



Export potential of Ukraine's grain crops under conditions of fragmentation of global trade

Tetiana Romanovska

PhD in Technical Sciences, Associate Professor
National University of Food Technologies
01033, 68 Volodymyrska Str., Kyiv, Ukraine
<https://orcid.org/0000-0003-3364-2408>

Nataliia Romanovska*

PhD in Economics, Associate Professor
State Institution "Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine"
01011, 26 Panas Myrnyy Str., Kyiv, Ukraine
<https://orcid.org/0000-0002-1377-7551>

► **Abstract.** The relevance of this study is determined by the need to adapt Ukraine's grain sector to wartime challenges, the transformation of global trade, and the search for new directions for the diversification of grain crop exports. The aim of the study was to assess the transformation of the geographical structure of Ukraine's grain exports, determine the level of concentration in the global wheat, maize, and barley markets, and substantiate directions for enhancing the resilience of the grain sector under conditions of wartime instability. The study employed statistical, comparative, and systems analysis methods, as well as the Herfindahl-Hirschman Index and the concentration ratio. It was established that the global maize market was characterised by a high level of concentration, whereas the wheat and barley markets exhibited moderate concentration. The findings demonstrated that Ukraine has maintained its position as one of the leading exporters of grain crops even under the conditions of Russia's full-scale war against Ukraine. During 2022-2024, a significant transformation occurred in the geographical structure of exports: the role of the European Union, African, and Asian countries increased, while dependence on individual traditional markets gradually declined. It was established that the diversification process was phased in nature: in 2022, forced adaptation to logistical constraints predominated; in 2023, active reorientation of export flows took place; and in 2024, the new multi-regional export model became stabilised. This reduced the risks associated with excessive dependence on individual export destinations and increased the flexibility of foreign trade activities. In certain segments, particularly barley exports, a high concentration of supplies to China was observed, with its share reaching 48.7% in 2025. It was determined that the key factors enabling the adaptation of the grain sector included the development of alternative logistics routes through Danube ports and EU land corridors, as well as expanded presence in new export markets. It was substantiated that the development of deep grain processing and the production of higher value-added products became an important factor in reducing the vulnerability of the agricultural sector to external economic and logistical shocks. The practical value of the study lies in substantiating directions for export diversification, the development of grain processing, and the modernisation of logistics infrastructure in order to enhance the competitiveness and resilience of Ukraine's agricultural sector

► **Keywords:** grain market; market diversification; logistics; wartime challenges; global trade; food security; competitiveness of the agricultural sector

► Introduction

The relevance of this study stems from the current challenges arising from military conflict, changes in international trade, and the need to enhance the resilience of

Ukraine's grain sector by identifying new opportunities and export markets for grain crops. Ukraine's grain production is a strategically important component of the

► **Suggested Citation:** Romanovska, T., & Romanovska, N. (2026). Export potential of Ukraine's grain crops under conditions of fragmentation of global trade. *Ekonomika APK*, 33(2), 22-31. doi: 10.32317/ekon.apk/2.2026.22.

*Corresponding author (romnatalina@gmail.com)



Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (<https://creativecommons.org/licenses/by/4.0/>)

agricultural economy and a key source of foreign exchange earnings for the state, ensuring its integration into global food supply chains. Russia's full-scale war against Ukraine, which began in February 2022, has caused significant changes in the functioning of the grain sector due to the blockading of seaports, the destruction of logistics infrastructure and rising transport costs, necessitating a reorientation of export flows and the search for new markets. S. Jagtap *et al.* (2022) emphasised that the Russia-Ukraine war caused significant disruptions to global food supply chains and exacerbated food security risks worldwide. A. Rose *et al.* (2023) demonstrated that the disruption to grain exports from Ukraine as a result of the war had significant economic consequences for global food markets and international trade. Ye. Bielashov (2023) noted that the operation of 'grain corridors' had become one of the key mechanisms for supporting Ukrainian agricultural exports and stabilising the global food market amidst the war. O. Bodnar *et al.* (2024) focused on the transformation of logistics in Ukraine's grain and oilseed markets, in particular on the development of new marketing approaches and transport strategies in the context of the war. V. Yanovska *et al.* (2025) identified the modernisation of logistics infrastructure and the development of alternative export routes as priority areas for ensuring the resilience of Ukraine's grain sector. In these circumstances, export diversification and the development of domestic grain processing have become key factors in enhancing the resilience and competitiveness of Ukraine's agricultural sector. Contemporary research into the functioning of the global grain market has been shaped by global crises, in particular the COVID-19 pandemic and the full-scale war in Ukraine, which have significantly transformed international trade flows and food systems. Another important aspect has been the financialisation of agricultural markets, as examined in the study by I. Hrabynska *et al.* (2022), which shows that the growing role of financial instruments has exacerbated price volatility and affected the stability of agricultural production and trade.

Considerable attention has been paid in the scientific literature to the development of grain processing as a factor in increasing the added value of exports. Conclusions regarding the need to develop the bioenergy sector for the use of grain crops were presented in a study by N. Yarchuk & Ya. Gontaruk (2022), in which the authors emphasised the prospects for the development of grain production and processing in Ukraine. The study substantiates the advisability of transitioning from a predominantly raw-material-based export model to deeper processing of grain crops, in particular for the production of bioethanol and other types of biofuels. The researchers emphasised that the development of bioenergy has made it possible to increase the added value of agricultural produce, reduce dependence on external markets and strengthen the country's energy security. In the study by Y. Gontaruk & H. Shevchuk (2022), the main focus was on ways to improve the production and processing of agricultural products into biofuels. The authors considered bioenergy as one of the strategic directions for the development of Ukraine's agricultural sector in the context of energy and economic challenges. The study substantiates the economic viability of using grain crops and agricultural waste

for the production of biofuels, in particular bioethanol and biogas, and emphasises the importance of developing the relevant processing infrastructure and providing investment support for the sector.

Recent studies have also focused on innovative uses of grain crops, particularly in the context of the development of the bioeconomy. In a study by V. Venger *et al.* (2025), the main focus was on the investment aspects of developing bioethanol production in Ukraine in the context of the transformation of the agricultural sector and energy security. The researchers analysed the economic prerequisites for establishing new processing facilities, assessed the prospects for attracting investment in bioenergy projects, and emphasised the importance of bioethanol production for increasing the added value of grain raw materials. The study substantiated that the development of the bioethanol industry contributed to the diversification of grain utilisation, a reduction in dependence on raw material exports, and the formation of more sustainable domestic production chains. The study by O. Kushnirenko *et al.* (2024) examines the technological aspects of bioethanol production and the prospects for introducing innovative grain processing technologies. The authors focused on the effectiveness of modern technological solutions in the bioenergy sector, particularly with regard to increasing processing productivity, reducing energy consumption and the comprehensive utilisation of by-products. The study highlighted that the development of bioethanol production technologies creates the conditions for expanding domestic demand for grain raw materials and reducing the agricultural sector's vulnerability to fluctuations in external markets. Thus, an analysis of current scientific approaches indicates a growing focus on the issues of diversifying the use of grain crops and developing processing sectors, which is directly linked to enhancing the resilience of the agricultural sector in the face of global instability. The aim of the study was to determine the concentration of international markets for grain crops, in particular wheat, maize and barley; to assess changes in the structure of grain exports; and to identify ways of ensuring the stable development of the grain sector under martial law.

► Materials and methods

The study was conducted within the framework of international trade theory, the economics of the agricultural sector and the theory of competitive advantages, which enabled a comprehensive assessment of the factors shaping the competitiveness of Ukraine's grain products in foreign markets against the backdrop of military and global trade challenges. The application of theoretical approaches made it possible to analyse changes in the export structure, shifts in the geography of sales and the sector's adaptation to an unstable external environment. To achieve the research objective, a combination of general scientific and specialised research methods was employed. In particular, descriptive statistical analysis was used to assess the volumes of production and exports of grain crops (wheat, maize, barley), determine the structure of exports by country and region, and identify the main trends in the development of global and national markets. The analytical method enabled the systematisation of data from

various sources, the identification of factors influencing the effectiveness of sales market diversification, and the identification of the main risks facing the grain agricultural sector. The comparative method was used to compare Ukraine's grain export practices with the international experience of leading exporting countries (the USA, Brazil, Argentina, Canada and Australia), which made it possible to identify the competitive advantages and constraints on the development of the grain business. A systematic approach ensured the integration of economic, logistical, institutional and technological factors into a comprehensive assessment of the functioning of the grain market and its potential for adaptation. The Herfindahl-Hirschman Index was used to quantitatively assess the level of concentration in global grain markets and the export structure of the main exporting countries:

$$HHI = \sum_{i=1}^n s_i^2, \quad (1)$$

where HHI – the Herfindahl-Hirschman Index, s_i – a country's share of total exports, n – the total number of entities.

In addition, the concentration ratio (CR_4) was applied, defined as the sum of the market shares of the four largest exporters:

$$CR_4 = \sum_{i=1}^4 s_i, \quad (2)$$

where s_i – the market share of country i amongst the four largest exporters.

The use of the CR_4 index made it possible to assess the degree of dominance of the leading market participants and to determine the level of oligopolisation in the structure of global trade in grain crops, whilst the HHI index provided a more detailed assessment of the overall unevenness in the distribution of market shares amongst all market participants. The use of this index made it possible to assess the degree of dependence on individual markets and to determine the level of export concentration for the main grain crops. The research data set was compiled taking into account the need to combine official

statistics, international analysis and sector-specific information resources. The core data came from international organisations, notably the OECD & FAO (2024), which reflected global trends in the development of grain markets, the dynamics of supply and demand, and changes in the structure of international trade. Data from industry organisations, notably the Ukrainian Grain Association (n.d.), were of particular importance, as they contained information on export volumes, the structure of sales markets and Ukraine's position in the global trade in grain crops. These sources enabled an assessment of the sector's current state and the identification of directions for its development. However, the limitations of the study relate to the potential influence of institutional bias and the lack of standardised methodological approaches to calculations. In addition, analytical and information resources were utilised, notably IndexMundi (n.d.) and the State Statistics Service of Ukraine (n.d.), which ensured the timely acquisition of information regarding changes in market conditions, export logistics and price trends. The combination of official statistics, international analysis and industry sources ensured an adequate level of representativeness for the study, enabled a multidimensional analysis of the processes of diversification of Ukraine's grain exports, and enhanced the reliability of the results obtained.

► Results

Ukraine's grain production is one of the fundamental components of the country's agricultural sector and plays an important role in ensuring food security at both national and global levels. Significant natural resource potential, favourable soil and climatic conditions, and a high level of agricultural technology enabled Ukraine to consistently rank among the world's leading producers and exporters of grain crops. Production volumes, export orientation, and the competitive cost of production allowed Ukrainian producers to export a substantial share of the maize, wheat, and barley they cultivated. Figure 1 shows the trend in exports of major grain crops from Ukraine from 2010 to 2024.

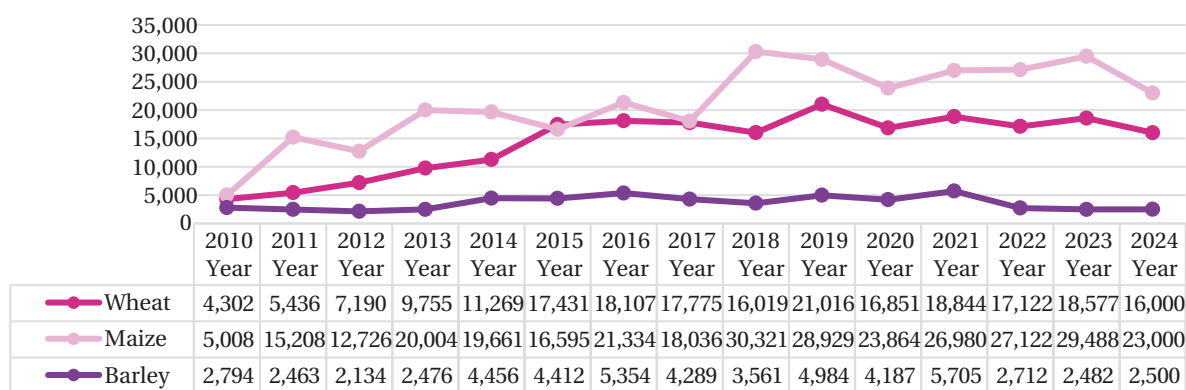


Figure 1. Exports of major grain crops from Ukraine, in thousands of tonnes

Source: IndexMundi (n.d.)

The global maize market in 2024 was characterised by even greater concentration: the leading producers were the United States (62,233 thousand tonnes – 32.9%), Brazil (47,000 thousand tonnes – 24.9%) and Argentina

(36,000 thousand tonnes – 19.1%). As of 2024, Ukraine ranked fourth with a volume of around 23,000 thousand tonnes – 12.2%. Next came Paraguay and Russia (3,300 thousand tonnes each), South Africa (2,800 thousand

tonnes), whilst other countries accounted for negligible shares of exports. In the wheat market, the leading positions in 2024 were held by Russia (46 million tonnes – 25.1%) and Canada (26 million tonnes – 14.2%), Australia (25 million tonnes – 13.6%), the USA (23.1 million tonnes – 12.6%), Ukraine (16 million tonnes – 8.7%). The group of countries with medium-sized export volumes included Argentina (11.5 million tonnes), Kazakhstan (10 million tonnes) and Turkey (7.5 million tonnes), whilst other countries accounted for a niche share of the market. In the barley market in 2024, the leading positions were held by Australia (5,800 thousand tonnes – 29.2%), Argentina (3,500 thousand tonnes – 17.6%), Russia (2,600 thousand tonnes – 13.1%), Ukraine (2,500 thousand tonnes – 12.6%) and Canada (2,100 thousand tonnes – 10.6%). Smaller volumes were supplied by Kazakhstan (1,700 thousand tonnes), the United Kingdom (750 thousand tonnes), Uruguay (250 thousand tonnes), the USA (174 thousand tonnes) and Turkey (150 thousand tonnes) (IndexMundi, n.d.).

An analysis of the level of concentration in global grain markets in 2024, carried out using the concentration ratio (CR_4) and the Herfindahl-Hirschman Index (HHI), enabled a comprehensive assessment of both the

share of leading exporters and the degree of unevenness in the distribution of market positions. It was found that the wheat market was characterised by a moderate level of concentration: the CR_4 stood at 65.6% and the HHI at 1,350, indicating a competitive environment whilst a limited number of exporting countries dominated (Table 1). The maize market proved to be the most concentrated, with the combined share of the four leading exporters (the USA, Brazil, Argentina and Ukraine) reaching 89.1%, and the HHI index standing at 2,250, which corresponded to a high level of concentration and indications of an oligopolistic structure. At the same time, the barley market demonstrated a moderately high level of concentration (CR_4 – 72.4%, HHI – 1,720), indicating a relatively balanced structure with a significant role played by several major participants. Overall, the results confirmed that global grain markets are characterised by varying degrees of concentration, with maize being the most centralised segment, whilst wheat and barley were characterised by a more diversified competitive structure. It is worth noting Ukraine's consistent presence among the leading exporters, which underlined its strategic importance in shaping global food security.

Table 1. Concentration indicators for global grain markets in 2024 (wheat, maize, barley)

Grain crop	Concentration ratio (CR_4)	Herfindahl-Hirschman Index (HHI)	Assessment
Wheat	65.6 %	1,350	Moderate concentration
Maize	89.1 %	2,250	High concentration
Barley	72.4 %	1,720	Moderate concentration

Source: compiled by the authors

Table 2 presents the dynamics of the geographical structure of Ukraine's exports of wheat, maize, and barley during 2022–2024 and January–August 2025 in physical terms (percentage share of total export volume). The analysis of the data indicated significant transformations in the directions of foreign trade in grain crops over the study period. In particular,

within the wheat export segment, a reorientation from traditional markets, such as Turkey and Romania in 2022, towards European Union markets was observed, most notably Spain, whose share increased steadily and reached 27.5% in 2024. At the same time, an expansion of Ukraine's presence in Asian markets, particularly Indonesia, was recorded.

Table 2. Geographical structure of Ukraine's major grain crops exports in 2022 – January–August 2025, % (by physical weight)

Grain crop (commodity classification code in the Ukrainian Classification of Goods for Foreign Economic Activity)	2022	2023	2024	January–August 2025
Wheat and a mixture of wheat and rye (meslin) (1001000000)	Turkey – 18.9 Romania – 13.1 Spain – 10.3 Egypt – 7.8	Spain – 24.9 Turkey – 14.4 Romania – 14.0 Egypt – 7.2	Spain – 27.5 Indonesia – 12.2 Egypt – 9.3 Algeria – 6.5	Egypt – 24.0 Algeria – 17.6 Spain – 13.7 Indonesia – 6.7
Maize (1005000000)	China – 17.7 Romania – 13.6 Spain – 11.0 Poland – 8.2	China – 20.6 Spain – 15.1 Romania – 10.8 Egypt – 10.8	Spain – 17.7 Turkey – 12.0 China – 11.9 Egypt – 11.2	Turkey – 31.9 Italy – 12.6 Spain – 10.1 Netherlands – 8.9 Egypt – 8.4
Barley (1003000000)	Romania – 24.7 Turkey – 20.4 Spain – 19.1 Libya – 9.6	Turkey – 19.2 Spain – 18.0 China – 17.3 Romania – 13.4	China – 37.0 Spain – 11.8 Libya – 9.4 Tunisia – 6.2	China – 48.7 Turkey – 12.5 Lebanon – 11.9 Libya – 7.9

Source: State Statistics Service of Ukraine (n.d.)

The structure of maize exports showed a trend towards a decline in the share of shipments to China, which, although it retained its leading position in 2022–2023, ceded the top spot to Spain in 2024. This indicated a gradual diversification of export markets and a growing importance of the European market. At the same time, the importance

of other European and Middle Eastern countries, such as the Netherlands and Turkey, was growing. Barley exports were characterised by the most pronounced changes. Whilst in 2022 the main importers were European countries, notably Romania and Spain, by 2024 there had been a sharp rise in China's share to 37.0%, indicating the

development of a high degree of dependence on a single market. At the same time, the role of North African and Middle Eastern countries, notably Libya and Tunisia, grew in importance. An analysis of data for January–August 2025 confirmed that these trends had continued to intensify. In particular, within the wheat export segment, there was a shift in focus towards North African countries: Egypt (24.0%) and Algeria (17.6%) took the leading positions, whilst Spain's share fell to 13.7%. This indicated a growing role for the African market in the structure of Ukrainian wheat exports and the continued diversification of exports through Asian markets, particularly Indonesia. In the maize segment in 2025, the positions of the Mediterranean and European markets were further strengthened. Turkey emerged as the leader (31.9%), reflecting its growing role as a major importer. Significant shares were also held by Italy (12.6%), Spain (10.1%) and the Netherlands (8.9%). At the same time, China's share continued to decline, confirming the trend towards reduced dependence on the Asian market. Barley exports in 2025 were characterised by a further increase in concentration: China's share rose to 48.7% indicating a critically high level of dependence on a single market. At the same time, the importance of Turkey (12.5%) and the countries of the Middle East and North Africa, in particular Lebanon and Libya, remained significant.

Turkey occupied an important place in the structure of Ukrainian grain imports, particularly wheat and maize. Turkey's growing role in the Ukrainian grain market was due to a number of interrelated factors. First and foremost, its favourable geographical location and well-established maritime logistics routes via the Black Sea proved decisive, ensuring relatively stable exports even in the face of military risks. A flexible customs and tariff policy was a key factor in stimulating grain imports. In 2024–2025, Turkey repeatedly reduced import duties on grain crops: 1) on maize to 0–5% compared with the standard rate of around 130%; 2) duty-free imports of wheat were introduced under the inward processing regime, allowing imported raw materials to be used for the subsequent export of processed products. These measures were prompted by a decline in domestic grain production and the need to ensure the country's food security. As regards wheat, a significant proportion of imports is linked not only to domestic consumption but also to the processing and subsequent re-export of flour and other products. Thus, Turkey has acted not only as an end consumer but also as an important intermediary in global grain supply chains (Belikova & Sirosh, 2025). At the same time, some of the grain volumes recorded as having been imported by Turkey may in fact be re-exported to third countries, particularly to regions in the Middle East and North Africa. This has led to certain limitations in the accuracy of interpreting the geographical structure of exports.

During 2022 and 2024, Spain strengthened its position as one of the main importers of Ukrainian grain crops, in particular wheat, maize and barley. Whilst imports of Ukrainian wheat into Spain were relatively insignificant prior to the outbreak of the full-scale war, there was subsequently a sharp increase in its share of Ukraine's export mix. The main factor driving the growth in demand was the structural characteristics of Spain's agricultural sector,

in particular the high level of development of livestock farming. This led to a stable demand for feed grains, primarily maize and barley, which were actively used in the production of compound feed. Consequently, Ukraine became one of the main suppliers of such products due to its competitive advantages. The price competitiveness of Ukrainian grain was also a significant factor. Amid global volatility in agricultural markets, Ukrainian products were often offered at lower prices compared with other suppliers, which stimulated imports by Spain. Logistics also played an important role. The operation of maritime export routes via the Black Sea ensured a relatively short transport distance and stability of supply, which proved critical for grain importers. Institutional conditions also contributed to the growth in imports. In particular, until June 2025, preferential terms for Ukrainian agricultural products' access to the European Union market were in place, providing for the absence of quotas and customs restrictions. This created additional incentives to increase supplies. It is worth noting that despite protests by farmers in EU countries, particularly in Spain in 2024, which were linked to competition from cheaper imports, the overall trend towards increased purchases of Ukrainian grain persisted. This indicated a high level of dependence within Spain's agricultural sector on external supplies of feed resources (Latifundist.com, 2025).

During the 2024–2025 marketing year, Egypt became one of the largest importers of Ukrainian grain crops, particularly wheat and maize. Its significance in the geographical structure of Ukraine's exports increased significantly compared with the 2023–2024 marketing year: the volume of Ukrainian wheat exports to Egypt exceeded 2.1 million tonnes, compared with 1.7 million tonnes in the previous season, whilst the country's share of Ukrainian wheat exports rose from 10% to 13% (The Odessa Journal, 2025). However, following the outbreak of Russia's full-scale war against Ukraine in February 2022, there was a partial reorientation of import flows towards alternative suppliers, primarily Russian grain. This was driven by both economic and risk-related factors. Price competition became a key factor in the shift in trade priorities. According to industry analysts, the price difference between Russian and Ukrainian wheat was often as little as 2–3 US dollars per tonne, which was a negligible figure for large importers. Under such conditions, importers in Egypt tended to favour suppliers with lower logistical and political risks. An additional deterrent was the supply risks associated with the military situation and the instability of logistics routes. This reduced the appeal of Ukrainian grain, even given its high quality and competitively low price. Despite this, Ukrainian grain maintained its presence on the Egyptian market, particularly in the maize segment, which was used for animal feed. This indicated a partial diversification of supply sources on the part of importers. At the same time, reports emerged in the international media regarding the possible use on the Egyptian market of grain of dubious origin, in particular grain that may have been exported from the temporarily occupied territories of Ukraine (Latifundist.com, 2025). This created additional challenges for the transparency of global grain trade and intensified price competition.

Italy's high level of participation in international grain trade was due to its dependence on imports. Domestic production did not meet the needs of the domestic market, particularly in the feed grain and food wheat segments. This was attributable both to natural and climatic conditions and to the specialisation of the agricultural sector. Wheat imports were of particular importance, as the grain was used in the food industry, primarily for the production of pasta – a traditionally important sector of the country's economy. The bulk of exported maize was used in livestock farming as a component of compound feed. Ukraine occupied an important position amongst suppliers of maize to the Italian market, due to its price competitiveness and geographical proximity. Sea shipments via the Black and Mediterranean Seas ensured relatively efficient logistics, which increased the attractiveness of Ukrainian grain to Italian importers. The growth in imports was due to the specific nature of the Dutch economy, which was characterised by a high level of development in livestock farming and agri-processing. This created stable demand for feed grain, particularly maize, and underlined the importance of the agricultural sector in bilateral trade. A key feature was that a significant proportion of the imported grain was used for domestic consumption and processing, which distinguished the Netherlands from traditional transit hubs. At the same time, the country served as an important logistics centre: a range of goods were transported in transit through its territory. The Port of Rotterdam played a key role in this process – one of Europe's largest seaports, which served as a hub for the onward re-export of Ukrainian grain to other European Union countries. Ukrainian agricultural companies actively utilised this route to optimise their supply chain logistics. The growth in Ukrainian grain exports to Algeria was driven by both cyclical and structural factors. Traditionally, this market had relied on grain supplies from France, which had long been the main trading partner in this segment. However, between 2022 and 2024, France faced a decline in its wheat harvest, which was the lowest since 2020. This created opportunities for alternative suppliers, notably Ukraine, to enter the market. An additional factor was the price competitiveness of Ukrainian wheat, which enabled it to occupy a niche in the Algerian market amidst a shortage of supply from traditional sources. As a result, Ukraine was able not only to increase its export volumes but also to gain a foothold in this market. Political factors, which influenced Algeria's choice of trading partners, also played an important role in the shift in the geography of imports. Diversification of suppliers became a key element in ensuring the country's food security, which stimulated the expansion of cooperation with new exporters. It is worth noting that Algeria had significant import potential: the country's annual wheat requirements exceeded 9 million tonnes, making it one of the major importers in the North African region. Provided current trends continue, Ukraine has the opportunity to further strengthen its position in this market (Latifundist.com, 2025).

The transformation of the geographical structure of Ukraine's grain exports in 2022-2024 was driven by military hostilities, which significantly altered the logistical conditions for grain production and necessitated a

rapid adaptation to the new external economic realities. In 2022, a key factor in these changes was the blockade of the Black Sea ports, through which up to 90-95% of grain exports had been channelled prior to the outbreak of full-scale war. The loss of traditional logistics routes led to a sharp decline in export volumes and forced Ukrainian exporters to seek alternative channels for selling and transporting their produce. During this period, the use of overland routes through European Union countries, as well as Danube ports, was stepped up. At the same time, the search for new export markets began, particularly in African countries, which had previously accounted for only a limited share of Ukrainian exports. The "Grain from Ukraine" initiative played a key role, aiming to ensure grain supplies to the most vulnerable countries, such as Ethiopia, Kenya and Somalia. Although this programme had a humanitarian component, it simultaneously helped to forge new trade links and expand the geographical reach of exports (Ukrainian Grain Association, n.d.). Thus, 2022 can be characterised as a phase of forced diversification of export markets.

In 2023, the transformation process took on a more systematic character and moved into a phase of active reorientation of export flows. The European Union became the main export destination, due to its geographical proximity, the simplification of trade procedures and the development of alternative logistics infrastructure. The share of EU countries in the structure of grain exports increased, ensuring relative stabilisation of export volumes. At the same time, Ukraine did not limit itself solely to the European market, but gradually restored and expanded its presence in traditional markets in South-East Asia, the Middle East and Africa. Thus, in 2023, two trends were observed: on the one hand, the strengthening of the EU's role as the main trading partner; on the other, the restoration and expansion of export markets beyond the European region. In 2024, these trends continued to develop and showed signs of stabilisation. At the same time, there was a gradual increase in the importance of Asian and African markets, indicating the consolidation of new sales markets and a higher level of export diversification. This helped to reduce dependence on individual importing countries and increase the resilience of grain production to external economic shocks. Consequently, the transformation of Ukraine's grain exports in 2022-2024 took place in stages: from a forced search for new markets in 2022 to an active expansion of the export geography in 2023 and its consolidation in 2024. As a result, there was a shift in the model governing grain exports from a focus on a limited number of traditional markets to the formation of a multi-regional structure, which ensured greater flexibility and adaptability of the grain agricultural sector amid global instability.

One of the principal structural challenges facing grain production in Ukraine has been its predominantly raw-material orientation, which has resulted in the loss of a considerable share of potential revenues. According to OECD & FAO (2024), the share of processed products within Ukraine's grain export structure did not exceed 25-30%, whereas in European Union countries this figure reached 50-60%. This indicates the existence of substantial untapped potential for the development of the

processing industry. The processing of grain crops generates additional value at every stage of the production chain. For example, converting wheat into flour increases export revenues, as does the production of bioethanol or gluten (grain protein). Moreover, the development of processing industries contributes to the formation of domestic demand for raw materials, thereby reducing dependence on external markets and price fluctuations. An important advantage of high value-added products is their lower sensitivity to logistical constraints. Since such products possess a higher value per unit of weight, transportation costs account for a smaller proportion of the final price, thereby enhancing their competitiveness. This is particularly relevant under conditions of rising transport costs. Consequently, the development of the processing industry represents not only an economically viable option but also a strategically important means of strengthening the resilience of Ukraine's grain sector.

The future development of Ukraine's grain industry will be determined by a combination of domestic resource capabilities and external factors associated with the global market. According to OECD & FAO (2024), global consumption of grain crops is expected to increase by 10-15% by 2030, creating favourable conditions for expanding Ukraine's export potential. One of the key directions of development is integration into the European economic area, which entails adaptation to European Union quality and safety standards. This will provide access to a high-income market and stimulate the modernisation of production. The implementation of sustainable development principles also played an important role, in particular the reduction of greenhouse gas emissions, the rational use of land resources and the development of bioenergy. In particular, bioethanol production could become a promising area for the use of grain crops, allowing for the diversification of raw material utilisation, whilst the digitalisation of the agricultural sector will help to improve production efficiency. The use of modern precision farming technologies will enable higher yields and reduced resource consumption. The key areas for enhancing the sustainability and efficiency of Ukraine's grain sector are: diversifying export markets by expanding presence in Asian and African markets; deepening trade and economic integration with European Union countries; developing alternative logistics routes, in particular via Danube ports and overland transport corridors; increasing the share of value-added grain products: flour, cereals, starch, gluten and bioethanol; and enhancing the competitiveness of products through technological modernisation and innovation. Provided that the strategy of diversification, the development of processing and the modernisation of infrastructure are implemented, Ukraine has the potential to strengthen its position in the global grain market and ensure the long-term growth of the agricultural sector.

► Discussion

The study has revealed changes in the geographical structure of Ukraine's grain exports and confirmed the high level of concentration in the global markets for wheat, maize and barley. The findings are consistent with a number of recent academic studies, whilst at the same

time refining and expanding on certain aspects concerning the consequences of war-related shocks, logistical constraints and diversification processes. The findings regarding the impact of the war on global grain supply chains are consistent with the conclusions of J. Glauber & D. Laborde (2022), who emphasised that Russia's full-scale invasion of Ukraine led to a sharp rise in food prices and disrupted the stability of global grain supplies. The authors highlighted Ukraine's systemic role as a major exporter, the loss or restriction of which had global consequences. The analysis conducted in this study confirmed this thesis; however, a detailed examination of the geographical structure of exports revealed that the system demonstrated greater adaptability than anticipated. In particular, there was a rapid reorientation towards markets in the EU, Africa and, to some extent, Asia, which mitigated the negative impact of the blockage of traditional routes. Thus, in contrast to the static assessment of global risks in J. Glauber & D. Laborde (2022), the results of this study demonstrated the dynamic adaptive capacity of the Ukrainian agricultural sector.

The findings of A. Espitia *et al.* (2022) regarding the acceleration of the regionalisation of world trade as a result of global crises fully corroborated the results of this study. The researchers noted that the COVID-19 pandemic had accelerated the processes of shortening global supply chains and strengthening regional trade links. This study demonstrated a similar trend, but in a war-time context: the European Union's share of Ukraine's export structure increased, whilst logistics flows were redirected towards closer markets. At the same time, unlike A. Espitia *et al.* (2022), who viewed regionalisation as a long-term structural trend, the results obtained indicated that, in Ukraine's case, it was partly forced and crisis-driven, caused by restrictions on maritime logistics. A comparison with the works of G. Tadesse *et al.* (2014) and M.F. Bellemare (2015), who demonstrated that high export concentration exacerbated price volatility on world markets, also confirmed the overall logic of the study. The calculated HHI indices showed that the maize market is highly concentrated ($HHI \approx 2,250$), whilst the wheat and barley markets exhibited moderate concentration. This confirmed the impact of structural concentration on the instability of market processes. However, unlike G. Tadesse *et al.* (2014) and M.F. Bellemare (2015), who considered concentration as a factor in global price volatility, this study shifted the focus to the consequences of concentration for the export vulnerability of a specific country – Ukraine. This has made it possible to broaden the interpretation of the HHI index from a global to a national-strategic level.

M. Torero (2020) emphasised the need for food systems to function without disruption as a prerequisite for global economic stability. The author highlighted the institutional dimension of food security. The analysis conducted partly supported these conclusions, but showed that in times of crisis, it is not only the stability of the system that plays an important role, but also its flexibility. Similar conclusions were drawn in the study by I. Ivashkiv *et al.* (2026), which predicted an increasing role for alternative port and land routes for the export of Ukraine's grain and oilseeds in the context of military

risks. In particular, Ukraine was able to maintain its export position due to a rapid shift to alternative routes (the Danube, land corridors to the EU). Thus, logistical flexibility proved to be no less important than the stability of the system. In the context of Ukrainian research, the findings were partly consistent with those of Ye. Ivanov (2022), who examined export diversification as an important tool for enhancing economic resilience. The data confirmed that expanding the geographical scope of exports reduced dependence on individual markets, particularly on China in the maize segment. At the same time, the results showed that diversification was uneven: for barley, an increase in concentration was observed (China's share rose to 48.7% in 2025). This allowed to partially disagree with the universality of the conclusions drawn by Ye. Ivanov (2022), as diversification is not an automatic process and depends on the specific characteristics of the commodity and demand.

Similar reservations applied to the approaches of O. Shnyrkov *et al.* (2020), who emphasised the positive impact of integration processes on the expansion of Ukraine's export markets. The present study confirmed the growing role of the EU, whilst at the same time demonstrating an increasing dependence on individual countries (Spain, Turkey). Thus, contrary to the optimistic interpretation of integration as a factor in the uniform expansion of markets, the actual data indicated the formation of new centres of demand concentration within the EU. Particular attention was required when comparing this study with the work of O. Shubravskaya & K. Prokopenko (2022), who examined the transformation of Ukraine's agricultural exports as a result of the war. Their conclusions were generally consistent with the findings of this study, particularly regarding the reorientation of logistics and changes in market structure. However, this study traced the phased nature of these changes more clearly (2022 – forced adaptation, 2023 – structural reorientation, 2024 – stabilisation of the new model), which allowed for a more detailed analysis of their transformation model. D. Tokarchuk *et al.* (2026) emphasised the importance of optimising the structure of crop utilisation for the development of biofuel production and enhancing the country's energy security. Similar approaches regarding the need to deepen the processing of grain products and to transition from a raw material-based export model to the production of higher value-added products are substantiated in the study by T. Ostashko *et al.* (2023). The authors emphasised that the development of the grain processing industry has become one of the promising avenues for strengthening the competitiveness of Ukraine's agricultural sector, reducing dependence on fluctuations in global commodity markets, and enhancing the resilience of the national economy in the face of wartime and post-war challenges. The results obtained in this study confirmed the validity of this approach, as the high concentration of certain external markets has heightened export risks, whilst the development of domestic processing can contribute to the diversification of the agricultural sector's sources of income. Thus, the analysis carried out showed that the study's findings generally confirmed the main tenets of contemporary academic literature regarding global food

risks, the regionalisation of trade and the importance of diversification. At the same time, the study clarified a number of aspects, in particular: the uneven nature of the diversification process, the emergence of new centres of demand concentration, and the heightened role of logistical adaptation as a key factor in the resilience of Ukraine's grain exports in the context of the war.

► Conclusions

Ukraine's grain production remained a strategically important component of the agricultural sector and a key source of foreign exchange earnings, ensuring the country's substantial integration into global food markets. At the same time, its operation was complicated by wartime risks, disruptions to logistics, and changes in the structure of international trade. Global grain markets exhibited varying levels of concentration: the maize market was highly concentrated (CR_4 – 89.1%; HHI – 2,250), whereas the wheat (CR_4 – 65.6%; HHI – 1,350) and barley (CR_4 – 72.4%; HHI – 1,720) markets demonstrated moderate concentration. This confirmed the oligopolistic nature of global grain trade and the uneven distribution of market shares. Ukraine maintained its position as one of the world's leading grain exporters; however, during 2022–2024, the geography of exports underwent significant transformation, indicating the emergence of a multi-vector export model. In 2025, both diversification of the wheat and maize markets and partial concentration of the barley market were observed, with up to 48.7% of barley exports destined for China. Key factors underpinning the adaptation of the grain sector included the reorientation of logistics through Danube ports and EU land corridors, as well as an expanded presence in new markets, including Spain, Turkey, Egypt, and Algeria. This made it possible to partially offset the loss of traditional routes and stabilise export volumes. In addition, it was established that the growing share of products with a low level of processing continued to impose structural constraints on the sector, whereas the development of deep grain processing became an important avenue for increasing value added and reducing dependence on external market shocks. Prospects for further research include a more in-depth assessment of the effectiveness of export market diversification, analysis of the impact of logistics costs on grain competitiveness, modelling of the optimal geographical structure of exports, and examination of the development of deep processing as a tool for increasing value added and reducing external risks.

► Acknowledgements

This article was prepared within the framework of the research projects “Ukraine's Industrial Development Policy under Conditions of Fragmentation of Global Trade” (State Registration No. 0126U001107) and “Development of an Innovative Technology for the Production of Lipid-Containing Food Products and Cosmetic Products”.

► Funding

None.

► Conflict of interest

None.

► References

- [1] Belikova, M., & Sirosh, Yu. (2025). Turkey becomes top importer of Ukrainian corn with quota policy driving record purchases in 2024/25 marketing year. *Fastmarkets*. Retrieved from <https://www.fastmarkets.com/insights/turkey-becomes-top-importer-of-ukrainian-corn-with-quota-policy-driving-record-purchases-in-2024-25-marketing-year>.
- [2] Bellemare, M.F. (2015). Rising food prices, food price volatility, and social unrest. *American Journal of Agricultural Economics*, 97(1), 1-21. doi: 10.1093/ajae/aau038.
- [3] Bielashov, Ye. (2023). Ukrainian exports: The potential of "grain corridors". *Ius Modernum*, 126(1), 60-69. doi: 10.31617/3.2023(126)05.
- [4] Bodnar, O., Halchynska, Yu., Larina, Ya., Filatova, A., & Stepanets, I. (2024). Logistics transformation on grain and oilseeds markets during the war in Ukraine: Marketing approaches and strategies. *Scientific Horizons*, 27(9), 134-147. doi: 10.48077/scihor9.2024.134.
- [5] Espitia, A., Mattoo, A., Rocha, N., Ruta, M., & Winkler, D. (2022). Pandemic trade: COVID-19, remote work and global value chains. *The World Economy*, 45(2), 561-589. doi: 10.1111/twec.13117.
- [6] Glauber, J., & Laborde, D. (2022). How will Russia's invasion of Ukraine affect global food security? *IFPRI is a CGIAR Research Center*. Retrieved from <https://www.ifpri.org/blog/how-will-russias-invasion-ukraine-affect-global-food-security/>.
- [7] Gontaruk, Y., & Shevchuk, H. (2022). Directions of improvement of production and processing of agricultural products on biofuels. *Economy and Society*, 36. doi: 10.32782/2524-0072/2022-36-8.
- [8] Hrabynska, I., Kosarchyn, M., & Dąbrowska, A. (2022). Economic imperatives of financialization of agricultural commodity markets. *Agricultural and Resource Economics: International Scientific E-Journal*, 8(3), 5-25. doi: 10.51599/are.2022.08.03.01.
- [9] IndexMundi. (n.d.). *Agricultural production, supply, and distribution*. <https://www.indexmundi.com/agriculture/>.
- [10] Ivanov, Ye. (2022). Evaluation of export diversification in Ukraine. *Economy and Society*, 41. doi: 10.32782/2524-0072/2022-41-41.
- [11] Ivashkiv, I., Saienko, V., Lyzun, M., & Lishchynskyy, I. (2026). Forecasting the export of grain and oilseed crops through Ukrainian ports under war conditions. *Journal of European Economy*, 25(1), 204-222. doi: 10.35774/jee2026.01.204.
- [12] Jagtap, S., et al. (2022). The Russia-Ukraine conflict: Its implications for the global food supply chains. *Foods*, 11(14), article number 2098. doi: 10.3390/foods11142098.
- [13] Kushnirenko, O., Venger, V., Valinkevych, N., Hakhovych, N., & Bykonja, O. (2024). Prospects for maize processing for the development of bioeconomy and decarbonisation in Ukraine. *Scientific Horizons*, 27(7), 32-44. doi: 10.48077/scihor7.2024.32.
- [14] Latifundist.com. (2025). *Top 10 countries importing Ukrainian grain and oilseeds in 2024/25 MY*. Retrieved from <https://latifundist.com/rating/top-10-krayin-importeriv-ukrayinskogo-zerna-i-olijnih-u-2024-2025-mr>.
- [15] OECD, & FAO. (2024). *OECD-FAO Agricultural outlook 2024-2033*. Rome: OECD; FAO.
- [16] Ostashko, T., Shubravskaya, O., & Olefir, V. (2023). Prospective directions of grain processing development in Ukraine. *Scientific Bulletin of International Association of Scientists. Series: Economy, Management, Security, Technologies*, 2(4). doi: 10.56197/2786-5827/2023-2-4-1.
- [17] Rose, A., Chen, Z., & Wei, D. (2023). The economic impacts of Russia-Ukraine war export disruptions of grain commodities. *Applied Economic Perspectives and Policy*, 45(2), 645-665. doi: 10.1002/aep.13351.
- [18] Shnyrkov, O., Rogach, O., Reznikova, N., & Nanavov, A. (2020). Ukraine's export diversification: The impact of economic integration and disintegration. *Journal Global Policy and Governance*, 9(1), 3-18. doi: 10.14666/2194-7759-9-1-001.
- [19] Shubravskaya, O., & Prokopenko, K. (2022). The agricultural sector of Ukraine in the global food market: Pre-war state and post-war prospects. *Research on World Agricultural Economy*, 3(4), 1-11. doi: 10.36956/rwae.v3i4.693.
- [20] State Statistics Service of Ukraine. (n.d.). Retrieved from <https://stat.gov.ua/en>.
- [21] Tadesse, G., Algieri, B., Kalkuhl, M., & von Braun, J. (2014). Drivers and triggers of international food price spikes and volatility. *Food Policy*, 47, 117-128. doi: 10.1016/j.foodpol.2013.08.014.
- [22] The Odessa Journal. (2025). *Egypt to maintain its position among top buyers of Ukrainian wheat*. Retrieved from <https://odessa-journal.com/egypt-to-maintain-its-position-among-top-buyers-of-ukrainian-wheat>.
- [23] Tokarchuk, D., Lohosha, R., Tokarchuk, O., & Dmytryk, O. (2026). Optimisation of agricultural crop allocation in sustainable biofuel production and energy security strategies. *Economics Ecology Socium*, 10(1), 30-46. doi: 10.61954/2616-7107/2026.10.1-3.
- [24] Torero, M. (2020). Without food, there can be no exit from the pandemic. *Nature*, 580, 588-589. doi: 10.1038/d41586-020-01181-3.
- [25] Ukrainian Grain Association. (n.d.). Retrieved from <https://uga.ua/en/home/>.
- [26] Venger, V., Kushnirenko, O., Romanovska, N., & Bykonja, O. (2025). Investment projects in the bioethanol production: Determining the optimum model. *European Scientific Journal of Economic and Financial Innovation*, 1, 416-429. doi: 10.32750/2025-0137.
- [27] Yanovska, V., Król, M., & Pittman, R. (2025). The logistics of grain exports from wartime Ukraine: What are the highest priority areas to address? *Transportation Research Interdisciplinary Perspectives*, 30, article number 101363. doi: 10.1016/j.trip.2025.101363.

[28] Yaremchuk, N., & Gontaruk, Ya. (2022). Prospects for the development of grain production and processing in Ukraine. *Black Sea Economic Studies*, 74, 88-97. doi: 10.32843/bses.74-13.

Експортний потенціал зернових культур України в умовах фрагментації світової торгівлі

Тетяна Романовська

Кандидат технічних наук, доцент
Національний університет харчових технологій
01033, вул. Володимирська, 68, м. Київ, Україна
<https://orcid.org/0000-0003-3364-2408>

Наталія Романовська

Кандидат економічних наук, доцент
Державна установа «Інститут економіки та прогнозування Національної академії наук України»
01011, вул. Панаса Мирного, 26, м. Київ, Україна
<https://orcid.org/0000-0002-1377-7551>

► **Анотація.** Актуальність дослідження зумовлена необхідністю адаптації зернового сектору України до воєнних викликів, трансформації глобальної торгівлі та пошуку нових напрямів диверсифікації експорту зернових культур. Метою дослідження було оцінити трансформацію географічної структури експорту зернових культур України, визначити рівень концентрації світових ринків пшениці, кукурудзи та ячменю, а також обґрунтувати напрями підвищення стійкості зернового сектору в умовах воєнної нестабільності. У дослідженні використано методи статистичного, порівняльного та системного аналізу, а також індекс Герфіндаля-Хіршмана і коефіцієнт концентрації. Встановлено, що світовий ринок кукурудзи характеризувався високим рівнем концентрації, тоді як ринки пшениці та ячменю мали помірну концентрацію. Доведено, що Україна зберегла позиції одного з провідних експортерів зернових культур навіть в умовах повномасштабної війни росії проти України. У 2022-2024 роках відбулася суттєва трансформація географічної структури експорту: посилилася роль країн Європейського Союзу, Африки та Азії, тоді як залежність від окремих традиційних ринків поступово зменшувалася. Встановлено, що процес диверсифікації мав поетапний характер: у 2022 році переважала вимушена адаптація до логістичних обмежень, у 2023 році – активна переорієнтація експортних потоків, а у 2024 році – стабілізація нової багаторегіональної моделі експорту. Це дозволило знизити ризики надмірної залежності від окремих напрямів збуту та підвищити гнучкість зовнішньоторговельної діяльності. Для окремих сегментів, зокрема експорту ячменю, спостерігалася висока концентрація поставок до Китаю, частка якого у 2025 році досягла 48,7 %. Визначено, що ключовими чинниками адаптації зернового сектору стали розвиток альтернативної логістики через дунайські порти та сухопутні коридори ЄС, а також розширення присутності на нових ринках збуту. Обґрунтовано, що розвиток глибокої переробки зернових культур і виробництва продукції з високою доданою вартістю стало важливим чинником зниження вразливості аграрного сектору до зовнішніх економічних та логістичних шоків. Практична цінність дослідження полягала в обґрунтуванні напрямів диверсифікації експорту, розвитку переробки зернових культур та модернізації логістичної інфраструктури для підвищення конкурентоспроможності та стійкості аграрного сектору України.

► **Ключові слова:** зерновий ринок; диверсифікація ринків; логістика; воєнні виклики; глобальна торгівля; продовольча безпека; конкурентоспроможність аграрного сектору