the state in the formation of international security alliances, the development of alternative logistics and the introduction of mechanisms for insurance of military risks. Only by minimizing external pressure and diversifying sales markets is it possible to restore the investment attractiveness of the industry and strengthen its position in the global architecture of food security.

Let us consider the endogenous threats of the agricultural sector, which constitute the internal basis of the system’s vulnerability. Structural deformations and resource constraints that have accumulated over decades have now reached a critical point, transforming from deterrents into direct threats to the integrity of the industry’s reproductive processes. An analysis of internal destructive factors shows that technological backwardness remains the main

barrier to competitiveness. The high level of depreciation of fixed assets, which in many segments of the agricultural sector of the economy exceeds 60-70%, leads to excessive resource consumption and crop loss during harvesting and storage [7]. This is especially acute in livestock and vegetable farming, where the lack of modern automated complexes leads to high cost and low added value of the final product. This preserves the raw material model of development, which is financially vulnerable to any market fluctuations.

Research into the threats caused by the shortage of personnel reveals a new demographic reality of the countryside. Forced migration and mobilization of labor resources have led to a shortage of qualified machine operators, agronomists and veterinarians, which threatens the implementation of precision farming technologies. The situation is complicated by the high level of shadowing of the agricultural market (illegal grain circulation, illegal lease), which washes away tax revenues and creates unequal conditions of competition. The incompleteness of the land reform in terms of land consolidation and protection of smallholders also remains an institutional destroyer that hinders long-term investments.

Of particular importance are the infrastructure gaps that arose as a result of the enemy's targeted destruction of logistics nodes. The destruction of elevators, oil extraction plants and terminals led to the disintegration of production chains.

The specificity of the current stage of development of the agricultural sector of Ukraine is that traditional economic risks have receded into the background, giving way to existential threats of a military nature. In the period 2022-2025, the agricultural sector faced challenges that have no analogues in modern world practice, which requires the formation of a special toolkit for identifying and neutralizing threats to prevent irreversible degradation of the state's production potential.

Threats of the war period are characterized by the physical destruction of material and technical assets and infrastructure. According to monitoring reports, targeted attacks on grain elevators, ports, and processing plants have led to the loss of a significant portion of storage and processing capacity. However, the most long-term destructive factor is mine contamination of arable land. Ukraine is currently recognized as one of the most mined countries in the world, where a significant proportion of highly fertile black soil has been withdrawn from economic circulation, which creates a long-term barrier to the restoration of agricultural production.

[7] Державна служба статистики України: офіційний веб-сайт. URL: http://www.ukrstat.gov.ua

These losses are cumulative. The gradual reduction in the area of mined land occurs at a slower pace than the physical destruction of equipment and infrastructure, which creates a long-term effect of delaying the restoration of the industry. A separate aspect is environmental terrorism, a vivid manifestation of which was the explosion of the Kakhovka hydroelectric power station in 2023. This caused the destruction of a unique irrigation system in the South of Ukraine, which actually led to the loss of the potential for intensive agriculture on an area of over 500 thousand hectares, turning these regions into a zone of risky management [8].

Indirect threats include the rupture of integration and logistical ties that have been built over decades. The disruption of traditional supply chains for fuel, fertilizers, and spare parts has forced agricultural producers to look for new channels, which significantly increases the cost of logistics. War risks have become a systemic challenge for the financial sector, as the high probability of destruction of collateral makes classic bank lending almost impossible without specialized state or international guarantees.

Building an effective system for protecting the agricultural sector requires a transition from a fragmented response to systemic risk management. The development of analytical tools based on the principles of priority and hierarchy allows state institutions and business entities to rationally allocate limited resources to neutralize the most destructive factors that threaten the economic stability of the industry.

To rank the identified threats by the degree of their impact on national security, it is advisable to use a matrix approach based on the assessment of two key parameters – the probability of an event and the depth of its negative consequences for reproductive processes in the agricultural sector. The risk matrix allows you to visualize the hierarchy of threats, highlighting destructive factors that require immediate intervention and zones of moderate impact, where it is appropriate to apply adaptation strategies.

Analysis of the matrix shows that threats of the first and second levels have a direct destructive impact on the liquidity and operational capacity of the agricultural sector. However, a particular danger is the cumulative effect, when the financial exhaustion of enterprises makes it impossible to invest in adaptation to climate change, which in the long term leads to an irreversible loss of resource potential. This justifies the need to build a multi-level

[8] Пріоритети розвитку реального сектора в умовах війни та повоєнного відновлення економіки України : аналіт. доп. / [О. В. Собкевич, А. В. Шевченко, В. М. Русан та ін.]; за загальн. ред. Я. А. Жаліла. Київ : НІСД, 2024. 104 с. URL: https://niss.gov.ua/sites/default/files/2024-02/ad_realsektor-2023.pdf

monitoring system that integrates satellite data, customs statistics and financial reports of enterprises into a single analytical ecosystem.

Building such a system allows you to predict not only individual risks, but also their synergy. For example, the combination of high fuel costs with limited access to export terminals creates a threat of stagnation, when the cost of production exceeds potential income. Real-time monitoring makes it possible to identify such conditions at the stage of weak signals.

Therefore, the use of matrix tools and the development of multi-level monitoring are necessary conditions for the transformation of the economic security system of the agricultural sector from a reactive model to a preventive one. This will allow not only to neutralize current military threats, but also to form a strategic reserve of resilience for the post-war restoration of the industry on the basis of sustainable development and global competitiveness.

35.3. Methodological Tools for Assessing the Level of Economic Security of Agricultural Enterprises

Substantiation of the methodological basis for assessing security at the enterprise level is a fundamental stage that ensures the transformation of theoretical concepts into applied tools for audit and management activities. The choice of a certain methodological paradigm determines the composition of the analytical apparatus and defines the principles of the functioning of the system for ensuring the integrity of the resource potential, forming strategic parameters for the functioning of the business entity in the conditions of volatility of the market environment. This allows you to systematize the process of identifying internal and external threats, transforming disparate indicators into a structured information base for making strategic decisions. The use of a substantiated methodology guarantees the objectivity of assessing the state of the enterprise and contributes to the development of effective preventive measures aimed at maintaining long-term financial and operational stability.

Modern scientific thought identifies several fundamental schools that form the logic of analyzing the security of the agricultural sector. Each of these schools offers its own hierarchy of priorities, where both static resources and dynamic development processes can be the object of protection. The central element of the methodological choice is to determine the relationship between the functional and systemic vision of economic sustainability, which directly affects the accuracy of diagnosing enterprise vulnerabilities.

The following approaches can be seen to assessing the level of economic security of agricultural enterprises:

1. The functional approach is based on the decomposition of security into separate specialized areas: financial, intellectual and personnel, technical and technological, legal and environmental. Within the framework of this methodology, security is perceived as the aggregate state of protection of key business processes from destructive influences. The assessment usually comes down to the analysis of local indicators in each area with the subsequent derivation of an integral indicator. This approach is effective for operational management, as it allows you to accurately localize the problem, for example, to identify a critical level of debt or obsolescence of the technical fleet. However, its limitation lies in its fragmentation: it often ignores hidden connections, when improvements in one function (for example, savings on personnel) lead to a systemic collapse in another.

2. The systems approach considers an agricultural enterprise as a holistic organism that is in a state of constant adaptation to the requirements of the external environment. Here, security is interpreted as the ability of the system to maintain its structure and implement development goals despite any market or climate transformations. The systems methodology is focused on assessing the survival potential and flexibility of a business. It allows you to take into account the synergy between resources and processes, analyzing the enterprise not as a set of departments, but as a single value creation mechanism. Such analysis is indispensable for developing long-term resilience strategies, although it requires more complex mathematical and information support.

In addition to the functional and systemic approaches that constitute the theoretical core, specialized schools are distinguished, based on the works of modern institutional economists and risk management theorists.

3. The resource-functional approach is the result of a synthesis of classical resource theory and functional analysis. It is based on the idea that the security of an enterprise primarily depends on the availability and quality of strategic assets (land, equipment, capital), and only then on the efficiency of their use. It means that assessing the security of a farm begins with an audit of its physical base. For example, if the soil is degraded and the equipment is worn out, then no effective process management can guarantee a high level of security.

4. The system-integration approach arose within the theory of strategic management of large corporate structures. Its origin is associated with the need to analyze not only the internal environment of an agricultural holding, but also its complex external relations: from relations with global traders to interaction with international financial institutions. This approach means that the security of a holding is assessed through its ability to integrate various links (production, processing, logistics) into a single sustainable chain. Here, the main object of

analysis becomes synergy – the ability of a system to be greater and stronger than the sum of its individual parts.

5. The network-system approach is relatively new to agricultural science and is based on the theory of network economics. It is applied mainly to cooperatives and associations of agricultural producers. The main idea is that the security of an individual network participant depends on the stability of the entire network. This approach means a transition from assessing individual resilience to analyzing collective resilience. Within the framework of this methodology, the security of a cooperative is considered as the reliability of horizontal connections. For example, if one farmer collapses, the network structure must have support mechanisms that will not allow the entire association to destabilize.

6. The risk (probabilistic) approach is often integrated into the systems analysis of large companies. It comes from mathematical schools of uncertainty analysis. Its essence lies not in fixing the current state, but in predicting the probability of threats in the future. Security assessment using this methodology means calculating scenarios: what will happen to the enterprise in the event of a change in the exchange rate, the introduction of export duties, or the onset of extreme drought. This turns the security system into an active tool for anti-crisis planning.

The use of these approaches allows you to form a multidimensional analytical model that corresponds to the complexity of modern agrarian relations. Each of them fills the gaps in the traditional methodology, allowing you to take into account the specific vulnerabilities of both a small farm and a transnational corporation.

The justification for choosing a methodology for large structures, such as agricultural holdings, is based on the need to manage geopolitical risks and complex financial flows, which makes a systemic approach the only possible way to adequately reflect reality. In contrast, for small producers, the functional approach is more pragmatic, as it provides specificity and clarity of the toolkit without overcomplicating analytical procedures. Thus, methodological adequacy becomes a guarantee that the assessment results will be used to actually strengthen security, and will not remain a formal statistical report.

Methodological justification of the choice of approaches to security assessment creates the necessary analytical foundation, but its practical implementation requires filling with specific tools. Formation of a system of indicators is the process of translating theoretical concepts into the plane of measured values, which allows management not only to record the current state

of security, but also to identify critical points of destabilization of the business entity.

The system of indicators of economic security of an agricultural enterprise appears as a set of quantitative and qualitative parameters that comprehensively reflect the state of its viability and resistance to external influences. The justification of this system is based on the principle of representativeness – each selected indicator should be as sensitive as possible to specific agricultural risks. Quantitative indicators ensure the objectivity of the analysis through the use of accounting and statistical reporting data, while qualitative indicators (business reputation, level of innovative activity, staff loyalty) allow us to take into account implicit threats that are difficult to formalize, but significantly affect strategic sustainability.

The distribution of indicators by functional subsystems allows for a deep analysis and a clear structuring of the safety audit. Within the framework of an agricultural enterprise, it is advisable to highlight the following key blocks [9]:

− Financial subsystem. It acts as a core element of security, as it determines the ability of the enterprise to finance its activities and withstand market shocks. The key indicators here are the current liquidity ratio (the ability to repay liabilities on time) and the autonomy ratio (the share of equity in assets). The high financial dependence of an agricultural enterprise on external loans in the conditions of seasonal production is considered one of the main threats to its existence.

− Production subsystem. It reflects the efficiency of using the material and technical base. The priority indicators are the return on assets and the level of yield of the main crops compared to the average regional values. A decrease in yield below the profitability threshold is a direct signal of the loss of production security.

− Personnel subsystem. It assesses the quality of human capital as the main intellectual asset. Indicators of personnel turnover and the level of qualification (the share of personnel with higher specialized education) allow diagnosing threats to intellectual potential. In the agricultural sector, the shortage of qualified agronomists or engineers can be a greater obstacle to development than the lack of finances.

− Ecological subsystem. It is of particular importance in the context of sustainable development. The state of soil fertility (humus content) and the level of chemicalization (the amount of pesticides per unit of production) are

[9] Шульга О. А. Формування ефективної системи управління економічною безпекою аграрного сектора економіки: монографія. Київ : ЦП «КОМПРИНТ», 2026. 284 с.

indicators of long-term resource security. Violation of ecological limits today inevitably transforms into economic losses in the future.

An important stage in the formation of the system is the determination of threshold values of indicators – critical markers that delimit the zones of safe, pre-crisis and dangerous conditions. The threshold value is a quantitative limit, the crossing of which indicates the beginning of destructive processes in the system. For agricultural enterprises, such values cannot be universal: they must be adjusted depending on the specialization (crop or livestock) and the natural and climatic zone of the farm.

The determination of these markers allows the management system to operate in an early warning mode. When the indicator approaches the threshold value, the anti-crisis response mechanism is triggered, which allows preventing the enterprise from entering a state of collapse. Thus, the formed system of indicators turns into an effective navigation device that ensures the stable movement of the enterprise along the trajectory of safe development. It is worth noting that in economic science there is no single regulatory act that would establish universal threshold values for all types of enterprises. The definition of these markers is based on the synthesis of financial theory, industry standards of the agricultural sector and empirical research of leading scientific schools. The definition of the system of indicators and their threshold values creates the necessary information base, however, to obtain a reliable conclusion about the state of the business entity, an adequate mathematical apparatus is required. The classification of methods of analysis and calculation of the level of security allows you to choose exactly the toolkit that most fully corresponds to the specifics of agricultural production, taking into account both strict financial reporting and poorly formalized environmental or social factors. Modern mathematical and statistical tools for assessing security are based on the desire to reduce a multidimensional system of indicators to a clear hierarchy of states. The choice of method depends on the depth of the required analysis and the availability of source data.

The main approaches used in domestic and global agribusiness practice are indicator, resource-functional, rating and expert methods.

The indicator method is the most common in the practice of economic diagnostics. Its essence lies in comparing the actual values of the enterprise's performance indicators with their normative, industry-average or predetermined threshold values. The main advantage of the method is high objectivity and ease of interpretation of the results. Any deviation from the norm immediately signals the emergence of a threat. However, a significant drawback is the complexity of establishing the standards themselves for the

agricultural sector, where indicators can vary greatly depending on the natural and climatic conditions of the region.

The resource-functional method shifts the emphasis from fixing deviations to assessing the effectiveness of using corporate resources to prevent threats. Within the framework of this approach, it is analyzed how effectively the enterprise transforms its land, personnel and financial potential into a state of security. The advantage of the method lies in its ability to identify internal reserves for increasing resilience, however, it requires a complex system of collecting internal information and a deep understanding of technological processes, which often complicates its application for external analysts.

The scoring and rating methods are focused on integrating heterogeneous indicators (for example, yield and liquidity level) into a single digital assessment. This is achieved by ranking the indicators and assigning them a certain number of points depending on their importance or deviation from the standard. The main advantage is the ability to conduct a comparative analysis between different enterprises or branches of an agricultural holding (benchmarking). The disadvantage is a certain subjectivity in determining weighting factors for various parameters, which may somewhat distort the final security picture.

Expert assessment methods are becoming indispensable in the analysis of qualitative characteristics that are not amenable to direct digital formalization (for example, the level of political risk, management quality or local community loyalty). Using expert knowledge allows us to take into account implicit threats and strategic opportunities that are not reflected in financial reporting. The main advantage is the flexibility and depth of analysis, but the method is vulnerable to expert subjectivity and requires careful selection of specialists to ensure the reliability of the conclusions.

Therefore, the choice of a specific method or their combination depends on the purpose of the study and the specifics of the agricultural enterprise. The most reliable results are obtained by the combined use of the indicator method for assessing quantitative parameters and expert assessments for analyzing the qualitative state of the system. This allows us to form an objective digital security profile, supported by a deep understanding of contextual risks.

However, traditional assessment methods based on the analysis of retrospective data often prove insufficient to ensure the survival of an agricultural enterprise in conditions of high turbulence. The transition from the assessment of past losses to predictive management requires the introduction of probabilistic tools that allow modeling future states of the system and assessing

its viability under extreme scenarios. That is, it is necessary to use probabilistic and predictive methods of risk assessment.

It is because of this that the modern threat forecasting tools in the paradigm of economic security of the agricultural sector shift the focus to identifying hidden vulnerabilities through simulation modeling and stress testing. One of the most powerful methods is Monte Carlo modeling, which is based on conducting a large number of iterative calculations with random variation of input parameters (fertilizer prices, precipitation levels, exchange rates). This allows you to obtain not one point value of the expected profit, but a whole probability distribution, which provides an understanding of the chances of maintaining financial stability under the most adverse circumstances. Unlike static forecasts, simulation modeling takes into account the correlation between risks, when one negative factor (for example, drought) enhances the effect of another (deficit of working capital).

An important place in the predictive analysis system is occupied by "what-if" scenarios and stress testing. Stress testing involves assessing the critical impact of hypothetical shock events on key security indicators. For the agricultural sector, such events can be a complete stop of export logistics, a sharp increase in the cost of energy by 50%, or a massive loss of crops due to pests. Scenario modeling allows you to develop anti-crisis plans in advance, transforming the security system from reactive (response to an event) to proactive (preparation for an event).

The justification for the importance of taking into account specific agricultural risks when calculating the integral level of resilience is based on their exogenous nature and high destructive power. For the domestic agricultural sector today, it is critically important to integrate the following groups of factors into mathematical models:

− biological risks (epizootics in livestock and epiphytotics in crop production, which can instantly devalue production potential);

− climatic risks (abnormal temperature regimes and moisture deficit, which require the inclusion of probability loss coefficients in financial plans);

− military risks (specific threats associated with mine hazards, destruction of elevator infrastructure and blocking of ports, which requires separate discounting of asset value and assessment of restoration cost).

Integration of these specific factors into predictive models allows calculating the VaR indicator – the maximum probable loss that an enterprise can suffer during a certain period with a given confidence probability.

The use of probabilistic and predictive methods allows you to turn the economic security system into an effective navigation tool. This provides not

just protection from known threats, but also preparing the enterprise to work in conditions of complete uncertainty, which is a prerequisite for the formation of agricultural resilience in the face of global challenges.

However, to ensure a high level of agricultural resilience, it is not enough to have a static assessment methodology. It is also necessary to develop a clear procedural sequence that would transform theoretical calculations into a dynamic management system. Algorithmization of the monitoring process allows you to transform disparate data flows into a structured analytical basis for making preventive management decisions that minimize the likelihood of the enterprise entering a critical state.

The algorithm for continuous monitoring of the security status of an agricultural enterprise is based on a cyclical process that includes four key stages. The first stage is the differentiated collection of primary information, where internal reporting (financial balance sheets, technological maps) is synchronized with external sources (stock quotes, meteorological data, changes in legislation). The second stage involves analytical filtering and verification, where the collected data is checked for reliability and relevance. The third stage is the direct calculation of indicators and comparison with threshold values, which allows identifying the risk zone. The cycle is completed by visualizing the results in the form of interactive dashboards or strategic maps, which visually demonstrate bottlenecks in the subject's protection system. The role of digital platforms and precision farming systems in this process is revolutionary, as they act as sources of objective data for calculating security in real time. Unlike traditional reporting, which has a significant time lag, data from soil moisture sensors, yield monitoring systems and satellite images (NDVI) allow assessing production and environmental safety directly at the moment of threat. This ensures methodological accuracy of calculations, eliminating the human factor and errors of subjective perception of the condition of crops or equipment. Thus, precision agriculture becomes the foundation for building a digital twin of enterprise safety, where each deviation from the technological regulations is recorded as a potential risk.

The implementation of such an algorithm allows an agricultural enterprise to move to a predictive monitoring model, where the system does not simply record the fact of damage, but predicts its occurrence based on the dynamics of input data. For example, combining data on moisture deficit from the precision agriculture system and information on rising energy prices from external markets allows the algorithm to calculate the threat to the financial autonomy of the enterprise in advance before the harvest begins. Such algorithmization transforms economic security from a passive control function into an active tool

for strategic survival in a highly competitive and climatically unstable environment.

The final stage of the analytical process in the economic security system is the transformation of the results of statistical and mathematical calculations into effective management imperatives. Without proper interpretation, the data obtained are devoid of practical value for management, therefore, the formation of a logical connection between the calculated indicator and the strategic response of management is a key condition for the viability of an agricultural enterprise.

The methodological justification of the assessment scale is based on the definition of transitional states through which the system passes under the influence of internal and external factors. In the scientific practice of agrarian economics, the most common is the three-level scale, which allows to clearly differentiate the necessary intensity of management intervention. The stability zone is characterized by the presence of all key indicators within the target benchmarks. That is, here security is maintained through planned measures to strengthen potential. The risk zone indicates that indicators are approaching threshold limits, which requires adjustment of current operational plans. The crisis zone signals destructive changes in reproductive mechanisms, where further functioning of the entity without radical restructuring becomes impossible.

The mechanism for transforming assessment results into plans for protecting economic interests has a hierarchical structure. At the operational level, monitoring becomes the basis for immediate resource maneuvering. For example, when a liquidity threat is detected, management makes a decision to optimize cash flows or attract additional working capital. At the strategic level, integrated security assessments are used to update the overall development model. If an enterprise has been in a state of vulnerability due to environmental factors for a long time, the management decision should be to transition to regenerative agriculture technologies, which is included in the long-term strategy.

The justification for the need for a cyclical assessment process is due to the high variability of the agricultural environment. A one-time security analysis is of limited value, since it reflects the state of the system only at a certain moment, which is insufficient in the context of climate change and military threats. Only continuous repetition of the «observation – analysis – action – control» cycle ensures proper adaptability of the management system. Each new stage of assessment takes into account the experience of previous periods, allowing the security system to improve and become more resilient to future challenges. This turns the security function into a constant process of maintaining a balance between the internal capabilities of the agricultural enterprise and the requirements of the external environment.

CONCLUSIONS

1. It has been established that security and sustainability are complementary vectors: the financial stability of enterprises creates a resource base for the implementation of environmental standards, while adherence to the principles of sustainable development acts as a strategic tool for eliminating external economic threats, such as transboundary carbon barriers. The social component of this paradigm ensures the preservation of human capital as the main factor of the internal resilience of the state.

Substantiation of the concept of an effective system of management of economic security of the agricultural sector made it possible to identify key criteria for its effectiveness: self-regulation, minimization of transaction costs and the ability to achieve stable growth even in periods of deep crises. The convergence of resource, functional and performance approaches proves that modern agricultural policy should be based on the synergy of these approaches. This means simultaneous protection of the material base (land and equipment), optimization of internal business processes and strict orientation on target indicators of profitability and environmental neutrality.

2. The process of identifying and classifying threats allowed to structure destructive factors by their areas of manifestation and sources of origin. Exogenous threats, caused by geopolitical restrictions and volatility of world markets, create external pressure, which is amplified by endogenous deformations – technological backwardness and infrastructure gaps. A special place is occupied by specific threats of the war period, in particular the physical destruction of assets and mine pollution, which have a prolonged negative effect and can lead to the degradation of resource potential in the long term.

Ranking of threats using the developed risk matrix revealed that logistical blockades and financial exhaustion of producers have a critical level of priority. The cumulative effect of these factors creates the risk of technological collapse, when business entities lose the ability to simply reproduce production cycles. To neutralize these challenges, the need to build a multi-level monitoring system is justified, which allows identifying weak threat signals at the early stages. The constructed risk matrix showed that the greatest danger is the cumulative effect of the combination of financial exhaustion of enterprises and environmental degradation of territories, which requires an immediate transition to proactive management methods.

3. Systematization of the methodological assessment tools demonstrated the need to transition from static analysis to probabilistic and predictive modeling. It was determined that effective diagnostics of the state of the enterprise should be based on a combination of an indicator method that records deviations from

threshold values, with a systemic approach that takes into account the dynamics of internal business processes. The role of digitalization and precision agriculture systems as sources of objective information for calculating the level of security in real time is substantiated, which allows the management system to make adaptive decisions even before the system enters the crisis zone.

It was proven that economic security and the sustainable development strategy are not alternative paths, but act as a foundation and a reference point, respectively. The integration of the requirements of the European Green Deal, digitalization and the transition to regenerative land use are defined not simply as environmental requirements, but as strategic tools for strengthening security, allowing to level global challenges (carbon barriers, climate change). It is determined that an effective enterprise security system should be inclusive, technologically rich and focused on the long-term preservation of natural and human capital, which is the only possible way to ensure the viability of the domestic agricultural sector in a globalized world.

SUMMARY

The study is based on the conceptual convergence of the theory of economic security and the sustainable development paradigm, which involves a transition from passive protection to a strategy of dynamic resilience. It is established that sustainable development in the agricultural sector requires an integrated balance between economic growth, social well-being of rural areas and environmental responsibility. The author argues that economic security is the material foundation of sustainable progress, since financially unprotected enterprises are unable to invest in long-term environmental projects. Special attention is paid to the environmental component, where the preservation of soil fertility and biodiversity is considered as a safeguard against the systemic depreciation of agricultural assets. The social aspect of security focuses on overcoming inequality, preserving human capital in rural areas and supporting small farms as the basis for inclusive development. The paper identifies modern exogenous threats, in particular military aggression, logistical blockades and volatility of world markets, which put critical pressure on the profitability of the industry. Endogenous destructive factors are analyzed, among which technological backwardness, high depreciation of fixed assets and an acute shortage of qualified personnel dominate. The role of the innovation and technological vector, in particular precision agriculture and digitalization, in increasing the adaptability of agribusiness to the requirements of the European Green Deal is determined. It is proven that the implementation of decarbonization mechanisms and regenerative agriculture is a strategic tool for

maintaining access to premium international markets in the context of the implementation of CBAM. It is summarized that the formation of an integrated model of safe development allows transforming the agricultural sector into a key actor in achieving global goals of food and environmental stability.

References

1. Global report food crises 2025. URL: https://www.fsinplatform.org/report/global-report-food-crises-2025/
2. Agroecology and the Transition to Sustainable Food Systems. URL: https://worldfoodsystem.ethz.ch/outreach-and-events/past-events/agroecology-lectures-2021.html
3. FAO. The State of Food Security and Nutrition in the World 2025. URL: https://openknowledge.fao.org/bitstreams/e612e779-ec47-44c2-a3e0-499569c3422d/download
4. The European Green Deal. URL: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
5. Купінець Л. Є., Жавнерчик О. В. Екологічна безпека аграрного землекористування: теорія і механізми забезпечення: монографія. Одеса : ІПРЕЕД НАНУ, 2016. 316 с.
6. Економічна безпека України в умовах високих воєнних ризиків та глобальної нестабільності: експ.-аналіт. доп. / [Базилюк Я., Власенко Р., Власюк О. та ін.] ; за заг. ред. Я. Жаліла. Київ : НІСД, 2025. 104 с.
7. Державна служба статистики України: офіційний веб-сайт. URL: http://www.ukrstat.gov.ua
8. Пріоритети розвитку реального сектора в умовах війни та повоєнного відновлення економіки України : аналіт. доп. / [О. В. Собкевич, А. В. Шевченко, В. М. Русан та ін.]; за загальн. ред. Я. А. Жаліла. Київ : НІСД, 2024. 104 с. URL: https://niss.gov.ua/sites/default/files/2024-02/ad_realsektor-2023.pdf
9. Шульга О. А. Формування ефективної системи управління економічною безпекою аграрного сектора економіки: монографія. Київ : ЦП «КОМПРИНТ», 2026. 284 с.

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