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Food security as a basis for socio-economic sustainability in war conditions

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Abstract. In times of war, access to food affects the humanitarian situation, economic stability, and national security. The purpose of the study was to analyse the main challenges of ensuring food security in war conditions and identify key principles and priorities for its support. Methods of statistical data analysis, comparative analysis, and generalisation of theoretical approaches were used to develop recommendations for improving the sustainability of food systems in Ukraine. As a result of the study, it was found that due to a full-scale invasion in 2022, wheat production in Ukraine decreased by more than 30%, and sunflower oil exports decreased by more than 1 million tonnes compared to pre-war levels. The world grain price index rose 17.9% in 2022, confirming the significant impact of the war on global food security. The study highlighted the main challenges of ensuring food security in Ukraine caused by military aggression: destruction of infrastructure, reduction of production capacity, land pollution, lack of resources for farmers, and reduction of export potential. The impact of the armed conflict on the agricultural sector, global food markets, and the availability of food products for the population was assessed. The results of the study confirmed that to ensure food security of Ukraine, it is necessary to implement comprehensive measures: modernisation of logistics and production infrastructure, stimulation of innovations in the agricultural sector, strengthening state support for farmers, and reducing dependence on imports. Recommendations have been developed for strengthening socio-economic sustainability through effective management of food systems. The proposed solutions are aimed at minimising the impact of war, stabilising food systems, and creating conditions for economic recovery. The results of the study can be used to develop food security strategies, adapt agricultural and economic policies in war conditions, and develop programmes to support producers and consumers

Keywords: armed conflict; rural economy; economic stability; infrastructure; export potential; sustainability of food systems

Introduction

Food security is a fundamental factor in ensuring socio-economic stability and the well-being of society. In the current context of global challenges, in particular armed conflicts, the problem of ensuring food security has become particularly important. Wars and other crises pose serious threats to the functioning of food systems, limiting the availability, stability, and use of food. However, food security is not only a matter of physical access to food, but also an important element of social cohesion, economic sustainability, and national security.

Armed conflicts cause large-scale disruptions in agricultural production, destruction of infrastructure, economic decline, and forced displacement of the population. As a result, the risks of hunger, malnutrition, and social instability are increasing, which exacerbates inequality between different regions and segments of the population. During military operations, access to food resources becomes significantly more difficult, dependence on external aid increases, and the vulnerability of food systems to external shocks increases. M.F. Asghar *et al.* (2022) highlighted the deep global consequences of the conflict, in particular, its violation of international governance, sovereignty, and the balance of power. The study discussed how the invasion destabilised Ukraine politically, economically, and socially, and highlighted its implications for global food security, energy supplies, and transnational mobility.

H.S. Grantham (2024) analysed the relationship between human conflict, food security, and biodiversity. The study reported that military action and socio-economic instability in conflict zones lead not only to food shortages, but also to ecosystem degradation, which threatens wildlife conservation. The researcher stressed the importance of developing sustainable policies that reduce pressure on natural ecosystems while ensuring food security for vulnerable communities. He proposed a model of sustainable resource use that includes the introduction of regulated wild animal catches and measures to support local agriculture, which can reduce dependence on natural ecosystems. O. Zghurska *et al.* (2024) examined the importance of sustainable development of Ukraine's agrosocial system after the war. The researchers emphasised the need to combine economic growth, social responsibility, and environmental sustainability to ensure food security and sustainable economic development. They proposed innovative approaches to the restoration of the agro-industrial sector, including the introduction of modern technologies, environmentally friendly production, and the development of social infrastructure in rural areas. The importance of ensuring food security during and after military crises is relevant not only for Ukraine, but also for many other countries of the world.

F.G.M. Yar & N. Karimi (2024) conducted a study of food security in rural Afghanistan, which is suffering from economic difficulties, armed conflicts, and weak infrastructure. The researchers analysed possible strategies for improving food supply, drawing on the experience of other countries with similar socio-economic conditions, such as Ethiopia, India, and Bangladesh. The researchers emphasised that the success of these strategies depends on adapting to the social, cultural and economic context of Afghanistan. This study highlighted the importance of an integrated approach to food security that combines increased agricultural productivity, income, and infrastructure. Using successful models from other countries can be an effective solution for Afghanistan, but they need to be adapted to the specific conditions of the region. R. Su *et al.* (2024) examined the impact of socio-economic and environmental policies on land conflicts and food security in China. The researchers have shown that effective land management in the face of increasing urbanisation pressures is critical to ensuring food security and environmental stability. The

most effective approach is a combination of economic and environmental strategies that ensure a balance between the conservation of natural resources and the development of urban and agricultural areas.

E. Halmaghi *et al.* (2023) examined the impact of armed conflict on food security, focusing on global impacts. The researchers noted that armed conflicts directly destroy key elements of the food system: the production, storage, and transportation of food in war zones. This makes it impossible to deliver the necessary resources to the local population, which exacerbates the humanitarian crisis.

The relevance of the study of food security in war conditions is conditioned by the need to find effective solutions to reduce the impact of armed conflicts on the agro-industrial sector, increase agricultural productivity, and ensure stable nutrition of the population. This is a key element in achieving economic sustainability, social peace, and the restoration of territories affected by military operations.

The purpose of the study was to analyse the main challenges of ensuring food security in war conditions, identify key principles and priorities for its support, and develop recommendations for strengthening socio-economic sustainability through effective management of food systems.

Materials and Methods

The study covered the period 2014-2024, which allowed tracking the impact of the military conflict on Ukraine's food security from the beginning of Russian aggression in 2014 and its escalation in 2022 to current challenges. The analysis included an assessment of the dynamics of changes in agriculture, export policies, infrastructure destruction, and changes in the economic availability of food.

To analyse the impact of war on food security, the following statistical and econometric methods were used: descriptive statistics – to assess major changes in food systems (production volumes, export indicators, price dynamics); regression analysis – to model the relationship between military operations and key indicators of the agricultural sector (for example, the impact of infrastructure destruction on grain production); correlation analysis – to assess the interdependence between changes in food prices, economic availability of products and risk factors (for example, inflation, logistics restrictions); trend analysis – to predict changes in production and exports time series analysis (ARIMA-modelling) – to assess the dynamics of food prices and export products; SWOT analysis – to identify the strengths and weaknesses of Ukraine's food security in war conditions.

The assessment of food security risks was carried out using a combined approach, which included: methods of multi-factor risk analysis – assessment of the impact of military operations, inflation, changes in the exchange rate, changes in the availability of fertilisers and fuel on the food sector; scenario analysis (What – if Analysis) – used to predict the possible consequences of various scenarios of war development (for example, the continuation of the blockade of Black Sea ports, the expansion of international assistance); modelling of the economic stability of the agricultural sector – assessment of the stability of farms to economic shocks.

The following software tools were used to analyse statistical and econometric data: SPSS – for regression and correlation analysis of the relationship between war and food security indicators; Stata – for modelling time series and evaluating the dynamics of food prices; Excel – for data visualisation and calculation of basic statistical indicators.

Official statistical and analytical data were used for the study: State Statistics Service of Ukraine (n.d.a; n.d.b) – data on food production, export and import; Food and Agriculture Organisation of the United Nations (FAO) (n.d.) – information on the availability of access to food in Ukraine; World Food Programme (WFP) (n.d.) – assessment of the humanitarian impact of war on food security; World Bank (n.d.) – macroeconomic indicators and forecast assessments of the economic situation in Ukraine; Ministry of Agrarian Policy and Food of Ukraine (n.d.) – official data on losses of the agricultural sector due to the war.

Results and Discussion

Food security is a comprehensive system for ensuring the availability, sufficiency, safety, and quality of food for all people at all times. Rome Declaration World Food Security (1996) defines food security as a guarantee of providing high-quality, safe food and drinking water necessary for a healthy life and social development of every person. The definition covered two fundamental components of food security – nutrition and drinking water, recognising their critical role in maintaining a healthy life. Quality and safety are emphasised, which go beyond the mere availability of resources, highlighting their compliance with the standards necessary for health. The link between food security and socio-economic development is also emphasised. This is important because sustainable access to quality food and water is the foundation for social cohesion, economic growth, and reducing inequality.

The issue of food security in the context of socio-economic stability attracts considerable attention of foreign researchers. In particular, A. Sen (2000) noted that true development is determined not only by economic growth, but also by the expansion of human freedoms. He saw food security as one of the key components of freedom, which is the foundation for achieving other forms of freedom and general well-being. The researcher considered food security as the consumption of food by an individual, family, or social group, depending on their ability to acquire the necessary resources to meet their nutritional needs. The focus was on the economic availability of food and the ability of an individual, family, or social group to meet their nutritional needs through the acquisition of resources. A. Sen highlighted social and economic inequality, which can be a major barrier to nutrition even in countries with sufficient food supplies. This is especially true in times of crisis, when food prices are rising and incomes are declining. While the definition indicates dependence on economic opportunities, it does not sufficiently consider the impact of global

factors such as armed conflicts, climate disasters, or political instability that can completely destroy food systems.

American researcher L. Brown (2011) analysed the current state of the global economic system and the natural environment, focusing on the relationship between socio-economic stability and food security. S. Maxwell (1996) proposed an expanded approach to understanding food security. He stressed that food security covers not only the provision of food, but also socio-economic aspects that affect the availability and possibility of obtaining food. Its concept demonstrates the link between food security and broader development issues such as poverty, inequality, and sustainability. Maxwell emphasised the need to consider various dimensions of food security, including production, economic availability, use, and supply stability.

A more comprehensive definition of the concept of food security was proposed by P. Pinstrup-Andersen (2009). The researcher considered food security at several levels: global, national, regional, and household levels. It was noted that effective strategies should consider the challenges of each of these levels to ensure sustainable development. It treats food security as a condition in which all people at all times have physical, social, and economic access to a sufficient amount of safe and nutritious food that meets their nutritional needs and preferences for an active and healthy life. The definition contains such important components of this concept as the availability, safety, and quality of food, and also emphasises the need to meet both physical, social, and economic needs. However, in the context of today's global challenges, it is important to consider not only access to food, but also the control of communities and states over their own food systems.

The issue of food security was also explored by a number of international institutions that deal with this issue from various aspects: economic, social, environmental, and political. Food and Agriculture Organisation of the United Nations (FAO) (n.d.) is a key organisation that investigates issues**of** global food security, developing agriculture, fisheries, and forestry. The annual report of the State of Food Security and Nutrition in the World, which is being prepared jointly with the World Food Programme (WFP) (n.d.), the International Fund for Agricultural Development (IFAD), the United Nations International Children's Emergency Fund (IFAD), and the World Health Organisation (WHO) monitors progress towards achieving Goal 2 of Sustainable Development of the United Nations – "Overcoming famine" (United Nations Development Programme, n.d.) and also analyses the challenges and risks that affect food security in the world.

Food and Agriculture Organisation of the United Nations (FAO) (n.d.) defines food security as a condition in which all people at all times have physical, social, and economic access to a sufficient amount of safe and nutritious food that meets their needs and preferences for a healthy life. The FAO definition covers all four dimensions of food security: physical accessibility (availability of sufficient food); economic accessibility (ability to purchase food from income or other resources); social access (consideration of social conditions that may affect access to food); food safety and quality (ensuring that food meets nutritional and safety standards). It is important to note that the definition pays attention to individual nutritional needs and preferences. This makes it more human-centred and adaptable to different cultural contexts. M. Zakhodym (2022) revealed food security as a state of the economy that ensures stable physical, economic, and social availability of food products, their safety and high quality. This situation guarantees a sufficient level of food supply under normal conditions and a minimum level in emergency situations, while maintaining the country's food sovereignty.

Law of Ukraine No. 1877-IV (2004) defines food security as the protection of human vital interests, which is expressed in ensuring unhindered economic access to food for maintaining normal life. The law proposes a definition of food security that focuses on the economic aspect of access to food. This definition emphasises the role of the state in ensuring the basic needs of the population by creating conditions for economic access to food. The definition emphasises that food security is a basic human right necessary for the maintenance of its normal life. This is an important socially oriented approach that corresponds to modern concepts of human rights and highlights state guarantees as a key mechanism for ensuring food security. This reflects the government's commitment to creating an enabling environment for economic access to food through price regulation, support for the agricultural sector, and social protection for vulnerable segments of the population. Emphasis on economic access to food, which is critical, especially in times of economic crises, when rising food prices can endanger the nutrition of the most vulnerable categories of the population. The Law of Ukraine "On state support for agriculture of Ukraine" offers a basic definition of food security, focused on economic access. However, to fully reflect the current concept of food security, it is necessary to include aspects of stability, food quality, and consider global challenges.

Order of the Cabinet of Ministers of Ukraine No. 684-r (2024) offers a definition of food security that reflects the current understanding of this concept, with an emphasis on the physical and economic availability of food products, and their safety and compliance with human needs. It is emphasised that food security is "...a component of national security and defence of Ukraine. ...is a system that clearly functions to provide all segments of the population with food products in accordance with accepted physiological norms at the expense of domestic production and necessary imports of those food products for which there are no domestic conditions". It is noted that armed aggression has become a global test for food security not only for Ukraine, but also for the whole world and can cause political instability in dozens of countries around the world. The main problems that are critical for ensuring food security in Ukraine and whose solution requires a comprehensive approach involving cooperation between government agencies, international partners and the agricultural sector are the following (Table 1).

Table 1. Problems of food security of Ukraine in the conditions of war

Problem	Content of the problem
Disruption of logistics chains	Armed aggression has led to significant destruction of transport infrastructure, which is critical for the delivery of agricultural products and food products to consumers. The blockade of seaports, through which the main export of agricultural products was carried out, significantly limited Ukraine's opportunities on world markets.
Reduction of production capacity	As a result of the fighting, many agricultural facilities were destroyed or damaged, including farms, food processing enterprises, grain elevators, and irrigation systems. This led to a decrease in agricultural production.
Land pollution	About 30% of agricultural land has become unusable due to mining or chemical contamination as a result of military operations. This creates additional difficulties for sowing campaigns and reduces the area suitable for growing crops.
Lack of resources for farmers	Agricultural sector faces a significant shortage of fuel, fertilisers, seeds, and plant protection products. In addition, high global prices for these resources limit the access of Ukrainian farmers to the necessary materials for production.
Insufficient government support	The lack of systematic state support programmes aimed at restoring destroyed enterprises and adapting to EU requirements significantly complicates the possibility of effective restoration of the agro-industrial complex.
Deterioration of food availability	The decline in the consumer capacity of the population caused by the economic consequences of the war makes it difficult to access food. Rising food prices are exacerbating the problem, especially in the regions that have suffered the greatest losses.
Reduced export potential	Due to the loss of stable export channels, the volume of deliveries of grain and other agricultural products to international markets has significantly decreased. This has a negative impact on both Ukraine's economy and global food security.
Lack of state food reserves	There is virtually no effective system of strategic food reserves in Ukraine, which creates additional risks under martial law.
Changing the consumption structure	Migration of the population, in particular, internal and external, has led to a reduction in the fund of domestic food consumption, which creates an uneven distribution of food resources between regions.
Destruction of the irrigation system	In the southern regions, a significant part of the irrigation system has been destroyed, which makes it difficult to grow crops, especially in arid conditions.
Deterioration of the humanitarian situation	In regions affected by significant destruction, there is a shortage of basic food, which causes a humanitarian crisis and poses risks to the most vulnerable segments of the population.
Growing dependence on imports	Restrictions on the production of certain categories of food products increase Ukraine's dependence on imports, which creates additional economic risks in an unstable geopolitical situation.
Environmental consequences of war	Water pollution, destruction of natural ecosystems, and the spread of explosive objects on agricultural land pose long-term risks to Ukraine's food security.

Source: compiled by the authors based on data from the Order of the Cabinet of Ministers of Ukraine No. 684-r (2024)

Food security problems caused by the war seriously undermine Ukraine's socio-economic sustainability, creating multi-level threats. The destruction of logistics and production chains, land pollution, reduced export potential and rising food prices lead to a decrease in the standard of living of the population, increased unemployment and economic inequality. The lack of resources and insufficient state support complicate the recovery of the agricultural sector, which is a key driver of the economy. These challenges exacerbate the humanitarian crisis, reduce the purchasing power of the population, and increase the country's dependence on external aid, jeopardising both national security and sustainable development prospects. However, these are not the only challenges that are associated with the violation of food security in Ukraine. Table 2 summarises the risks to food security.

Table 2. Risks to Ukraine's food security

Risks	Content of risks
Economic risks	Armed aggression leads to significant challenges for the Ukrainian economy, including limited access of farmers to credit resources, high prices for raw materials, fertilisers, and fuel, and an increase in the tax burden. These factors complicate the functioning of the agricultural sector and reduce its competitiveness in the global market.
Military risks	The fighting caused the destruction of infrastructure, enterprises, and agricultural land. Mining of territories, damage to irrigation systems, and destruction of agricultural facilities significantly affect the ability to grow and process food.
Environmental risks	Chemical pollution of land, destruction of water resources, excessive use of fertilisers and soil degradation pose a serious threat to the environmental stability of agricultural territories. In addition, climate change increases the negative impact on the agro-industrial complex.

Table 2, Continued

Risks	Content of risks
Technological risks	The lack of innovation and the destruction of research infrastructure make it difficult to introduce new technologies in the production and processing of agricultural products. However, the lag behind global trends in technological progress deepens dependence on external technology supplies.
Social risks	Deterioration of the humanitarian situation, rising unemployment, and declining incomes significantly reduce the availability of food for vulnerable groups. In addition, internal and external population migration causes an uneven distribution of food resources.
Infrastructure risks	Destruction of transport, logistics, and storage infrastructure (grain elevators, refrigeration units) limits the ability to store and transport agricultural products. Imperfect infrastructure also complicates the development of the agricultural sector and reduces its efficiency.
Import dependency	Due to the loss of part of its production capacity, Ukraine is forced to partially rely on the import of certain food products. This creates additional economic risks in an unstable geopolitical situation.

Source: compiled by the authors based on data from the Order of the Cabinet of Ministers of Ukraine No. 684-r (2024)

Each of these risks requires a comprehensive approach to overcoming, in particular infrastructure development, stimulating innovation, environmental monitoring, and active support of the agricultural sector at the state level. Russian aggression has profoundly affected Ukraine's ability to ensure food security and maintain stable agricultural exports, creating new challenges for both the Ukrainian economy and the global food system (Fig. 1).

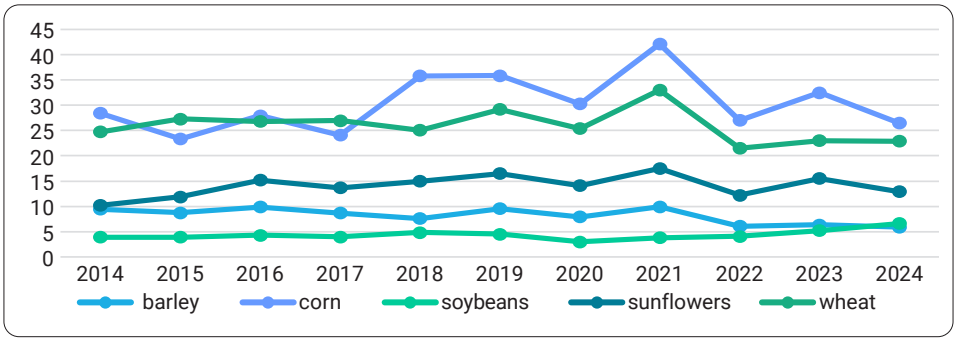

Figure 1. Production volume of barley, corn, soybeans, sunflowers, and wheat in Ukraine, thousand tonnes
Source: compiled by the authors based on data from United States Department of Agriculture (USDA) (n.d.)

According to N. Havrylenko *et al.* (2022), when assessing the importance of the Ukrainian agricultural sector for global food security, statistics clearly prove its significance. Statistics show that Ukraine is a leading producer of sunflower (more than 60% in the world production of sunflower seeds), wheat (about 40%) and corn (about 30%), which makes it an important player in the global agricultural sector. The global importance of Ukraine and Russia in these categories reinforces their role in ensuring global food security, and highlights the risks to the global market in the context of conflict or other destabilising factors.

The war significantly affected global markets for wheat, corn, and barley. Together, Ukraine and Russia are among the largest grain exporters, and export disruptions due to port blockades and infrastructure destruction have caused a shortage of products on world markets. This, in turn, led to a sharp increase in prices. For example, wheat prices rose particularly strongly in 2021-2022 (Fig. 2).

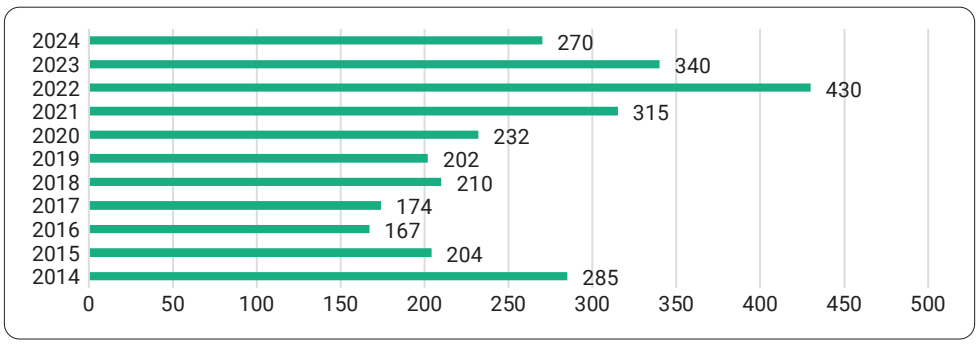

Figure 2. Average prices for US wheat
Note: HRW from 2014 to 2024 (in nominal USD per tonne)
Source: compiled by the authors based on data from Statista (2024)

Sunflower oil prices also rose to record levels due to a reduction in exports from Ukraine, which is the world's largest exporter of sunflower oil. In 2022, the price of sunflower oil reached USD 1,427.4 per tonne, which is significantly higher than in previous years (Fig. 3).

Higher prices for cereals and oils have led to higher costs in the food industry, which has led to higher prices for other food products such as meat, dairy products, and eggs. High prices for agricultural products have led to a decrease in food availability for many countries, especially in regions that depend on Ukrainian grain imports. The war has led to volatility in global agricultural markets. Fear of a prolonged deficit due to the ongoing conflict forced importers to accumulate inventory, which further stimulated price increases.

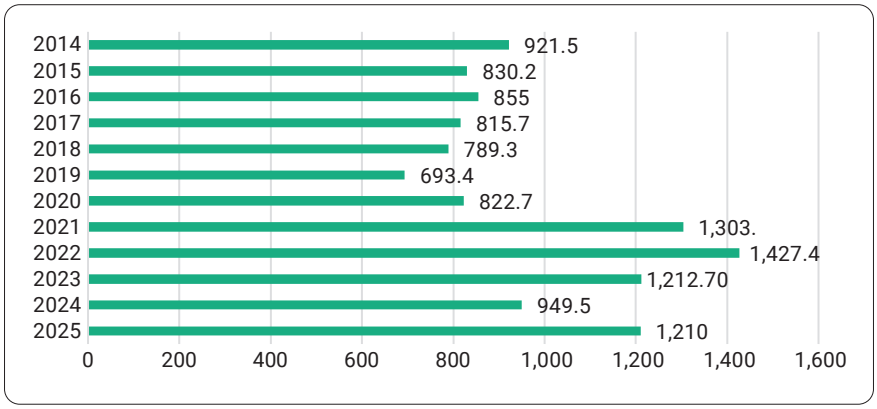

Figure 3. International prices for sunflower oil
Note: FOB Rotterdam (in USD per tonne)
Source: compiled by the authors based on data from INSEE (2025)

J.W. Glauber (2023) noted that Russia's invasion of Ukraine has created serious risks to global food security, which has required a number of responses from governments and international organisations. The situation remains very volatile today and introduces significant uncertainties in the already tough global market. Of immediate concern is the vulnerability of net food importing countries, which are highly dependent on Ukraine for supplies, such as the Middle East region. After peaking in May 2022, prices for agricultural products in general fell to pre-war levels, and price volatility also fell. While some may conclude that the global food crisis is over, concerns remain.

B. Rice *et al.* (2023) noted that the war significantly exacerbated the instability of global food prices, especially for wheat, corn, soybeans, and rice. Military actions disrupted the export chains of Ukraine, one of the world's leading grain suppliers, and also led to higher prices for energy resources and fertilisers, which increased the cost of agricultural production. The introduction of export restrictions in various countries (in particular, in Russia and Kazakhstan) also contributed to higher prices, and changes in demand for alternative products, such as rice, only increased overall market volatility. The researchers noted that in the short term, the situation will remain unstable, and international monitoring of export policies and prices is necessary to stabilise the market.

Russia uses food shortages in low-and middle-income countries as an instrument of influence in two ways: first, it tries to eliminate Ukraine as a competitor in the supply of food to these countries, which reduces the influence of Ukraine; second, it increases the dependence of these states on Russian food exports, strengthening its own geopolitical influence. C. Welsh & J. Glauber (2024) and N. Kutsmus *et al.* (2024) noted that since the start of a full-scale war in 2022, the volume of food exports from Russia has increased, while Ukrainian exports have declined. Wheat exports from Ukraine to Europe increased from 2% to 50%, and corn – from 36% to 64%. Although most of this grain is then sent to other countries through European intermediaries, a sharp increase in supplies to neighbouring countries has led to market imbalances, in particular, in Poland, Romania, Hungary, Slovakia, and Bulgaria. This has caused trade conflicts between Ukraine and these states, and disputes within the EU over how to support Ukrainian farmers without harming local farmers at the same time. These difficulties have resulted in political consequences, including the impact on elections in individual countries and increased tensions both in the region and in the European community itself.

M. Dorosh-Kizym *et al.* (2024) argued that the war seriously affected Ukraine's food security, in particular, through the destruction of infrastructure, disruption of logistics chains, and reduced food production. Agricultural enterprises have demonstrated significant resilience due to the ability to move farms to safer regions. This contributed to the growth of the number of cattle in such oblasts as Zakarpattia, Kharkiv, and Lviv. Such positive changes demonstrate the ability of the agricultural sector to adapt to the new realities of war, although the overall demographic situation in the industry remains difficult. V. Vytoptova (2024) noted that small farmers, in particular those engaged in growing seasonal crops, were most affected, because this sector provided jobs and a stable income for a significant part of the rural population.

According to the Ukrainian food security and livelihood cluster, about 7.3 million Ukrainians, which is 20% of the population (excluding the occupied territories), face moderate or serious food shortages. Among them are 1.2 million children and 2 million elderly people. These data are also confirmed by the United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA) and the World Food Programme (WFP) (IFPRI, 2023).

According to the FAO (n.d.), the war affected more than 150 thousand farmers and workers of the food system, who either suffered significant losses or were forced to emigrate. Almost 90% of small crop producers reported a decline in income, and more than 70% of them recorded a significant or sharp decline – more than 25%. Small producers of livestock products were less affected, but more than 60% of them reported a decline in income, including 46% – a significant or sharp decline (Mykhailo, 2023).

The rise in the price of agricultural products requires special attention in the context of ensuring food security. Rising prices have a significant impact on food security, as it affects all of its key components:

1. *Physical availability of food products.* Rising prices can reduce production volumes, especially if producers face high costs for resources (fuel, fertilisers, logistics). This affects the availability of basic food products for the population, especially in regions that depend on domestic supplies.

2. *Economic accessibility.* High prices for agricultural products increase costs for end users. Most of all, this affects low-income groups of the population, who may lose the opportunity to buy enough quality food. As a result, this leads to increased hunger, poor nutrition and health.

3. *Stability of the food system*. Sharp price fluctuations create instability for food markets. This can lead to a shortage of goods, speculation, and additional logistical problems. The war in Ukraine, for example, caused disruptions in global supply chains, which affected the prices of cereals and oils, which are key for many countries.

4. Social consequences. Rising food prices can lead to social tension, protests, or even political instability. This is especially true for countries that depend on food imports from regions such as Ukraine, where the war has severely restricted exports.

Figure 4 shows the average prices for agricultural products sold by enterprises in Ukraine for the period 2014-2023 (UAH/tonne).

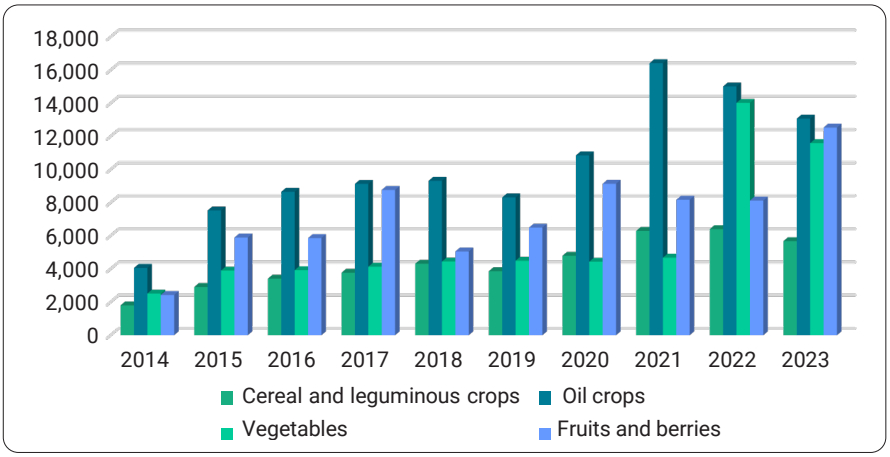

Figure 4. Average prices for agricultural products sold by enterprises in Ukraine for the period 2014-2023 (UAH/tonne)
Source: compiled by the authors based on data from State Statistics Service of Ukraine (n.d.C)

According to the FAO (n.d.) disruptions caused by the war in Ukraine have raised the average food price index to the highest level in history. The FAO grain price index rose 17.9% in 2022 due to factors such as significant market disruptions, rising energy and resource prices, adverse weather conditions, and the continued high level of global food security (Filho *et al.*, 2023). In this context, the analysis of the Ukrainian price environment allows making several generalisations. First of all, the most pronounced increase in prices is observed in the segment of livestock products (in particular, farm animals in live weight) and oilseeds. This indicates both increased domestic and external demand for the relevant products, and increasing production costs, including energy resources, feed, and logistics. A more moderate increase in prices for grain and vegetable crops may be associated with relatively stable domestic demand, less dependence on foreign markets, and constant yields of these categories during the analysed period. Special attention is drawn to the sharp increase in prices after 2015, which coincides with a period of macroeconomic instability, currency fluctuations, and global growth in inflationary pressures. This, in turn, affected the cost of production and transportation of agricultural products. In addition, the rapid rise in the price of products with high export potential, such as oilseeds and meat, is of particular importance. This confirms the strategic importance of foreign trade activity for the Ukrainian agricultural sector, since these categories provide foreign exchange earnings and increase the competitiveness of agricultural producers on world markets. Thus, the analysis of price

dynamics over the past decade allows tracing not only economic patterns, but also the impact of global challenges, including war, climate change, and fluctuations in energy markets, which shape the modern environment of functioning of the agro-industrial complex of Ukraine.

Conclusions

The risks to Ukraine's food security during the war are multifaceted and include economic, military, environmental, technological, social, and infrastructure threats. These include the destruction of logistics and production infrastructure, land pollution, limited access of farmers to resources and financing, reduced export potential, and dependence on imports. In addition, technological lag, climate change, rising unemployment, humanitarian crisis, and limited government support exacerbate the vulnerability of the agricultural sector and reduce the sustainability of food systems, jeopardising the physical and economic availability of food for the population.

The assessment of the impact of the war in Ukraine on food security showed the scale and depth of the consequences for the agro-industrial complex both at the national and global levels. In the period 2014-2024, the production of major crops, such as wheat, barley, corn, sunflower, and soybeans, fluctuated significantly. For example, in 2021, Ukraine produced more than 42 million tonnes of corn and 33 million tonnes of wheat, but as a result of a full-scale invasion in 2022, these volumes decreased by more than 30%. In 2023, sunflower oil exports decreased to 5.7 million tonnes compared to 6.8 million tonnes in 2020, which indicates limited logistics and loss of sales markets.

Prices for agricultural products have increased significantly: the average price of US wheat (HRW) in 2022 reached USD 468 per tonne, which is almost twice as high as in 2020. The FAO grain price index rose 17.9% in 2022, while the price of FOB Rotterdam sunflower oil rose to USD 1,427.4 per tonne, a record high. In domestic terms, average prices for agricultural products in Ukraine in 2023 were two and sometimes three times higher than in 2014. The data also show that more than 7.3 million Ukrainians are facing food shortages, including 1.2 million children and 2 million elderly people. About 30% of Ukraine's agricultural land became unusable due to mining or destruction, and 90% of small farmers reported a decrease in income.

Consequently, the war in Ukraine not only disrupted the internal food system, but also destabilised world markets. To overcome these challenges, it is necessary to systematically reform agriculture, build sustainable supply chains, restore logistics infrastructure, and increase international assistance. Without comprehensive solutions, food security will remain at risk in the face of prolonged conflict. Further research will focus on developing strategies and policies aimed at strengthening the sustainability of food systems, ensuring sustainable access to resources for farmers, and mitigating the negative effects of war and global crises on food security.

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Conflict of Interest

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Продовольча безпека як основа соціально-економічної стійкості в умовах війни

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Анотація. В умовах війни забезпечення доступу до продовольства впливає на гуманітарну ситуацію, економічну стабільність та національну безпеку. Метою дослідження був аналіз основних викликів забезпечення продовольчої безпеки в умовах війни та визначення ключових принципів та пріоритетів її підтримки. Використано методи аналізу статистичних даних, порівняльний аналіз і узагальнення теоретичних підходів для формування рекомендацій із підвищення стійкості продовольчих систем України. У результаті дослідження встановлено, що через повномасштабне вторгнення у 2022 році виробництво пшениці в Україні зменшилось на понад 30 %, а експорт соняшникової олії скоротився на понад 1 мільйон тонн порівняно з довоєнним рівнем. Індекс світових цін на зернові у 2022 році зріс на 17,9 %, що підтверджує суттєвий вплив війни на глобальну продовольчу безпеку. Дослідження висвітлило основні виклики забезпечення продовольчої безпеки України, спричинені військовою агресією: руйнування інфраструктури, скорочення виробничих потужностей, забруднення земель, дефіцит ресурсів для аграріїв та зниження експортного потенціалу. Оцінено вплив збройного конфлікту на сільськогосподарський сектор, глобальні ринки продовольства та доступність харчових продуктів для населення. Результати дослідження підтвердили, що для забезпечення продовольчої безпеки України необхідно впровадити комплексні заходи: модернізацію логістичної та виробничої інфраструктури, стимулювання інновацій у аграрному секторі, посилення державної підтримки фермерів і зниження залежності від імпорту. Розроблено рекомендації для зміцнення соціально-економічної стійкості через ефективне управління продовольчими системами. Запропоновані рішення спрямовані на мінімізацію впливу війни, стабілізацію продовольчих систем і створення умов для економічного відновлення. Результати дослідження можуть бути використані для розробки стратегій продовольчої безпеки, адаптації аграрної та економічної політики в умовах війни, формування програм підтримки виробників та споживачів

Ключові слова: збройний конфлікт; сільське господарство; економічна стабільність; інфраструктура; експортний потенціал; стійкість продовольчих систем

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