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Strategic vectors of agribusiness development in Ukraine

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► **Abstract.** In the current conditions of war, the formation of strategic vectors of agribusiness in Ukraine is an integral part of economic development in the post-war recovery. The purpose of this study was to identify the tasks that will provide opportunities to eliminate the negative trends caused by the war. The study conducted a bibliometric review of scientific papers on agribusiness in Ukraine and the world. Such an analysis helped to track trends, identify gaps and unresolved areas for further research, and formulate strategic vectors for the development of the agricultural sector. The study substantiated changes and trends in agribusiness in Ukraine as a result of the comparative dynamics of Ukraine's share in global agricultural exports. The paper focused on the specific features of exports during the Grain Initiative and identified the key continents of exports. It was found that the key problems faced by the agricultural sector in Ukraine include the unstable geopolitical situation, martial law, environmental changes, labour force shortages, and rapid globalisation. International agribusiness activities have undergone dramatic changes caused by the full-scale invasion. That is why Hoshin Kanri's strategic model for the development of Ukraine's agribusiness during the war and post-war recovery allows identifying key factors, forming trends, and anticipating risks affecting agribusiness. The proposed strategy also accommodates the need for the necessary resources to implement innovations and attract investment. This will improve the organisational design of agribusiness-oriented enterprises. The formation

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of an agribusiness development strategy should be aimed at spreading innovations in agribusiness and the greatest involvement of enterprises in this area in innovative activities. The findings of this study can be used in the activities of agricultural enterprises

▸ **Keywords:** agrotechnology; agro-industrial complex; agroholdings; agribusiness ecosystem; export; grain initiative

▸ Introduction

A special subsystem of economic relations, such as agribusiness, has emerged relatively recently as a result of the combination of agrarian, industrial, and trade capital in the integration of industry and agriculture. The development of agribusiness in any country, as well as the improvement of its sectoral and territorial structures, contributes to the rationalisation of production, efficient distribution and use of resources and raw materials, ensuring the country's food security and the development of international activities. A turning point in the development of agribusiness was the full-scale invasion of the country, which resulted in the extensive loss resources and damaged or destroyed infrastructure. Many elevator capacities have been partially or completely destroyed or are located in uncontrolled territory (under occupation). In the global market, Ukraine has always been a key exporter of raw materials, and most of its products were transported using maritime logistics routes. From 2022, the hostilities have significantly restricted this mode of transport, leading to a global redistribution of trade flows to commodities such as base metals, mineral oils, and agricultural products (Bentley *et al.*, 2022). World trade, as well as the global economic outlook, has suffered significant damage as a result of the Russian military invasion of Ukraine (Ruta, 2022).

Agribusiness in Ukraine has undergone a transformation due to the war, climate change, environmental degradation, rising costs, and declining profitability from major crops. Businesses with livestock as a key activity have faced problems with access to necessary resources such as feed, medicines, or equipment. There is a shortage of labour, rising prices for electricity and fuel and lubricants, dependence on electricity supply schedules, and a general shortage of electricity. Researchers increasingly often focus their studies on the economic consequences of the Russian-Ukrainian war (Polinkevych, 2024). M. Behnassi & M. El Haiba (2022) considered food security issues in the context of military conflict, as they weaken the country's and nation's potential, impeding the cultivation and harvesting of crops, processing, transportation, and supply to the market. K. Mahlstein *et al.* (2022) examined the issue of economic development in wartime, with a key focus on the use of sanctions as a coercive tool for shaping international policy. Y. Fang & Z. Shao (2022) focused on the changes that commodity markets experience from the negative impact of war: shortages, food crisis, price increases, currency fluctuations.

Due to the military actions in the country, agricultural enterprises are experiencing challenges in providing agricultural resources, such as seeds, fertilisers, and pesticides. Agribusinesses must diversify by looking for new types of activities, as well as change markets and find new buyers. T. Glauben *et al.* (2022) focused on grain market analysis and food security measures, M.A.R. Estrada & E. Koutronas (2022) addressed the effects and consequences of economic sanctions on trade. The recovery and development of agricultural business in Ukraine requires the development of effective strategic decisions. This is a rather lengthy process that depends on financing and attracting foreign investment, finding innovative approaches to agricultural activities, and securing stable export routes and logistics flows. The post-war recovery of agriculture in Ukraine means the development of agricultural technologies that will contribute to the efficient and rational use of resources, automation, increased competitiveness, and improved market relations and the economy of Ukraine overall (Shults & Lutskiv, 2024). N. Skorobogatova (2023) considered the ecosystem of agribusiness as a way to a balanced recovery of the agrarian economy of Ukraine, while S. Zakharin *et al.* (2021) presented approaches to the strategic management of the agro-industrial complex, which are effective for implementation during the post-war recovery of the country.

The purpose of the present study was to formulate strategic vectors for the development of agribusiness in the context of war and during the post-war reconstruction of the country. Based on this purpose, the study solved the following tasks:

- conducting a bibliometric review of literature sources to identify key clusters and research areas on agribusiness in Ukraine and the world;
- substantiation of changes and trends in agribusiness in Ukraine;
- development of the Hoshin Kanri strategic model for the development of agribusiness in Ukraine during the war and post-war recovery.

▸ Literature review

The scientific basis for business process management is reflected in all areas of economic activity. The agrarian sector of the economy is no exception, which was later transformed into a separate area, namely agribusiness. In the first half of the 1950s, the term "agribusiness" was first mentioned in scientific studies as a vertical integration of activities. H.J. Davis & R.A. Goldberg (1957) were among the first to define agribusiness as a system of combined operations for the production and distribution of goods in the agricultural sector. The key areas of agribusiness are production operations on the farm, storage, and processing of agricultural products and finished goods. Thus, the concept of agriculture has acquired a new vector and expanded its scope. A little later, G. Sykes (1963) published a paper describing agribusiness as a close relationship between agriculture and industry, which jointly focus on the processing and marketing of agricultural products.

Over time, a new vector and approach to the concept of agricultural management has become increasingly popular. The production, processing, manufacture of agricultural goods and trade development as areas of agribusiness have become an economic sphere of activity for countries and a new area of research for scientists. J. Baran & J. Żak (2014) presented an analysis of transport activities carried out in different agribusiness entities, which resulted in a general rating of transport units operating in the considered agribusiness enterprises. The researchers defined a coherent system of criteria that allows evaluating transport activities in agribusiness, including both universal advantages and specific features of transport. An evaluation matrix was built and a rating of 10 transport units was formed.

I. Kovalchuk *et al.* (2021) considered the legal regulation of agribusiness as a relatively new area of activity, while Ya. Pushak *et al.* (2021) described the benefits of an economic security assessment system that determines macroeconomic sector trends. T. Gagalyuk *et al.* (2021) identified the benefits of corporate social responsibility in the activities of agricultural enterprises, which is significant in meeting the defined sustainable development goals for the period up to 2030. O. Demchenko *et al.* (2023) investigated the determinants of human capital development in the context of global challenges. Within the framework of the presented study, the literature review covered papers with a special focus on the agribusiness of Ukraine in the context of the war that began in 2014 and intensified after the full-scale invasion by Russia in February 2022.

A. Mazur *et al.* (2018) examined the issues of organisational reform of the agro-industrial complex to optimise them to meet the requirements of an advanced model of agricultural economic development. The significance of this topic is determined by the content and vector of systemic transformations in the agricultural sector of the economy aimed at forming a competitive and economically attractive management system. Some components of the presented model are also relevant for the strategy of agribusiness development in Ukraine in the post-war period. K. Nazarova *et al.* (2020) studied the trends in the development of the agricultural market of Ukraine. The researchers proved the significance of the agricultural sector for the national economy by considering its share and dynamics in GDP formation, the balance of key indicators in the agricultural market, and the necessity of attracting investors. However, the conclusions presented have lost their relevance due to the occupation of certain territories of the country and the mining of agricultural fields, which will require humanitarian demining.

That is why the study by L. Shovkun-Zablotska *et al.* (2024) is relevant, where the researchers chose the development of areas and tools for managing agricultural enterprises in the context of war in Ukraine as the purpose of the study. The objectives of the study were to develop a mathematical model of the operational change of the goal of an agricultural enterprise, to establish the conditions for changing the goals of agribusiness, to determine the wartime requirements for agribusiness management and to assess the impact of the war on the components of the resource potential of agricultural enterprises. G. Fernandes *et al.* (2023) focused on the consequences of the armed conflict for shipping, which is indispensable for export-import operations of agricultural products. This article presented a quantitative assessment of the effects of the Russian invasion of Ukraine on various possible transport chains and the search for alternatives. A methodology for estimating the transport of agricultural products from Ukraine to a North African port was presented. The main conclusion of the study was that the costs for alternative transport chains increased at least twice.

E. Ribašauskienė *et al.* (2024) examined the most relevant strategies to ensure the resilience of the agricultural supply chain in the face of disruptive events. Innovation, cooperation, diversification, and knowledge accumulation are assessed as possible agribusiness strategy options. R. Goyal & S. Steinbach (2023) investigated the changes in the futures market in the wake of the Russian invasion of Ukraine and the Black Sea Grain Initiative. The study estimated that agricultural futures prices were 16% higher than hypothetical prices during the first nine weeks after the full-scale invasion. In contrast, the Black Sea Grain Initiative did little to change traders' perceptions of agricultural commodities in relation to the uncertainty of the futures market caused by the Russian-Ukrainian war.

In the analysis of trade in grains and oilseeds, S. Ahn *et al.* (2023) found that imports from Ukraine were 78.2% lower between February and July 2022. The researchers showed that the Russian-Ukrainian war had significant trade implications for the countries directly involved, but only limited ones for the global grain and oilseed markets. N. Volkova *et al.* (2023) studied the quality and competitiveness of agricultural products and agricultural enterprises in the context of Russian military aggression. The researchers proved that agribusiness needed an effective strategy and management approaches in wartime. O. Garafonova *et al.* (2023) analysed the damage caused by the war to Ukraine and agribusiness specifically. The researchers analysed the distribution of losses in the agricultural sector of the economy, including agricultural machinery, grain storage, livestock, and raw materials. The researchers also identified the principles of recovery after the war, which included gradual development, integration into the EU, investment promotion, creation of agricultural holdings, and cluster development of agricultural activities.

Y. Miao & T. Kharchenko (2023) focused on the development of an innovative strategy for managing agribusiness in the context of globalisation, while A. Mykhailov *et al.* (2021) developed investment tools for managing innovations in agribusiness. Thus, the analysis of the literature showed that agribusiness in wartime is a relevant area of interest for researchers in various fields, countries, and institutions. That is why it is important to conduct a bibliometric review in this area to identify scientific clusters and trends in the field of agribusiness.

▸Materials and methods

The methodological framework of this study was formed by general and special scientific approaches and methods. The general scientific approach was the basis for the formation of prerequisites, trends, and patterns in the sustainable development of agricultural business. The

dialectical approach helped to formulate the philosophical aspects, factors, and conditions of agribusiness during the war. Based on the critical (evaluative) approach, the contradictions, critical aspects, and paradoxes of business focused on the strategic vectors of agribusiness development were identified. The application of systemic and synergistic approaches helped to form a holistic view of the formation of the agribusiness strategy of Ukraine.

The development of quantitative research was largely driven by the availability of modern bibliometric databases that provide information on publications and their citations. A bibliometric database contains bibliographic information about scientific publications on agribusiness and allows tracking their citations. Each of the existing databases has its specific features, set of functions, capabilities, and limitations. To study agribusiness issues, the study chose the Scopus scientometric database, which allows analysing scientific literature (and through it, the academic community) by a series of quantitative indicators, such as the number of publications, citations, number of co-authored papers, and complex production indicators. The bibliometric method was also employed to analyse the literature in the Scopus database. The analysis did not include any restrictions on the language of publication or country. In addition, no time limits were set for the period of publications, since the subject of agribusiness is relatively new, and the total number of papers (n = 8,710) does not exceed the limits set by the Scopus database. To assess the authors' influence, the profiles of individuals automatically generated by the Scopus database based on maximising publications were analysed. The presented profiles allow comparing authors by the number of publications, number of citations, and Hirsch index level. Information for the documents that met the requirements was filtered by the keywords "agribusiness", "agribusiness AND strategy", "agribusiness AND Ukraine". The Scopus scientometric database, which was chosen as a basis, contained 8,710 papers (as of August 2024) on the keyword "agribusiness" since 2004. This is because agribusiness has recently emerged from the field of agriculture, yet it is becoming increasingly relevant every year.

For the bibliometric analysis, the study used the online platform for monitoring and analysing international scientific research using visualisation tools and modern citation metrics of Scopus and the VOSviewer tool for building and visualising bibliometric networks. The application of the software helped to identify the principal links between existing data visualisation concepts and to identify new and little-studied aspects in the field of agribusiness. The map developed using VOSviewer software clearly demonstrates the frequency of terms that are used at least five times in publication titles, abstracts, and keywords, as evidenced by the size of the circle and the font size of the term. Thus, the larger the circle, the more publications contained the term associated with the keyword. Based on the colour, one can determine the belonging to a certain cluster of interrelated terms. Network visualisation displayed a system of interconnected terms (the closer they are to each other, the greater the level of semantic proximity) both within the same cluster and between clusters. The lines depicted on the map reflected the connections between individual keywords. Thus, the results of the study allowed forming clusters, each of which combined a different number of thematically close keywords with varying frequencies of use and overall proximity of connection. The study also applied the Hoshin Kanri methodology to formulate a strategy for Ukraine's agribusiness. The built model will facilitate the alignment of strategies at enterprises, as well as the improvement of business processes for cross-functional management. The study employed the authors' publications, which are mostly presented in the Scopus database, regulatory documents of the Ministry of Agrarian Policy and Food of Ukraine (2023), and reports of the Main Agribusiness Website (Agribusiness of Ukraine, n.d.).

▸ Results

Agribusiness is a form of entrepreneurial activity in the agro-industrial sector of the Ukrainian economy. This sector includes business activities in the supply of inputs (fertilisers, machinery, seeds, and pesticides); agricultural production itself (crop and livestock production); processing, storage, and trade of raw materials and finished products. Notably, agribusiness includes certain types of activities related to the agricultural sector, such as market infrastructure and agro-services. To fulfil the purpose of the study, a network map of interconnections was built using the keyword "agribusiness", which helped to identify key scientific clusters that reflect the features, advantages, and disadvantages of agribusiness (Fig. 1). The mapping of interrelationships using VOSviewer software revealed that agribusiness issues are reflected in 18 scientific clusters. The clusters presented in Figure 1 demonstrate that agribusiness is not a separate area of scientific and practical interest, but is interconnected with logistics and management processes, territorial features, ecosystems and digital technologies, agriculture and food, economic and political features. Further study of the bibliometric data helped to build a network map of interactions in Figure 2. Thus, the greatest scientific attention to agribusiness was concentrated in the United States, Brazil, Indonesia, India, Germany, and Italy. The study of mutual citations between representatives of different countries shows a description of general trends in agribusiness, as well as an analysis of key issues in the world and global changes in the world economy. Out of the submitted papers, the Scopus scientometric database identified only 129 documents that address the issue of agribusiness in Ukraine. The bibliometric review helped to form a scientific portrait of the key authors, as it allowed analysing the number of published papers, citations, the author's h-index, as well as the titles of key and most cited papers (Table 1).

The diagnostics of the scientific portrait showed that the Scopus scientometric database does not contain a significant number of papers on agribusiness in Ukraine. Publications from 2021 onwards have become particularly popular, but there are virtually no papers describing the strategy for agribusiness development and prospects for the country's recovery in the post-war period. The study also found that by subject area, the largest number of publications belongs to Economics, Econometrics, and Finance (n = 63); Agricultural and Biological Sciences (n = 48); Business, Management, and Accounting (n = 47); Social Sciences (n = 39); Environmental Science (n = 16).

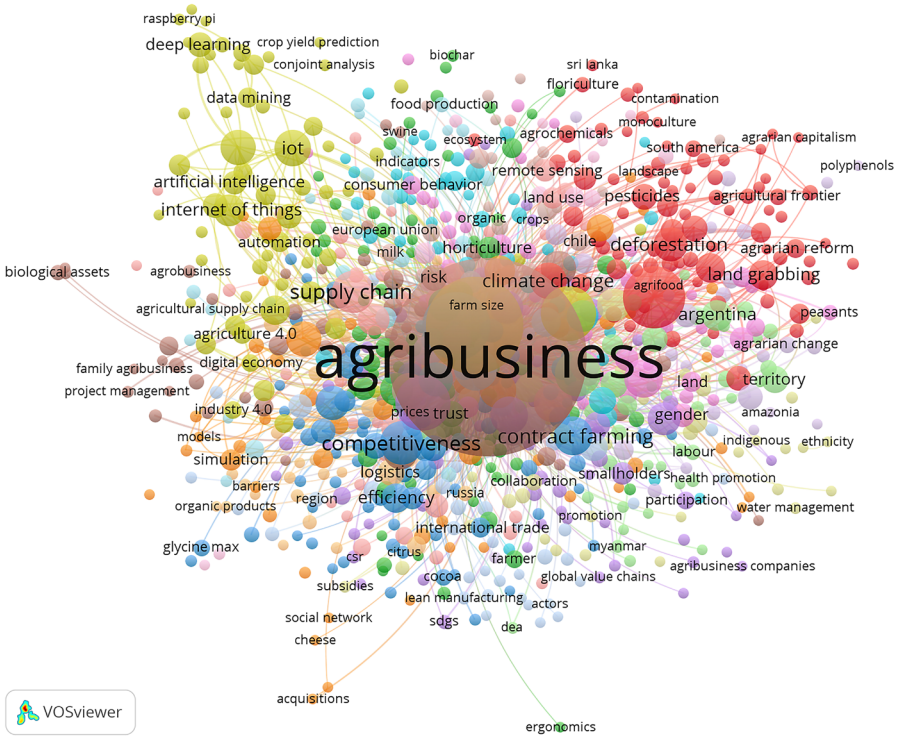

Figure 1. Clusters formed during research on the term "agribusiness"
Source: compiled by the authors of this study based on scientific publications indexed by the international scientometric database Scopus using the VOSviewer tool

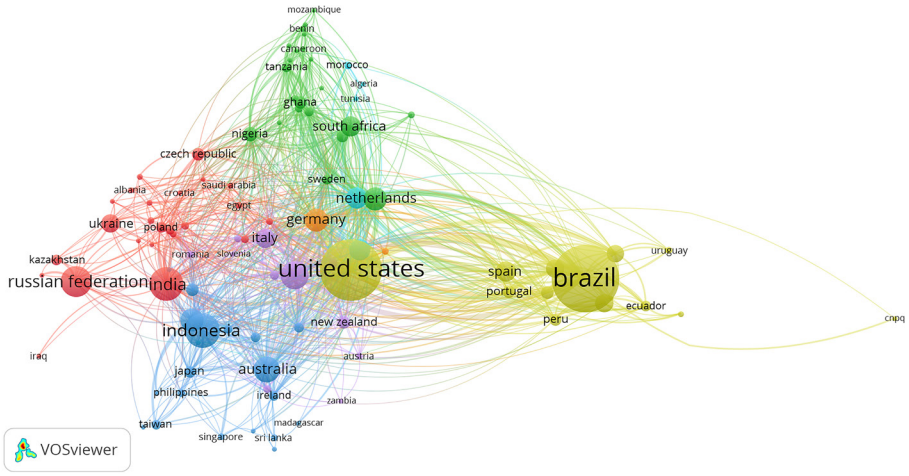

Figure 2. Network map of connections between scientists in different countries of the world
Source: compiled by the authors of this study based on scientific publications indexed by the international database Scopus, using the VOSviewer

Table 1. Scientific portrait of the first five authors of scientific papers on agribusiness in Ukraine as of 15 August 2024

Author name, affiliations, author profile	Total publications, including those on Ukrainian agribusiness	Citations by/h-index	Papers on the topic of agribusiness in Ukraine and number of citations in Scopus
Kucher, Anatolii V. Lviv Polytechnic National University, Lviv, Ukraine 57006415200	51/3	309/10	A. Kucher (2020) – 7 L. Pronko *et al.* (2020) – 23
Basiurkina, Nataliya Odesa National University of Technology, Odesa, Ukraine 57217103580	5/2	24/2	O. Demchenko *et al.* (2023) – 2 Ya. Pushak *et al.* (2021) – 14

Table 1 , Continued

Author name, affiliations, author profile	Total publications, including those on Ukrainian agribusiness	Citations by/h-index	Papers on the topic of agribusiness in Ukraine and number of citations in Scopus
Gagalyuk, Taras V. Leibniz-Institut für Agrarentwicklung in Transformationsökonomien, Halle, Germany 35117765300	28/2	287/12	T. Gagalyuk *et al.* (2021) – 3 T. Gagalyuk & J.H. Hanf (2009) – 9
Kharchenko, Tetiana B. Sumy National Agrarian University, Sumy, Ukraine 57203587295	9/2	36/3	Y. Miao & T. Kharchenko (2023) – 2 A. Mykhailov *et al.* (2021) – 3
Kovalchuk, Inna Lviv Polytechnic National University, Lviv, Ukraine 57219240814	4/2	4/1	I. Kovalchuk *et al.* (2021) – 1 I. Kovalchuk *et al.* (2020) – 1

Source: compiled by the authors of this study based on data from the Scopus database

A characteristic feature of agribusiness is that it is a combination of separate types of work and therefore covers the sowing and cultivation of primary raw materials, their processing, storage, and sale. Certain areas are confirmed to gain advantages through scientific research. However, the key conclusion of the bibliometric review was that there were virtually no studies that would focus on the agribusiness in wartime. After the full-scale invasion, some of Ukraine's agricultural products lost their positions in global exports. This is because a significant area of land has fallen under occupation, and military operations are taking place on other lands (Fig. 3), which has led to the alienation of land involved in agribusiness. Despite these changes, Ukraine has managed to largely preserve its agribusiness and, in some cases, improve its position. Positive trends are driven by the recovery of exports, albeit not in full, and by production, which continued even during the war (Fig. 4).

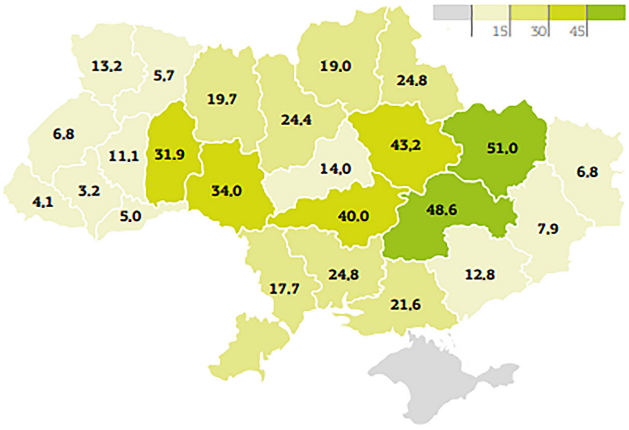

Figure 3. Area of alienated land in Ukraine due to war, by region, thousand ha (as of 31 October 2023)
Notes: total area – 492 thousand ha
Source: compiled by the authors of this study based on the infographic guide Agribusiness of Ukraine (n.d.)

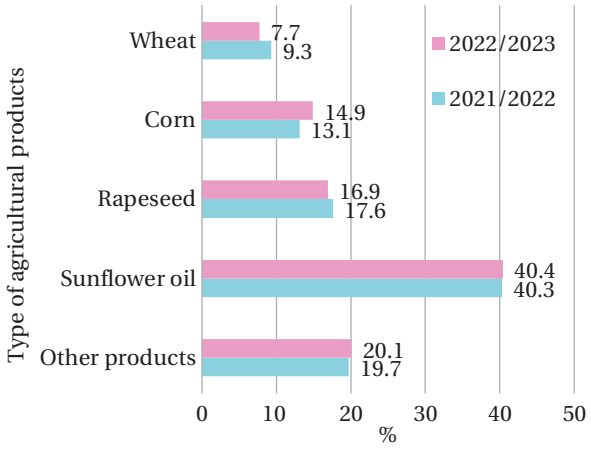

Figure 4. Comparative dynamics of Ukraine's share in global exports of agricultural products, %
Source: compiled by the authors of this study based on the infographic guide Agribusiness of Ukraine (n.d.)

An analysis of the data in Figure 4 suggests that agricultural products and their exports have hardly maintained their positions in the global market. Countries in different regions are dependent on Ukraine's raw material base and can only sustain their economies through imports. Changes in the trends of agribusiness in Ukraine have become a research interest for scholars. S. Ahn *et al.* (2023) considered the negative effects of the Russian invasion on global trade in grains and oilseeds, as well as major price fluctuations and threats to global food security. This situation has caused negative dynamics not only for Ukraine but also for many countries around the world. Countries such as Thailand, Iran, Bangladesh, and African countries have experienced a shortage of Ukrainian grain supplies, wheat and maize exports by India, and energy exports by European countries. This substantially affected the operations of agribusinesses due to disruptions in the resource management system.

A. Rose *et al.* (2023) described the disruption of grain exports and the emergence of a global food crisis as an economic consequence of the war. The results of the study were based on the analysis of the effects of the decline in grain exports and the deterioration of macroeconomic indicators in various regions of the world, as Ukraine is a key raw material base. Before the war, the main logistics for Ukrainian farmers was sea transport,

but the blockade of ports caused devastating damage and required the search for effective levers to overcome the situation. The best alternative was the creation of the Grain Initiative in August 2022, which became critically significant for Ukraine and enabled it to export 32.9 million tonnes of products (Fig. 5). In their study, H.M. Ay & A. Söylemez (2023) proved the benefits and significance of the Black Sea Grain Initiative for Ukrainian grain exports and analyse Turkey's policy when signing this agreement.

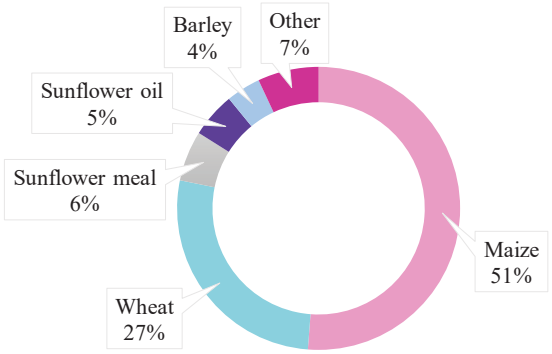

Figure 5. Ukraine's top five export commodities during the Grain Initiative, million tonnes
Source: compiled by the authors of this study based on the infographic guide Agribusiness of Ukraine (n.d.)

Only partial replacement of maritime transport by road is possible, but port infrastructure cannot be replaced. Despite the adaptation of agribusiness to new realities, farmers still cannot fully perform their work and face sales problems due to the constant shelling of border areas, infrastructure, and border blockades initiated by neighbouring countries. Another convincing factor in the development of Ukraine's agribusiness is the results of exports during the Grain Initiative, where the main consumers are Asia, Europe, and Africa (Fig. 6).

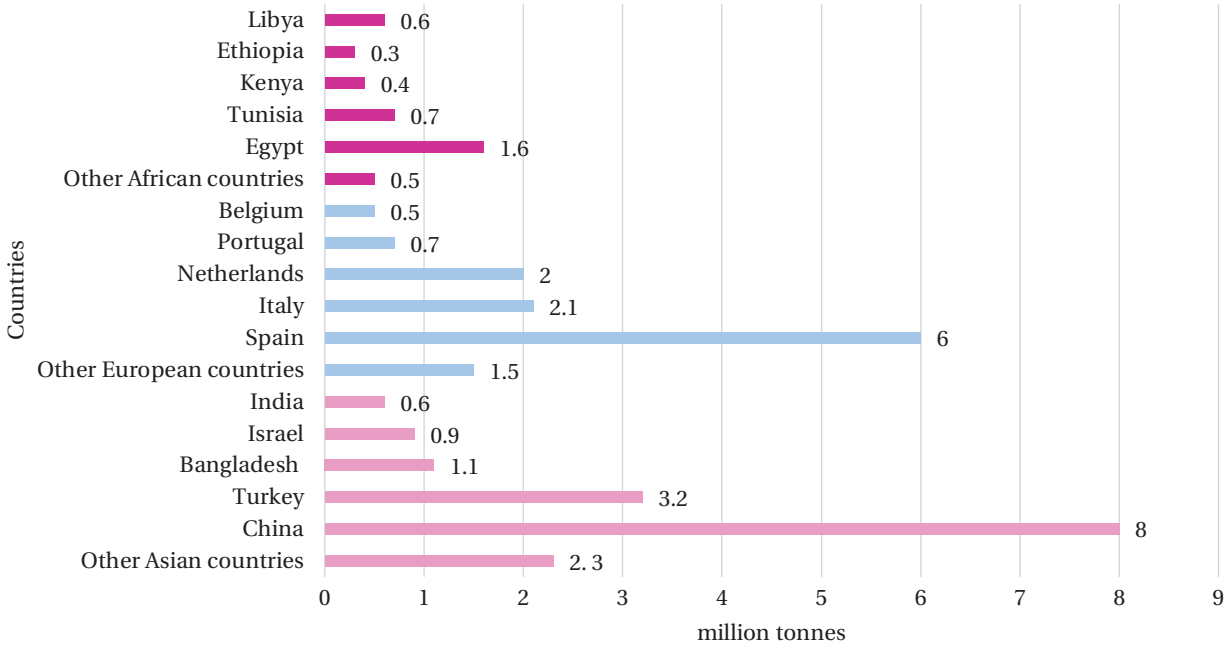

Figure 6. Geographical structure of exports during the Grain Initiative in 2022-2023, million tonnes
Source: compiled by authors of this study based on the infographic guide of Agribusiness Ukraine (n.d.)

Despite the war conditions, agrarians are trying to organise the sowing campaign as efficiently and fully as possible. There are certain trends and changes in spring crop sowing, such as a decrease in the area under maize, but an increase in the cultivation of oilseeds and some industrial crops. Alternatives must be found due to the mining of fields in the occupied territories, soaring prices for fertilisers and pesticides, and problems with the Grain Initiative. 2022-2024 resulted in a decrease in wheat and barley acreage due to the occupation of the southeastern regions of Ukraine. However, rapeseed plantings are still at a sufficient level, which raises the chances of successful exports. Scientometric databases contain a sufficient number of papers where the researchers focus on the issues of Ukrainian agriculture. For example, F. Urak *et al.* (2024) described the impact on agricultural prices

and food security in the context of the Russian-Ukrainian war, while S. Devadoss & W. Ridley (2024) investigated the effects of the Russian invasion of Ukraine on the global wheat market. It was found that the war has complicated international activities, export-import operations, and has led to an increase in prices and a loss of welfare of Ukrainian farmers. A. Qadir *et al.* (2024) estimated the sunflower acreage in Ukraine during the full-scale Russian invasion and calculated the reduction of the acreage and the shift of cultivation from the south to the south-central regions. As a result of the full-scale invasion, there was a considerable decrease in the number of livestock. This was caused by the destruction of farms and the occupation of territories.

Despite a drop in monetary terms, exports of livestock in physical terms increased slightly. A substantial portion of the poultry population was lost due to the occupation and hostilities in the eastern and southern regions of Ukraine. Most of the poultry farms that were not affected by the hostilities increased their livestock and established new logistics routes for export. The poultry sector benefited from improved access to the EU market, which helped to avoid market overload and slowed the growth of domestic prices. At the same time, exports of dairy products even increased due to improved access to the EU market and favourable prices on the world market. The war and food security were described by I. Rudolfsen *et al.* (2024), allowing for an assessment of the opportunities and losses for agribusiness in Ukraine.

The ongoing hostilities in the southeastern region of the country have led to a substantial decline in vegetable production. Farmers are forced to refocus their operations on other crops, change their activities, and enter new markets. Notably, exports declined due to the blocking of sea routes used to deliver to the Middle East and Asia. The situation in the fruit and berry market continues to be challenging, with producers facing obstacles in securing packaging materials, shortages and rising prices for fertilisers and pesticides, and problems with water and electricity supply. Despite the turbulent times since 2022, Ukraine has stayed one of the key suppliers of honey to the EU and is the second largest exporter. I. Svynous & N. Svynous (2023) described the development of cooperation as the basis for the formation of product supply in the honey market in Ukraine, and S.F. Razanov *et al.* (2024) described the productivity of bee colonies and biomonitoring of corbicular pollen and war-affected foraging plots of honey bees with cultivated clover.

The processing industry plays a strategically significant role in Ukraine's economy and has considerable potential for growth. With exports of agricultural raw materials blocked, the prospects for agro-processing and domestic investment by farmers in new production facilities are growing. Due to the logistical complications caused by the hostilities, the geographical structure of sugar exports has also changed, with sugar being able to be shipped to EU countries free of duties and tariff quotas. A poor harvest of raw materials and a drop in sugar production in Europe resulted in Ukraine's advantageous position on the global sugar market. Z. Mukhtar (2023) described not only changes in the sugar market in Ukraine, but also the overall impact of the Russian-Ukrainian war on food security and countries that have experienced food shock.

Thus, the changes and trends in the development of agribusiness in Ukraine under the influence of military operations allow identifying the key obstacles: rising costs of services, occupation of territories, damage and destruction, and risks of export operations. Power outages, rising prices for raw materials and fertilisers have led to a shift to alternative sources. Agrarians faced the problems of rising costs of grain processing and grain drying. Furthermore, it is impossible to conduct business in the temporarily occupied territories, while in the de-occupied territories there are threats from mine contamination of fields. Representatives of agribusiness faced the theft of agricultural products and machinery, as well as the misappropriation of industrial and domestic agricultural facilities. As a result of shelling of infrastructure and hostilities, many elevators were partially or completely destroyed. Farmers are trying to restore the operation of damaged equipment as quickly as possible by repairing it. Force majeure, blockages, and lack of stability in the operation of enterprises caused by military risks make it impossible to perform contracts for prompt delivery of agricultural products.

The full-scale invasion and ongoing military operations in Ukraine have led to certain adverse consequences, such as the loss of crops due to mined areas. Due to the inability to cultivate land and harvest, production volumes are decreasing and, accordingly, the economic situation in the country is deteriorating. The shelling and destruction led to the loss of a significant amount of agricultural machinery. The mined areas pose a threat to occupational safety and require humanitarian demining. The country's ecology has been irreparably damaged by the contamination of soil and ecosystems with chemicals. The unstable situation in Ukraine, the danger from constant shelling of the territory, elevated levels of corruption and poverty have led to an outflow of investors, which also considerably weakens the opportunities for agribusiness in Ukraine. That is why, considering the hypotheses and implications of the study of agribusiness trends, it is expedient to formulate strategic vectors for development.

In July 2023, the Ministry of Agrarian Policy and Food of Ukraine (2023) published the Strategy for the Development of the Agricultural Sector, thereby defining the vision of Ukraine's agricultural sector. The key areas of the strategy include food safety and quality, international cooperation, logistics, crop and livestock production, and the introduction of the latest technologies. Thus, four global trends in the development of agribusiness are planned to be implemented in Ukraine. The first is the growing demand for food, which is due to the steady increase in the world's population. The second trend is the issue of food security, which requires stable and coordinated work of agribusiness. The third trend is focused on the development and implementation of automation and digitalisation of agricultural processes, which helps to increase yields, reduce losses and ensure higher product quality. The fourth trend is focused on changes in climate conditions, which require innovative approaches to selecting and caring for grain varieties. Overall, for the successful development of agribusiness in Ukraine under the current conditions, it is necessary to actively introduce innovative technologies, improve the quality of agricultural products, improve supply chain management and try to maintain

stable conditions for the development of business processes. It is also necessary to improve methods of sowing, growing, storing, and supplying to ensure food security in Ukraine and reduce food shortages in the world.

M.F.B. Alam *et al.* (2023) described the crises and intense disruptions in the supply chain caused by COVID-19 and the ongoing Russian-Ukrainian war. The researchers are convinced that "Agriculture 4.0", which combines conventional agriculture with various modern innovative technologies, can help improve food supply to markets and food security. Thus, "Agriculture 4.0" can become a prospect for the development of Ukraine's agribusiness and ensure the sustainability of food security for the country's economy. The key finding of the study is that automation and robotics reduce the use of manual labour, and augmented reality (AR) is designed to teach farmers innovative skills, while providing financial incentives will support farmers in developing agribusinesses. F. Sgroi (2022) described the changes that the agricultural sector underwent under the influence of the COVID-19 pandemic. What is interesting about this study is that the measures presented for agribusiness development in a pandemic can be adapted to strategic directions of development in times of war. Currently, small agricultural enterprises cannot be competitive, as they increasingly operate in a globalised market, which leads to a gap between production and consumption. Cooperative strategies (aggregation of product supply), which underlie investment-based innovation, are the basis for the sustainability of agricultural enterprises. Considering the identified key trends of the "Strategy for the Development of the Agro-Industrial Complex", as well as the hypotheses in Figure 7, the Hoshin Kanri model of Ukraine's agribusiness strategy has been developed to help structure the factors, organisational design, risks, and trends in the future development of the agricultural sector. The areas presented in Figure 7 indicate that the agribusiness strategy should focus on the development of innovative technologies and the involvement of agricultural holdings in innovative activities. This will help improve key factors affecting agribusiness, avoid potential risks, and support current trends. The strategy of agribusiness in Ukraine involves the search for new methods, technologies, activities, and management solutions for production and sales. These areas will further contribute to the effective organisational design of agricultural enterprises. Effective implementation of the Hoshin Kanri Model by attracting the necessary resources will lead to increased profits and competitiveness of agricultural products both in Ukraine and on the global market, improved business processes, reduced costs, and increased customer satisfaction.

Cooperation with stakeholders/investors	Business processes of agribusiness management	Organisational processes of agricultural companies		Logistics and logistics routes	Lack of necessary government support	Complications in harvesting, especially in frontline regions	Reduction of sown areas	RESOURCES	Raw materials and supplies	Employees/personnel	Capital	Material and technical base of agribusiness, robotics	Technologies, software
*		*	Labour shortage due to migration and mobilisation	*	^	*				*	*	^	
^	^	*	Complex process of restoring deoccupied lands		*	*	*						*
	*		Mining of territories that prevents sowing	^	^	*	*		^	*	^	*	*
*		*	Neighbouring countries blocking the supply/export of agricultural products	*	*				*		*	^	
*	*	^	Increased cost of material and technical resources: seeds, fertilisers, pesticides, fuel, electricity		*	^	*		*		*		
	*	^	Global population growth		^				^				v
			Key factors affecting agribusiness / Organisational design of agribusiness / Risks of agribusiness / Agribusiness trends										
*	*	^	Growing demand for food	*	^		*						
	*		Food security	*	*	^	*						
	*	*	Increasing role of automation and digitalisation	^	*	*	^						
^	^	^	Climate conditions, climate change		^	*	*						

Notes:
** – direct dependence;*
^ – indirect relationship.

Figure 7. Hoshin Kanri's model for Ukraine's agribusiness strategy
Source: developed by the authors of this study

Implementation of the agribusiness strategy in Ukraine is possible even during the military operations that have been ongoing for years. The means of implementation can include grant methods for start-ups, the use of innovation vouchers in agribusiness, cooperation with scientific institutions, and rethinking the range of crops. It is critical for Ukraine to become a leader in the raw material base and establish processing plants in the country. Agribusinesses focused on further processing of grain or the implementation of joint projects to conduct several types of activities simultaneously can be much more productive.

Thus, the theoretical aspects and practical recommendations on agribusiness in Ukraine are relevant and will always be relevant in scientific research. Ukraine's geographical location allows for the implementation of the most radical innovative projects and modern technological capabilities and skills. During the war and post-war reconstruction of the country, the agribusiness strategy becomes relevant as part of the national economic development programme, which helps to create the preconditions for further implementation of the economic growth trend and sustainable development of the country's economic and food security. The implementation of the above requires a more thorough review of the issues outlined, which determines the prospects for further research on the subject matter of the study.

▸ Discussion

The agribusiness of Ukraine is a rather relevant area of research, as agriculture has historically been a key industry sector. Successful implementation of strategic recommendations for the development of agribusiness requires a comprehensive approach and constant analysis of market trends and consideration of consumer preferences. Furthermore, consumers come from countries on different continents, not just the domestic market. Therefore, to succeed in agribusiness, one needs to implement effective strategies. When developing and planning the implementation of such strategies, representatives of domestic agribusinesses should be guided by a clearly defined goal and target audience. Setting goals will help direct resources to the crucial aspects of the business, while identifying the target audience will help understand who the consumers are and how best to engage them in cooperation. This was the focus of the Hoshin Kanri Model for the development of Ukraine's agribusiness strategy. Overall, the development and implementation of effective strategic decisions is a crucial element of agribusiness development in Ukraine.

A bibliometric review of scientific papers using the keyword "agribusiness AND strategy" revealed a series of papers that mention the development of agribusiness. N. Reznik *et al.* (2020) considered the key aspects of innovation in the agro-industrial complex of Ukraine and the necessity of further innovative development, the principal provisions for the development of an effective innovation environment, trends in the globalisation of the international economy, and analysed the business environment of agribusiness entities. It is also relevant that, apart from numerous civilian casualties and unprecedented population displacement and migration, the Russian-Ukrainian war will have severe environmental consequences. Climate change and ecological processes are crucial for agricultural development, which leads to deteriorating dynamics (Babenko *et al.*, 2021). Hapich & Onopriienko, 2024 considered the potential for future agricultural development of the country on the example of the region using a new conceptual strategy for water management by changing the methods of field irrigation to save energy and resources. S. Demianenko & I. Sas (2023) described ways to improve agricultural land use in the context of global warming and the consequences of Russia's military aggression. Changes in Ukraine's agribusiness are ongoing, and this is not only due to external factors, war, or global climate change. It is also significant to consider the factors of the internal environment. The existing strategies or legislative framework contain a series of shortcomings and discrepancies that adversely affect the country's economy. A. Skrypnyk *et al.* (2020) identified the benefits of an agribusiness strategy under certain conditions, namely (maximising profits or yields) based on statistical observations of yields and inputs (fertilisers, plant protection products).

The ongoing hostilities are hampering agribusiness in Ukraine. The lack of security and stability complicates farmers' access to areas that require cultivation and harvesting, with some areas still under occupation. The results of the study showed the interconnection of agribusiness with opposite types of activities. The development of information technology and the popularity of artificial intelligence are not spared from the agricultural sector. And considering that agribusiness is a broader concept, it is expedient to consider the practices of implementing digital technologies in the field of agribusiness. Z. Xue *et al.* (2024) identified the effects of digital transformation on agribusiness. It was proved that digital transformation not only expands the technological capabilities of agribusinesses, but also mitigates their financial constraints, thus facilitating the convergence of innovative resources, such as technology, talent, and capital for agribusiness and, as a result, increasing the level of innovation in agribusiness. The identified mechanisms should be factored in when formulating the agribusiness strategy in the post-war recovery of the country. Considering that agribusiness covers a wide range of tasks and involves many participants in its process, the development of a digital ecosystem will simplify and accelerate work related to the workplace; digital engineering and production; logistics management chain; digital products, services, and management systems (Osiyevskyy *et al.*, 2023).

The rapid development of digital technologies enabled M. Annosi *et al.* (2024) to identify the era of digital agriculture. The new competitive environment created by digital transformation requires strategic activation, cooperation, and cultivation of new skills and competences. At this stage, it is vital to consider digital competencies and strictly follow the rules of cybersecurity, as mentioned by Ya. Shestack *et al.* (2023). The development and proliferation of digital technologies is changing the way business sectors function, organise, and operate. In this context, the agri-food sector is no exception, undergoing a phase of radical change for organisations, devoting exponential amounts of resources to research and development and

the adoption of innovative technologies in the so-called "digital agriculture" era. During the military operations in Ukraine, there are certain restrictions on such agribusiness opportunities, but it is always expedient to consider digital technologies as a resource for agribusiness.

R.K. Bannor & K.K. Arthur (2024) identified the following main gaps that characterise the agribusiness sector, including gaps in business management and entrepreneurial skills, gaps in training, insufficient knowledge and skills of young people, insufficient skills and knowledge among women in agribusiness, and gaps in technology and innovation. This opinion is quite relevant, since during the war and mobilisation of men, many jobs were reoriented towards women. The researchers also highlighted imperfect governance and institutional reforms, social and cultural norms, poor market systems, and inadequate information flow in the agribusiness sector as gaps. The findings suggest that governments in developing countries should allocate funds for agribusiness projects and research projects that address the problems of developing countries to generate the necessary benefits in the agribusiness sector. Thus, the findings of the study showed the significance of strategic development of agribusiness in Ukraine during the war and during the country's post-war recovery. Based on the hypotheses and proposed recommendations, it is likely that the economy will improve, foreign economic activity will develop, innovations and digitalisation will be focused on, and regulatory documents will be revised.

Conclusions

Fluctuations in demand for agricultural products, changes in land ownership, competition, and technological change are constant phenomena in the agribusiness sector. Furthermore, agribusiness in Ukraine has undergone major changes caused by the aggressor's intervention in the country. A bibliometric review of scientific papers presented in the Scopus database showed interest in agribusiness issues in various subject areas. However, a small number of papers on agribusiness and its trends in Ukraine were found (n = 129). Ensuring the sustainable development of agribusiness in Ukraine is a key issue in the context of European integration and on the path towards economic stability and competitiveness of the country. This is evidenced by the findings of the survey: Russia's military aggression against Ukraine, an imperfect legal framework, damaged infrastructure, problematic situations with sales markets, resource supply of raw materials and necessary inputs, as well as a low level of digitalisation pose significant obstacles to the development of agribusiness in the country.

The study proved the need to formulate a modern strategy for the development of agribusiness and its post-war reconstruction. For the successful implementation of the strategy, it is necessary to eliminate negative factors, ensure an adequate level of infrastructure, attract investments, develop and apply modern innovative technologies, and create favourable and safe working conditions for farmers. It is also vital to follow product quality requirements in line with international standards, develop marketing infrastructure and build own brands. That is why it is significant not only to establish sales of raw materials, but also to create opportunities for their further processing in Ukraine and develop the industrial complex. An effective strategy will not be a quick fix, but it can become a significant lever for the development of agribusiness in Ukraine, ensuring its competitiveness, economic and sustainable development. Further research perspectives lie in formulating effective measures for the development of agribusiness as a key area in the development of the country's economy.

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Conflict of interest

None.

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Стратегічні напрями розвитку агробізнесу в Україні

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► **Анотація.** В сучасних умовах війни формування стратегічних напрямів агробізнесу в Україні є невід'ємною складовою розвитку економіки у повоєнному відновленні. Метою дослідження було визначення завдань, які забезпечать можливості ліквідувати негативні тенденції спричинені війною. У роботі здійснено бібліометричний огляд наукових робіт, що присвячені питанням агробізнесу в Україні та світі. Такий аналіз дозволяє відслідкувати тенденції, виявити прогалини і невирішені напрямки для подальших досліджень, а також сформувати стратегічні напрями розвитку агросфери. Обґрунтовано зміни і тенденції агробізнесу в Україні у результаті порівняльної динаміки частки України у світовому експорті продукції агропромислового комплексу. У роботі акцентовано увагу на особливостях експорту за час дії «Зернової ініціативи», а також визначено ключові континенти експорту. Встановлено, що ключовими проблемами, які охопили агросферу, є умови нестабільної геополітичної ситуації, воєнний стан, екологічні зміни, дефіцит робочої сили та стрімкі глобалізаційні зміни. Міжнародна діяльність у агробізнесі зазнала кардинальних змін, які спричинило повномасштабне вторгнення. Саме тому розроблена стратегічна модель Hoshin Kanri розвитку агробізнесу України під час війни та повоєнному відновленні країни дозволяє побачити ключові чинники, сформувати тенденції і передбачити ризики, що впливають на агробізнес. Запропонована стратегія також враховує потребу у необхідних ресурсах для імплементації нововведень та залучення інвестицій. Це дозволить удосконалити організаційний дизайн підприємств, що орієнтовані на агробізнес. Формування стратегії розвитку агробізнесу має бути спрямовано на поширення інновацій в агробізнесі та найбільше залучення підприємств цієї сфери до інноваційної діяльності. Висновки, що отримані у межах дослідження можуть бути використані у діяльності підприємств агросфери

► **Ключові слова:** агротехнології; агропромисловий комплекс; агрохолдинги; екосистема агробізнесу; експорт; зернова ініціатива