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Food crisis in the modern world: Causes and possible consequences for Ukraine

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► **Abstract.** The prevention of the emergence and escalation of food crises in each country depended on the timely identification of their characteristic warning signs in order to protect food security. The study aimed to identify and summarise the causes and consequences of food crises in Ukraine and worldwide for preventing their occurrence and mitigating their negative impacts. The study revealed the specific features of the systemic vulnerability of food systems. It substantiated that the multidimensional and multidirectional nature of simultaneous global crises (financial, energy, environmental) created a synergistic polycrisis, with the food crisis as one of its components. Using the Ishikawa diagram, it was identified the cause-and-effect relationships leading to Ukraine's food crisis and structure the causes into major categories. The article established that potential causes of a food crisis and declining food security in Ukraine may include: the unresolved consequences of past crises; the global pandemic; manifestations of global economic shocks (rising world food prices, slowdown in agricultural production growth, declining global grain reserves, high energy prices, global population growth); the environmental crisis and extreme weather events; wars; local sectoral crises, such as the crisis in the dairy industry. Between 2020 and 2024, amid the COVID-19 pandemic and russia's full-scale invasion of Ukraine, global food prices rose 2.7-fold, while wheat stocks fell to 272 million tonnes in 2023/2024 period. The results of the study showed that, given the existing agricultural, industrial, innovative, and scientific-production potential, the occurrence of critical famine in Ukraine was possible only under artificially created challenges: wars causing destruction of arable land, seizure of harvests, restricted access to food; global man-made and environmental disasters. Theoretical, methodological, and applied provisions regarding the causes and potential consequences of food crises in the modern world can serve as a source of scientific information for the development of food security strategies and programmes

► **Keywords:** polycrisis; hunger crisis; food security; synergistic impact; food supply; Ishikawa diagram

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▸ Introduction

The frequency of global crises and disasters on a global scale had been gradually decreasing during the 20th and the beginning of the 21st century, which was a consequence of the manifestations of globalisation processes: the interdependence of countries in the world economy; the openness of markets and international cooperation; the strengthening of the international division of labour; the intensification of competition. At the same time, these processes were exacerbated by threats, including the growth of the greenhouse effect and climate change, the use of nuclear energy and genetic engineering, the spread of disease epidemics, and socio-economic imbalances. Crises, throughout their history, have arisen as a result of military conflicts, environmental disasters, pandemics, and could be of an economic, financial, energy, or food nature. The causes and threats of a food crisis and the approaches to overcoming them were the focus of research by scholars worldwide. D. Graham (2024) examined the nature of imperial responses to food crises during the ancient Roman Empire. Here hunger was addressed, among other measures, through special projects that created employment opportunities and increased household incomes, notably the construction of the Portus harbor. T. Nakamura *et al.* (2024), in the context of the main factors influencing the global food crisis (the COVID-19 pandemic, the armed aggression of the russian federation in Ukraine, and global climate change), assessed the measures undertaken to counter the food crisis in Germany. Researchers concluded that perceptions of the causes of the food crisis vary according to income, education, and age.

Y.-I. Lee *et al.* (2024), based on experimental research, showed that disinformation on social media regarding food product quality can disrupt social stability, especially among vulnerable groups, and exacerbate the food crisis. Therefore, it was crucial to prevent the spread of misleading messages concerning the quality and properties of food products, and thus strengthen efforts to counter misinformation about the food crisis. A.M.T. Thow (2024) traced the dynamics of food insecurity and its underlying causes, and proposed approaches to addressing nutrition challenges during food crises. In addition to ensuring food availability, the researcher proposed strengthening the integration of nutrition issues into broader crisis-response measures, including trade policy, urban planning, agricultural investments, and public health. K.O. Ouko & M.O. Odiwuor (2023) assessed the factors driving the approach of food crises in African countries, as well as the consequences and causes of global food price volatility in developing nations. Scientists identified the pandemic, the war in Ukraine that disrupted international food supply chains and prices, and climate change as the main causes of the food crisis on the African continent.

Researcher B.R. Tukamuhabwa (2023) underscored the importance of managing risks in agri-food supply chains, particularly for developing countries. C.S. Tang (2025) assessed the crisis factors and proposed addressing the global food crisis through the implementation of technologies and innovations in agriculture. The author evaluated innovative technological solutions to mitigate the food crisis, particularly for smallholder farmers. A. Libert-Amico & R. Koloffon (2025) highlighted the challenges and opportunities facing food systems during crises. Key challenges included shocks, violence, conflicts, and weak institutions that impeded investment in crisis-response measures. Opportunities involved synergies between climate, peace, and humanitarian actions, as well as development measures aimed at fostering resilient food systems during food crises. M. Kalyvaki & D.Q. Spencer (2025) emphasised the importance of systems for timely management, knowledge sharing and crisis communication, for addressing crises and making effective managerial decisions at both the enterprise and supply chain levels. D.T. Gebeyehu *et al.* (2025) assessed, through a survey of various respondent groups, both the direct and indirect impacts of the pandemic on food security in Ethiopia. To prevent future food crises from potential pandemics, researchers proposed establishing targeted groups to mitigate the impacts of food crises and strengthening disease prevention measures that affected food security.

F. Santos *et al.* (2025) proved that the escalation of the global food crisis exacerbated by climate change, conflicts, and economic hardships, necessitated a comprehensive approach to addressing economic challenges. Researchers applied a regression model based on data from 113 countries, covering both pre- and post-pandemic periods, and found that substantial income disparities among different social groups exacerbated food insecurity and made it impossible to overcome the problem through economic growth alone. A. Rokopanos *et al.* (2025), based on multivariate models, examining the relationships between agricultural commodity prices and input prices identified notable differences in these relationships before and after the 2009 crisis and concluded that modern agricultural policies were insufficiently effective, reducing farmers' incentives, while weakening the resilience of the agricultural sector. H. Ballouk *et al.* (2024) assessed the factors influencing financial security resilience and the risks associated with climate change, which were similarly relevant to food supply chains. The purpose of the article was to analyse and summarise the causes and effects of food crises in Ukraine and globally, with the goal of preventing their occurrence and alleviating their negative impacts.

▸ Materials and methods

The research was based on general scientific, historical, and economic-mathematical methods of scientific knowledge. To assess the state of the agri-food sector and its transformations during crisis periods, the historical method was applied. To structure the manifestations of polycrisis factors, as well as the consequences of a potential food crisis in Ukraine, the method of systemic generalisation was used. To identify differences in the behaviour of the food market under the influence of crisis phenomena, statistical methods were employed: the correlation-regression method – to establish interdependence and relationships between food production indicators and macroeconomic indicators; the index method – to analyse global price indicators, assess the impact of crisis factors on food costs, as well as on average global energy prices; grouping and comparison – to analyse employment in the agro-industrial sectors and to classify indicators by types of food products, production industries, and types of activities; and time series analysis – to examine changes over time in the sown area by types of agricultural crops. The

balance method was used to assess supply and demand in the global grain market. The tabular method was employed to systematise and generalise datasets on food production and consumption, price fluctuations, and employment. The graphical method was applied to visually represent the development trends of the agro-industrial complex and the emergence of crisis phenomena.

For a comprehensive analysis of the factors causing food crises in Ukraine, their cause-and-effect relationships, and the associated risks, the Ishikawa (fishbone) diagram method was employed. The diagram was structured by categorising causes into major groups, represented as the "bones" of the fish skeleton. More specific causes, which provided a detailed description of the cause-and-effect relationships within each category, were placed along the smaller branches. The completed diagram made it possible to identify and visually document the of the problem under study. The information base of the research included: reports of the Food and Agriculture Organization of the United Nations (FAO), specifically FSIN & Global Network Against Food Crises (2023; 2024); materials of the World Food Programme, such as data from FAO *et al.* (2024). Also, it was analysed publications of the United States Department of Agriculture – articles by R. Trostle (2008) and S. Morgan *et al.* (2022) and materials of the World Economic Forum in Davos (Serhan, 2023; Guterres, 2023). To analyse food security and determine its scale in individual countries, the Integrated Food Security Phase Classification (IPC) (2008), recognised as an international scientific standard, was analysed. To reveal the main manifestations of polycrisis factors and the consequences of a possible food crisis, the database of the State Statistics Service of Ukraine (n.d.) was used.

▸ Results and Discussion

The main manifestation of food crises was the deterioration of food security, when the absence or shortage of food became the cause of malnutrition or hunger. FAO defined a food crisis as a situation of severe food insecurity that cannot be addressed using local resources and capacities alone, and that required urgent action to protect and save lives, as well as to preserve livelihoods at the local or national level. A food crisis was considered large-scale if more than 1 million people or more than 20% of the country's total population were affected by high levels of severe food insecurity. This level of crisis, according to the IPC developed by the FAO, referred to the third phase or "crisis" (acute food insecurity). If at least one region of the country experiences severe food insecurity, the situation was classified as a fourth phase or "emergency" (critical level of hunger) (FAO, 2024a). Severe food insecurity occurred, when a country's population was unable to consume enough food to sustain their lives and well-being. Food insecurity was assessed using internationally recognised indicators of acute hunger, as defined by IPC, which included five levels of food insecurity: 1) minimal food insecurity; 2) stressed food insecurity; 3) crisis (acute food insecurity); 4) emergency (severe hunger); 5) catastrophe or famine (this was the phase, when mass famine can be declared) (IPC, 2008).

Since the beginning of the development of agriculture, communities engaged in the production of agricultural products had experienced cyclical famines, the frequency, and intensity of which have changed throughout history, depending on changes in demand for food due to population growth, as well as changes in supply due to unstable climatic conditions. S. Devereux (2000) noted that according to expert estimates, from 70 to 120 million people died from famine around the world during the 20th century, more than half of them died in China: 30 million during the widespread starvation of 1958-1961; up to 10 million in 1928-1930; more than two million in 1942-1943. The Bengal famine of 1973 caused the deaths of an estimated 0.8 to 3.8 million people out of a population of 60.3 million (Sen, 1982). The major famines of the late 20th century also included the Biafran famine in the 1960s; the famine in Cambodia during the 1970s caused by the Khmer Rouge; the North Korean famine of the 1990s; the Ethiopian famine of 1983-1985.

The former Soviet Union lost 8 million people due to the famine of 1930-1933, over 1 million as a result of the famine of 1946-1947 and the blockade of Leningrad, and around 5 million during the famine of 1921-1923, including losses from the Holodomor on the territory of Ukraine. In the Soviet Union, the critical factors behind the 20th-century famines were: the lack of integration of historically famine-prone regions of a vast country due to underdeveloped communication and transportation networks; punitive economic policies (collectivisation of agriculture, state seizure of grain), and the genocidal policies of the country's top leadership against Ukraine. During the second half of the 20th century, the global food crisis was halted, and nutrition levels improved significantly in all regions. Despite the rapid growth of the world's population in the 1950s and 1980s, world grain production outpaced the rate of population growth, and meat and seafood production also increased. Between 1990 and 2019, the global prevalence of chronic undernourishment declined from 38% to 7.9% (Lee & Ghelani, 2023). N. Ryshkevych (2011) emphasised that the growth in grain production slowed down from 1990, in contrast to population growth.

Between 2001 and 2010, the risk of food crises intensified once again, threatening around 40 countries. One of the contributing factors was the growing energy dependence of nations, which led to the conversion of large areas of agricultural land in many European and American countries for the cultivation of energy crops intended for biofuel production, aimed at reducing the environmental impact of fossil fuels and decreasing reliance on them. Thus, the use of cereals and maize for biofuel production was six times higher than their use for food purposes, with a ratio of approximately 25 to 4 (%). At the same time, within a short period (1999-2008), global food prices rose sharply – by 98%, which led to hunger in many low-income countries. The overall commodity price index surged by 286%, while the crude oil price index increased by 547%. The situation was unprecedented, as the rise in prices for nearly all food commodities occurred simultaneously with record-high energy prices (Trostle, 2008; Mittal, 2009). The 2007-2008 crisis was dubbed the "triple F" crisis by the FAO because it was a consequence of the global food, fuel, and financial crises. In 2009, the number of people suffering from hunger rose sharply to over 1 billion, and the prevalence of hunger reached nearly 20% (FAO, 2011).

In 2020, at the beginning of the COVID-19 pandemic, FAO experts estimated that an average of 768 million people worldwide were facing food insecurity. The food problem hit countries in Asia, Africa, Latin America and the Caribbean the hardest, where the shares of undernourished populations were 55%, 37%, and 8%, respectively (Kernasiuk, 2022). In 2023, an average of 733 million people worldwide experienced undernourishment (first phase of food insecurity). Approximately 282 million people in 59 countries and territories faced high levels of acute hunger (fourth phase) in 2023, compared to 258 million people in 58 countries and territories in 2022 (FSIN & Global Network Against Food Crises, 2023). The FAO, the International Fund for Agricultural Development (IFAD), the United Nations Children's Fund (UNICEF), the World Food Programme (WFP), and the World Health Organization (WHO) predicted that if modern trends continue, approximately 582 million people will suffer from chronic undernourishment by 2030, with half of them residing in Africa. These projected figures were very similar to those from 2015, when the Sustainable Development Goals were adopted, and this was a concerning indication that progress has stalled (FAO *et al.*, 2024). The global food system, responsible for feeding billions of people, was under constant pressure from various triggers: climate change; armed conflicts; frequent shocks; global economic crises; and political instability, especially in low-income countries. These triggers disrupt global food supply chains, leading to massive food losses in some regions and acute shortages in others. This imbalance was exacerbated by the globalised nature of food supply chains, where approximately 20% of the world's dietary energy comes from imported products (Clapp & Cohen, 2009).

According to FAO estimates, global food production needs to increase by 70% over the next 40 years (by 2050) to feed the growing world population, which was expected to reach 9.3 billion (FAO, 2009a; Starychenko, 2019). Only resilient food systems will be able to withstand such a demand. However, the fact that food crises have occurred repeatedly since the 1970s indicated the vulnerability of the global food system and its susceptibility to disruptions caused by failures in other systems. For example, Ukraine alone was classified four times between 2018 and 2023 as a country experiencing a major food crisis, where at least one million people faced acute food shortages (FSIN & Global Network Against Food Crises, 2024). Crises of 2010-2025 have highlighted three key features of the systemic vulnerability of food systems:

- a limited range of staple crops involved in industrial food production;
- an imbalance between a small number of agricultural exporting countries and a large number of import-dependent countries;
- highly concentrated global agro-food and financial markets.

The world of 2020s was experiencing a major global food crisis characterised by rising hunger, where climate change intertwines with economic and financial crises, a health crisis, and a geopolitical crisis. Therefore, experts view the current food crisis as part of a broader problem – a polycrisis, which united other crises that cannot be separated due to their interconnected nature. The term "polycrisis" had been used to describe the complex interaction between crises and their consequences, and sometimes to justify the inaction of political leaders, international institutions, and the private sector, who continued to resist significant changes in their practices and conduct business, while typically maintaining a technocratic approach to poverty (Lawrence, n.d.). The term was firmly established at the annual meeting of the World Economic Forum in Davos, in January 2023 (Serhan, 2023). The report emphasised that "simultaneous shocks, deeply interconnected risks, and the undermining of resilience give rise to the risk of a polycrisis – where discrete crises interacted in such a way that the overall impact far exceeds the sum of each part". The term was used, among other things, to denote the potential scarcity of natural resources, including food raw materials, water, metals, and minerals.

S. Fedulova (2023) referred to the global crisis as multidimensional, emphasising that it was not equivalent to a polycrisis, as it does not have catastrophic consequences for the entire world. Its multidimensionality lies in the simultaneous impact of risks that emerged from global crises (financial, energy, food), specifically: the rising cost of living, geopolitical confrontation, the destruction of social cohesion, and societal polarisation. The author argued that the most serious risk was the unprecedented increase in the cost of living in the 21st century, occurring at a time, when people and countries had limited capacity to cope with the cascade of existing crises – the COVID-19 pandemic and climate change. An analytical review by the Canadian research centre Cascade Institute, which focused on emergent and systemic risks, highlighted key characteristics of a polycrisis. The first of these was the necessity of causal relationships between crises across different systems, which gave rise to side effects and amplify the crises (Is there life in a polycrisis…, 2023). The second was the simultaneous involvement of multiple systems in crisis; so, a polycrisis was defined as a situation "when three or more systems are in crisis at the same time". The third characteristic was that the "collective effect" resulting from the interaction of multiple crises cannot be compared to the sum of the effects these crises would have individually.

At the epicentre of the polycrisis were agriculture, the food industry, and the processing sector, which were highly vulnerable to extreme weather events and climate change-related phenomena, geopolitical shocks, natural resource scarcity, and biodiversity loss. These sectors faced a wide range of challenges that required urgent attention, including the pressing need for decarbonisation, to which the food production sectors were directly relevant (LaBrecque, 2023). The interconnected set of shocks and critical situations emerging simultaneously across various spheres of society undermined the resilience of food systems, increased their instability, and became the causes of a food crisis. For Ukraine, as well as for the global economy as a whole, food crisis that began in 2019 was the result of the synergistic impact of multiple triggers and, at the same time, part of a set of crises that collectively constituted a global polycrisis. Ukraine experienced the most terrible manifestation of the cost of living crisis due to the war imposed by russia, which significantly constrained household budgets as a result of rising food prices and a sharp decline in incomes, increased levels of poverty and hunger,

negatively impacted education, and reduced access to energy. The 2022 russian invasion of Ukraine, occurring amid a polycrisis, also posed a significant threat to the global food system, as both countries were major exporters of grains. This led to a sharp surge in grain prices and volatility to record levels. The most vulnerable in this situation were the countries of Africa and the Middle East, which heavily depended on grain imports from russia and Ukraine. According to FAO (2022a) estimated, during this period, as a result of the war in Ukraine, approximately 20-30 million people in various countries worldwide faced hunger.

World Bank analysts predicted that if the war in Ukraine continues, by 2030 the number of chronically undernourished people worldwide will be approximately 23 million higher than if the war had not occurred (Emediegwu, 2024). Before the escalation of russian military actions in February 2022, the Eastern regions of Ukraine – Donetsk and Luhansk regions – were already experiencing a food crisis: as of 2021, approximately 383,000 people faced acute food insecurity. In total, during 2019-2021, 9.9 million people across the country experienced moderate or severe food insecurity according to the Food Insecurity Experience Scale, which measured chronic food insufficiency. The highest levels of food insecurity in 2022 were recorded in areas most affected by the war, particularly in the Eastern and Southern regions: 56% of the population in Luhansk, 50% in Kharkiv, 46% in Kherson, and 45% in Donetsk; as well as in the Northern regions: 45% of the population in Chernihiv and 41% in Sumy. In these regions, every second household was classified as food insecure (FAO, 2022b).

The agri-food sector of Ukraine has suffered significant since 2022 to 2025, negatively impacting both crop and livestock production domestically and on global markets. The migration crisis caused by the war had become the largest in Europe since World War II, with approximately 3.7 million internally displaced persons as of 2023 (FSIN & Global Network Against Food Crises, 2024). This has correspondingly reduced the labour potential of the food system, which, combined with high unemployment rates, has limited financial access to food. In 2023, over 7 million people in Ukraine faced acute food insecurity, especially in frontline areas of the Eastern and Southern regions. A comprehensive diagnosis of the key factors and causal relationships of the risks that led to the emergence of food crises in Ukraine was conducted in the study using the Ishikawa diagram (Fig. 1).

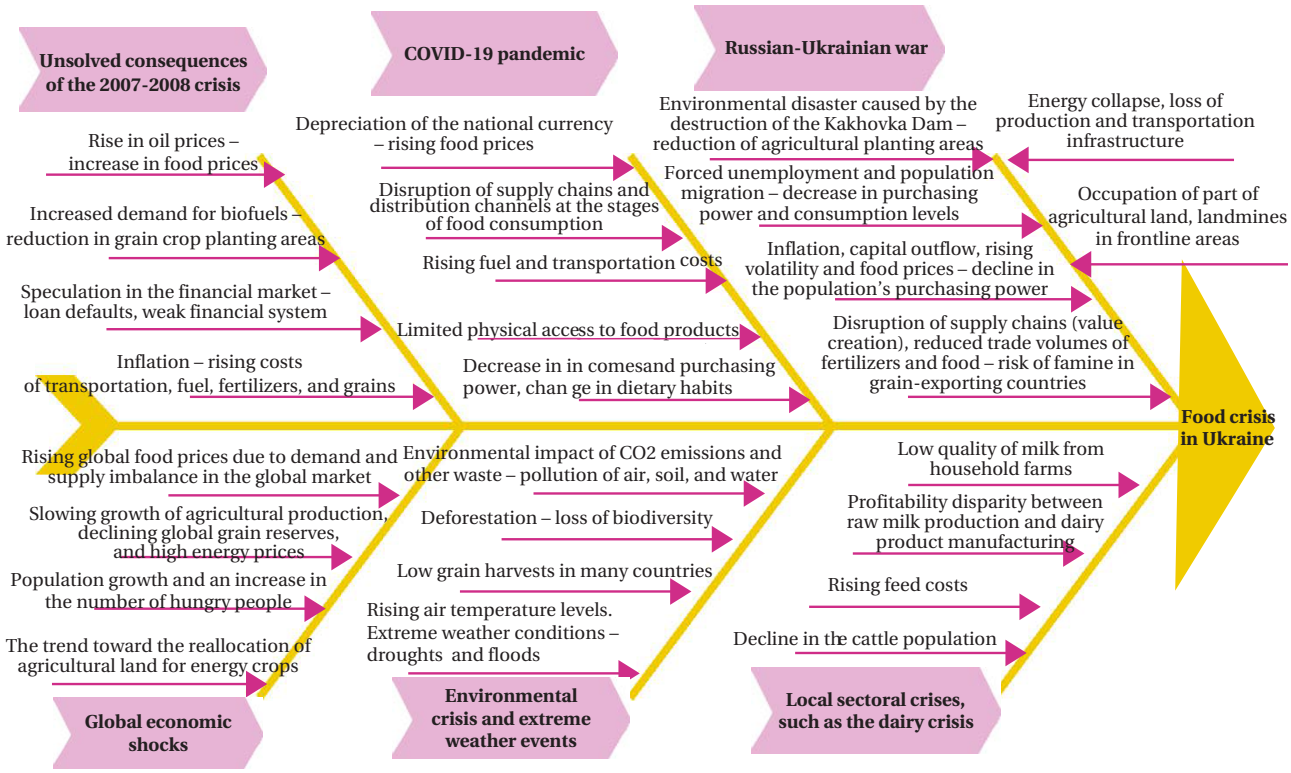


Figure 1. Ishikawa diagram showing the cause-and-effect relationships of a possible food crisis in Ukraine
Source: based on J. Ng (2025)

The global crisis of 2007-2008 became an unresolved consequence for Ukraine's food security. It was triggered by problems in the monetary and financial sectors of developed countries, which spread globally, leading to a decline in the USD exchange rate, inflation, and a reduction in household incomes in most countries around the world. The crisis caused not only significant economic losses but, together with other factors, also led to a prolonged stagnation of the Ukrainian economy. While during the period from 2000 to 2007 Ukraine's gross domestic product (GDP) grew at an average annual rate of 7%, in the period from 2008 to 2013 it dropped to 0.7% (World Bank Group, 2017). In 2014-2015, Ukraine experienced a double shock: the armed conflict with the russian federation and a decline in global commodity prices. During this period, the economy contracted by 8.2%

annually. In 2016-2021, GDP grew at an average annual rate of 1.9% (State Statistics Service of Ukraine, n.d.). The rise in the global oil price to USD 143 per barrel in 2008 led to an increase in food prices, as energy accounted for a significant portion of the costs of food production and transportation. At the beginning of 2008, the average world price of wheat rose to USD 481 per ton (FAO, 2009b). At the same time, during 2007-2008, there was a continued redistribution of agricultural land, with expanding areas dedicated to energy crops used for biofuel production.

In Ukraine, during 2007-2009, influenced by global trends, the increase in prices for fuel and lubricants, as well as natural gas (by 82% and 54% respectively), caused a significant rise in the cost of basic food products: sugar, butter, fruits, oils, and fats more than doubled in price; bread and bakery products increased by 71%; milk and dairy products by 93%; meat and meat products by 62%; fish and fish products by 58%; and eggs by 86% (State Statistics Service of Ukraine, n.d.). The 2007-2008 crisis demonstrated the strong financial interdependence, particularly in the agro-industrial sector, and low efficiency of the global financial system amid increasing globalisation and accelerated capital migration (Ortina, 2015). This crisis should have concluded with the transfer of financial resources accumulated by large businesses into new productions of the next technological paradigm, particularly in nanotechnology, biotechnology, and information technologies (Horkina, 2001). However, the process of recovery from the crisis had been prolonged and remained incomplete in many countries, including Ukraine. This had resulted in the emergence of new socio-economic challenges, including within the food sector. Specifically, rising oil prices drove up food prices; demand for biofuels produced from agricultural raw materials reduced grain cultivation areas. A fragile financial system and speculation in financial markets led to credit defaults; inflation caused increases in costs for logistics, fuel, fertilizers, seeds, grains.

In 2008 alone, in food production, sugar production decreased the most, with the production index at 80.9% in 2009, followed by processed vegetables and fruits at 83.1%. The crisis worsened the work of the agricultural sector due to rising credit rates and restricted access to credit necessary for sowing campaigns, modernisation of capacities and equipment purchases, as well as reductions in investments and demand for agricultural products in both domestic and foreign markets. The mitigation of negative consequences and the recovery from the crisis in Ukraine were facilitated by the implementation of a special VAT (Value Added Tax) regime and minimum purchase prices for grain for agricultural producers, the attraction of international financial aid, and other measures aimed at overcoming the adverse effects of the global crisis, which eased the mutual settlements of agricultural enterprises. Ukraine's accession to the World Trade Organization (n.d.) in 2008 accelerated its integration into the global economy.

Each crisis, the methods and means of overcoming it, revealed new opportunities for the country's economy and agricultural sector. Thanks to banking reforms implemented in 2009-2010 (strengthening banking supervision, monetary policy to prevent inflation and UAH devaluation, ensuring liquidity of the financial system) and in 2016-2017 (rehabilitation of insolvent banks, liberalisation of currency regulation, consolidation of the banking sector), the national currency and financial system withstood the full-scale invasion of the russian federation in Ukraine in 2022. The UAH devaluation in 2008-2009 contributed to the expansion of Ukrainian agricultural exports. The food sector proved to be the most resilient to the crisis among other economic sectors, owing to high grain yields and support for food exports (Kachur *et al.*, 2016; Vidyakin, 2017). The analysis of food market indicators trends during 2001-2010, which encompassed the crises of 2003-2004 and 2007-2009, revealed a correlation between food production indicators and the Ukraine's macroeconomic indicators (Table 1).

Table 1. Correlation coefficients between food production indicators and macroeconomic indicators in 2001-2010 in Ukraine

	Correlation coefficients of indicators				
	GDP, UAH billion	**Exchange rate, UAH/ USD**	**Present population, thousand persons**	**CPI, % compared to the previous year**	**Direct investment, USD million**
Meat and meat products, thousand tons	0.92	0.64	-0.87	0.35	0.61
Milk and dairy products, million tons	-0.96	-0.70	0.85	-0.61	-0.62
Sugar, thousand tons	-0.50	-0.53	0.32	-0.39	-0.20
Bakery products with short shelf life, thousand tons	-0.98	-0.73	0.95	-0.49	-0.64
Sunflower oil, thousand tons	0.91	0.75	-0.92	0.34	0.55

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

Correlation coefficients demonstrated a strong interconnection (both direct and inverse) between the country's GDP and the production of the analysed food products. The exchange rate showed the highest correlation with export-oriented sunflower oil. A significant dependence was observed between production indicators and the number of population (except for sugar). Regarding the inflation indicator, there was a sufficiently strong inverse relationship with the production of milk and dairy products. A fairly strong correlation was also evident between foreign direct investment and the production of most types of food products, with the exception of sugar, as sugar production was highly volatile and dependent on both global and domestic market conditions. Overall,

the relationship between food production and macroeconomic indicators was quite strong and corresponded to the state of the economy of Ukraine. The negative impact of the global COVID-19 pandemic on Ukraine's food security manifested in rising food prices, complications in the logistics of raw materials and finished product supply (storage, transportation, and distribution of food to consumers), a reduction in the number of production personnel at food manufacturing enterprises, and decreased labour productivity. Despite the fact that Ukraine's food sector demonstrated considerably greater resilience to the impacts of the pandemic compared to other economic sectors, industrial production of food products declined on average by 6.2% during 2020-2021, primarily due to reductions in vegetable oils, sugar and sugar confectionery products, flour and tobacco products (Kovalenko & Bokiy, 2022).

Despite low inflation rates in 2020, Ukraine experienced significant price fluctuations in food products. Prices for long shelf-life products (such as cereals and flour) and butter increased at an accelerated pace. The price growth was influenced by logistical challenges, rising costs of raw materials and energy resources, as well as increased demand during quarantine measures. Prices of bread, sunflower oil, butter, milk, cheese, and meat increased significantly in 2021. Despite these challenges, indicators of adequacy of meat and dairy product consumption by the Ukrainian population remained practically unchanged (State Statistics Service of Ukraine, n.d.). Quarantine restrictions affected the export of meat products by complicating the conditions for livestock farming and processing, primarily of cattle. To mitigate the negative impacts of the pandemic, many countries, including Ukraine, implemented short-term and long-term planning and forecasting tools, improved food supply logistics, modernised storage facilities, and provided targeted food supply measures for low-income populations and regions with limited access. Ukraine had not yet fully recovered from the impacts of the pandemic on food security, as these challenges were further exacerbated in 2022 by a new wave of food-related problems caused by the full-scale invasion of Ukraine by the russian federation. The analysis of the correlation between food production and macroeconomic indicators over 2011-2021, which encompassed the 2014 military-political crisis in Ukraine and the COVID-19 pandemic in 2019-2020, indicated that the strength of the relationship between these groups of indicators changed compared to 2001-2010 years (Table 2).

Table 2. Correlation coefficients between food production indicators and macroeconomic indicators in 2011-2021 in Ukraine

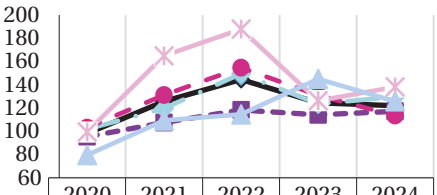
	Correlation coefficients of indicators (2011-2021)				
	GDP, UAH billion	**Exchange rate, UAH/ USD**	**Present population, thousand persons**	**CPI, % compared to the previous year**	**Direct investment, USD million**
Meat and meat products, thousand tons	-0.56	-0.21	0.97	-0.99	0.32
Milk and dairy products, million tons	0.65	0.29	-0.99	1.00	-0.39
Sugar, thousand tons	-0.76	-0.46	0.80	-0.77	0.62
Bakery products with short shelf life, thousand tons	-0.60	-0.84	-0.04	0.16	0.38
Sunflower oil, thousand tons	0.91	0.75	-0.92	0.34	0.55

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

The correlation between GDP and food production slightly decreased but remained. While in the 2001-2010 years the exchange rate correlated with the production of all analysed product types, in 2011-2021 the relationship was observed only with bakery products and sunflower oil. The strongest correlations were found between the production of dairy and meat products and inflation, as well as between dairy production and the number of population. The weakest correlation was observed between the production of bakery products and macroeconomic indicators (except for the exchange rate and GDP). The main measures to overcome the crisis caused by the pandemic were aimed at enhancing the resilience of the food system and addressing other crisis-related challenges. These measures included support for internal producers, diversification of food supply chains, promotion of local producers and food self-sufficiency among the population, improvement of legislation, and other initiatives. As a result, in 2021, Ukraine's annual production index increased to 102.8% for bakery products, 108.8% for fruit and vegetable processing, and 103.9% for meat and meat products (Bokiy, 2024; State Statistics Service of Ukraine, n.d.). Global economic shocks that reduce food security levels may arise from numerous factors. Since 2001, the primary factors have included: rising global food prices due to demand-supply imbalances; slowing growth rates in agricultural production; decreasing global grain reserves; high energy prices; increasing global population and number of people suffering from hunger; and the trend of reallocating agricultural land to energy crops for biofuel production.

So, the increase in global food prices due to the imbalance between supply and demand. According to estimates by the Ministry of Agrarian Policy and Food of Ukraine (n.d.), prior to the full-scale invasion by the russian federation, Ukraine supplied food to over 400 million people worldwide, excluding its own population. The country was a leading exporter of agricultural products to many countries in the Middle East and North Africa (Grigorenko, 2022). Disruptions in supply chains caused by russian aggression in 2022 led to an increase in the prices of staple food products in Ukraine, created an imbalance between global food supply and demand, and resulted in a 44%

surge in global food prices compared to their already elevated levels in 2021. According to FAO data, between 2020 and 2024, average global food prices rose by 2.7 times, including: meat and meat products – by 1.6 times; milk and dairy products – by 2.9 times; cereals – by 3.1 times; vegetable oils – by 5.4 times; and sugar – by 1.8 times (Fig. 2).



	2020	2021	2022	2023	2024
Food Price Index	98.1	125.7	144.5	124.5	122
Meat	95.3	107.5	118.3	114.1	117.2
Milk	101.8	119.6	149.5	123.7	129.6
Cereals	103.1	131.2	154.7	130.9	113.5
Vegetable Oils	99.4	164.9	187.8	126.3	138.1
Sugar	79.5	109.3	114.5	145	125.7

Figure 2. Global food price indices in 2020-2024, %
Source: FAO (2025)

Despite a slight decrease in global food prices in 2024 compared to 2022, prices have not returned to 2020 levels. Slowing growth in agricultural production, declining global grain reserves, and high energy prices. Global production of major agricultural crops reached 9.6 billion tones in 2022, representing a 56% increase compared to 2000. Key crops such as sugarcane, maize, wheat, and rice together account for nearly half of global agricultural output. Although food production continued to grow, the rate of growth was declining, and hunger remained a persistent issue (Martella, 2024). Findings from the United States Department of Agriculture's long-term assessment of annual global, regional, and national agricultural production and productivity indices (conducted since 1961) indicated that during 2011-2020 years, global agricultural output grew at its slowest pace – 1.93% annually, compared to 2.72% in 2001-2010s (Morgan *et al.*, 2022). This slowdown was primarily due to a deceleration in total factor productivity growth (including land, labour, capital, and material inputs), which declined to 1.14% annually in 2012-2021 from 1.93% in 2001-2011 years.

It was attributed these changes to several factors: 1) climate change, where extreme weather events (droughts, heavy rains) led to reduced crop yields; 2) emergence of new pests and diseases, which also negatively affected yields and required farmers to incur additional costs for control; 3) reduction in public investment in research and development, resulting in long-term declined in productivity (Chadde, 2023). According to estimates by the International Grains Council, the expected global grain stocks at the end of the 2024/2025 marketing year (MY) were projected to decrease by 5.2% (to 581 million tonnes) compared to the 2021/2022 MY. This change was driven by an increase in global grain consumption, which was expected in 2021/2022 to reach 2,326 million tonnes. Most of this increase was provided by corn consumption, which was projected to rise by 17 million tonnes (to 1,230 million tonnes). Despite an increase in wheat production volumes, global wheat stocks had declined during the 2021/22 to 2023/24 MY period to 272 million tones, with a further reduction to 267 million tones anticipated in the 2024/25 MY (Table 3).

Table 3. Balance of supply and demand for grains in the global market

Indicator	2021/2022	2022/2023	2023/2024	2024/September of 2025	2024/September of 2025 to 2021/2022, %
All cereal crops, million tonnes					
Production	2,293	2,267	2,304	2,316	101.0
Consumption	2,293	2,277	2,316	2,326	101.4
Ending stocks	613	603	591	581	94.8
Production-consumption balance, year-on-year	0	-10	-12	-10	x
Trade	427	428	455	421	98.6
Wheat, million tonnes					
Production	780	804	795	798	102.3
Consumption	784	794	807	803	102.4
Ending stocks	274	284	272	267	97.4
Production-consumption balance, year-on-year	-4	10	-12	-5	x
Trade	198	209	215	198	100.0
Corn, million tonnes					
Production	1,222	1,163	1,227	1,224	100.2
Consumption	1,213	1,184	1,223	1,230	101.4
Ending stocks	298	277	281	276	92.6
Production-consumption balance, year-on-year	9	-21	4	-6	x
Trade	181	180	195	181	100.0

Notes: x – not applicable
Source: IGC reports falling global grain stocks despite record production in 2024/25 (2024)

The results of the assessment of food security status, presented in Order of the Cabinet of Ministers of Ukraine No. 684-r (2024), indicated that the achieved level of domestic production development of agricultural products,

raw materials, and food in Ukraine was capable of ensuring the physical availability of food products for the population at a daily energy equivalent level of 2,677-2,700 kcal per person. For comparison, the average daily caloric intake in EU countries ranges between 3,400 and 3,500 kcal. In addition to the consequences of the pandemic, the complex geopolitical situation, and weather conditions, energy prices significantly affected the level of food security. The energy intensity of food production, as well as the cost of electricity and gas, remained quite high and were incorporated into the final product price throughout the entire production and supply chain. The most energy-dependent industrial sectors in Ukraine in 2020 were ferrous metallurgy (15,216 GWh), the food industry (4,588 GWh), and the chemical sector (3,964 GWh). Interruptions in energy supply negatively affected the dairy, oil and fat, milling, bakery, and compound feed industries (Sobkevych & Shevchenko, 2023).

In the series of global economic, the deepening demographic crisis in Ukraine had a considerable impact on the formation of food security. The demographic crisis under wartime conditions posed a threat to food security by hindering access to food in frontline areas, increasing poverty among citizens, who had lost their jobs, and driving population migration, especially from rural regions, which simultaneously reduced the volume of agricultural production. In 2021, of the 1.4 billion hectares of land used for cultivating agricultural crops worldwide, about 8% was allocated for the production of raw materials used in biofuel manufacturing (Oils & Fats International, 2023). If the area of arable land dedicated to energy crops continues to expand, food security may be put at risk. At the same time, Oils & Fats International (2023) study have identified an increase in the value of highly productive arable land due to competition between food and biofuel production. So, it economically feasible to grow energy crops on arable land, as alternative solar and wind energy were even more expensive. Bioethanol was growing in popularity, its share of global biofuel production now exceeding 94%, as many countries replace part of their fossil fuels with biofuels in line with international regulations. In the European Union, the raw materials for bioethanol production were cereals and corn, as well as sugar beet and sweet sorghum (Skoufogianni *et al.*, 2019). By-products of biofuel production from agricultural crops were used in the food chain as high-quality protein feed additives, which reduced the demand for pure protein crops, in particular soybeans.

In Ukraine, during 2000-2021, the areas of agricultural land used for cultivating crops suitable for biofuel production, particularly rapeseed and sunflower, increased by 4.7 and 2.3 times (to 6,622.0 and 1,005.8 thousand hectares), respectively. During 2022-2024, amid the full-scale war of the russian federation against Ukraine, as a result of the occupation of part of its territory, the sown area for sunflower decreased by 25.3% compared to 2021 (to 4,947.4 thousand hectares), while that for rapeseed increased by 25.9% (to 1,265.9 thousand hectares). The areas cultivated with cereals, leguminous crops, and sugar beet, which can also serve as raw materials for bioethanol production, have changed variably. Between 2000 and 2021, the area under cereals increased by 17.2% (to 15,994.8 thousand hectares), while the area under sugar beet decreased by 73.5% (to 226.7 thousand hectares). During 2022-2024, the sown areas of cereals and leguminous crops declined by 30.5% (to 11,116.1 thousand hectares), sugar beet cultivation increased by 13.6% (to 258 thousand hectares). The area devoted to other energy crops in 2024 amounted to 3.5 thousand hectares, which was three times higher than in 2021 (Table 4).

Table 4. Sown area by species of agricultural crops in all agricultural holdings in Ukraine, thousand hectares

Crop	2000	2010	2015	2020	2021	2022	2023	2024	2021 to 2000, %	2024 to 2021, %
Cereal and leguminous crops	13,646.5	15,090.0	14,738.4	15,392.2	15,994.8	12,171.1	10,984.6	11,116.1	117.2	69.5
Industrial crops	4,186.8	7,295.8	8,350.3	9,223.8	9,244.5	8,292.2	8,909.7	9,257.1	220.8	100.1
Oilseed crops,including:	3,256.3	6,744.9	8,074.3	8,983.7	8,997.7	8,095.2	8,638.3	8,999.1	276.3	100.0
sunflower seeds	2,942.9	4,572.5	5,104.6	6,457.2	6,622.0	5,292.8	5,220.1	4,947.4	225.0	74.7
soya beans	64.8	1,076.0	2,158.1	1,351.0	1,310.8	1,558.9	1,842.1	2,655.5	2,022.8	202.6
winter rapeseed and colza (spring rapeseed)	214.3	907.4	682.4	1,126.6	1,005.8	1,185.7	1,435.6	1,265.9	469.3	125.9
mustard seeds	27.2	129.1	66.9	24.7	20.8	19.0	86.0	43.0	76.5	206.7
flax kudryash (oil)	2.3	58.9	62.2	13.8	27.7	33.1	47.5	54.1	1,204.3	195.3
Sugar beet (for processing)	855.6	500.9	237.4	220.0	226.7	184.1	250.3	258.0	26.5	113.8
Energy crops	…	…	…	c	1.1	2.5	2.2	3.5*	x	318.2

Notes: dots (…) – no data published; c – data are not released by the State Statistics Service of Ukraine in order to comply with the requirements of Ukrainian law; x – not applicable
Source: State Statistics Service of Ukraine (n.d.); W. Wichtmann & O. Denyshchyk (2024) for indicator marked with the (*) symbol

According to estimates by source Energy crops can be grown on 8 million hectares in Ukraine (2018), about 8 million hectares of land in Ukraine that were not used for growing traditional agricultural crops were suitable for cultivating energy crops, but only of the perennial bioenergy plants. Extreme weather events driven by climate change were causing significant harm to food security and the global economy. The rise in global temperatures led to an increase in the frequency and intensity of extreme weather events (such as frosts, hurricanes,

typhoons, floods, and droughts), which affected agricultural productivity. The source Climate change will reduce grain yields by 23% – scientists (2017) predicted that due to global warming, which caused droughts and other extreme weather conditions, cereal yields may decline by 23% by 2050, and led to a decrease in the global production of major crops such as wheat, maize, rice, and soybean. Due to global warming and climate change, Ukraine was experiencing a shift in natural-climatic zones, with corresponding movement of warm-loving agricultural crop sectors toward the northern regions of the country, leading to a reorientation of agricultural activities. V. Rusan *et al.* (2024) emphasised that areas with insufficient precipitation during the growing season were expanding. Increased winter temperatures and reduced soil freezing contributed to the spread of pests and diseases affecting agricultural crops and forests.

The reduction of forest area altered ecosystems, affected the efficiency of the agricultural sector, and posed risks to food security. Agricultural production was also a source of greenhouse gas emissions and a contributing factor to climate change. R. Murabildayeva *et al.* (2024) have revealed a complex relationship between agriculture, CO_2 emissions, and food security levels. Improving food security directly depended on increasing production, which in turn was accompanied by a rise in CO_2 emissions that pollute the environment and reduce agricultural efficiency. During the period 2000-2022, greenhouse gas emissions in agri-food systems increased by 10%, including farm emissions – by 15%, livestock production accounts for about 54% of these emissions (Martella, 2024). The total greenhouse gas emissions from agri-food systems in 2022 amounted to 16.2 billion tonnes of carbon dioxide equivalent (Gt CO_2-eq) (FAO, 2024b). Industrial food production generated liquid, gaseous, and solid waste that polluted the hydrosphere, atmosphere, and soils. The food industry had the greatest impact on water resources, ranking among the leading sectors in water consumption, and exhibited a low level of wastewater treatment. In terms of water usage per unit of production, the sector held the highest position. Particularly hazardous were solid wastes, which may contain organic substances, including yeast and residues from filtration and clarification processes; bicarbonates obtained during preliminary water treatment; sludge from wastewater treatment facilities; and hazardous wastes such as used oils and solvents generated during equipment maintenance and operation. The most significant negative environmental impacts were caused by the meat, sugar, alcohol, and yeast sectors of the food industry (Ministry of Environmental Protection…, 2021).

One of the evident approaches to enhancing the sustainability of the agricultural sector was the development of organic farming, characterised primarily by the avoidance of synthetic fertilizers and pesticides. In 2022, the agricultural area with certified organic status in Ukraine amounted to 263,619 hectares (OrganicInfo, 2023). The countries with the highest share of organic farming in total agricultural area in 2022 were Austria (26%), Sweden (20%), and Uruguay (19%). 15 of the top 20 countries with the best-developed organic agriculture were located in Europe. In other regions, the balance between conventional and organic farming still leans toward traditional practices (FAO, 2024b). The war initiated by the russian federation in Ukraine has caused significant damage to the functioning of Ukraine's agricultural sector. According to FAO estimates, by the end of 2022, rural households in Ukraine suffered losses of approximately USD 2.25 billion due to the war, of which around USD 1.26 billion were in the crop production sector and USD 0.98 billion in livestock production. About 25% of rural households in Ukraine were unable to continue production, and 38% of them were located in frontline regions (FAO, 2022a). By the end of 2023, 38% of agricultural enterprises were forced to close, and only 45% managed to resume their operations at less than half capacity (Verkhovna Rada of Ukraine, 2023). According to the State Employment Service (n.d.), as of January 1, 2025, 13,813 individuals were registered as unemployed in the agriculture, forestry, and fishing sectors, while 4,386 individuals held the same status in the food processing industry. The supply of job vacancies in the labour market remained low: in agriculture, the number of vacancies was 7 times lower than the number of job seekers, and in food manufacturing, it was nearly twice as low (Table 5).

Table 5. Number of vacancies and job seekers in Ukraine's agri-food sector

Types of economic activity	Code NACE	Number of vacancies, units	Number of job seekers, persons	Number of which registered as unemployed, persons
Agriculture, forestry, and fishing, including:	A	2,027	14,765	13,813
crop and animal production, hunting and related service activities	01	1,881	13,366	12,560
forestry and logging	02	137	1,338	1,201
fishing and aquaculture	03	9	61	52
Manufacture of food products	10	2,616	4,793	4,386
Manufacture of beverages	11	230	306	278
Manufacture of tobacco products	12	0	6	4

Source: State Employment Service (n.d.)

So, military aggression had negatively affected the production volumes of major agricultural crops and had led to the reorientation of farming enterprises toward the cultivation of less resource-intensive crops. In 2023, the lands of the occupied regions were mainly cultivated with wheat, while in government-controlled territories, farmers shifted their focus to growing sunflower and rapeseed, which required fewer resources and have lower production costs compared to cereal crops. In addition, the blockade of Ukraine's Black Sea ports had

limited the export opportunities for agricultural products, leading to a decline in their prices on internal markets and significantly reducing the profits of farming enterprises. At the same time, there was a decrease in the production of livestock products and a reduction in the number of livestock (Rusan *et al.*, 2024).

R. Neyter *et al.* (2024) noted that from 2022 to 2025, the total value of destroyed assets in the agricultural sector amounted to USD 10.3 billion. Losses, including foregone income of agricultural producers and increased production costs, have risen to USD 69.8 billion. The environmental disaster caused by the flooding of 5,000 hectares of arable agricultural land due to the actions of the occupiers at the Kakhovka Hydroelectric Power Plant resulted in damages amounting to USD 5.427 million. Disruption of the irrigation system, dependent on the Kakhovka Reservoir, led to annual losses of USD 367.9 million (Koval *et al.*, 2024). Disruptions in food supply chains to food markets have caused a crisis in the functioning of the established system for providing food to the population of Ukraine and the world, leading to increased food prices. This has reduced the level of food security both locally and globally – significantly worsening the physical and economic accessibility of food for low-income groups. From December 2021 to December 2023, food prices increased rapidly, with the largest rises observed in the following groups: bakery products – wheat bread made from first-grade flour (up 37%); meat products – pork (up 56.4%); cereals – millet (up 44%); dairy products – butter (up 46%); and eggs (up 66%). Simultaneously, the purchasing power of the population declined, with the share of food expenses in total household consumption exceeding 52%. In 2023, the average salary in Ukraine amounted to UAH 16,000, which was 8% (or UAH 1,200) higher than in 2022; however, in currency equivalent, the salary decreased by EUR 75 (Ukrinform, 2023).

Also, dairy production was strategically important for every country. In Ukraine, since 1991, the dairy industry had undergone significant transformations due to various challenges and issues, including the COVID-19 pandemic and the war initiated by the russian federation against Ukraine. The decline in the dairy cow population and the shortage of raw milk have caused a localised crisis in the sector. The crisis was further exacerbated by reduced export volumes, loss of markets due to trade embargoes, decreased purchasing power of the population, and the destruction of infrastructure and logistics as a result of military actions. Alongside internal challenges, the global dairy crisis of 2014-2020 also impacted Ukraine by causing a decline in global prices for dairy products. As a consequence, the purchase price of raw milk in Ukraine decreased to USD 22.1 per 100 kg in 2016. Farmers were forced to seek new sources of income and diversify production. Since 2020, prices have risen rapidly due to decreased production and limited physical access for the population during the COVID-19 pandemic (Kozak, 2016). By the end of 2024, the dairy cow population in Ukraine amounted to 1.26 million heads, which was half the number it was in 2014. According to the forecast of the The Union of Dairy Enterprises of Ukraine (n.d.), the number of cows was expected to decline to 1.18-1.14 million heads in 2025-2026, respectively. In 2024, industrial milk production in Ukraine reached 2,809 thousand tonnes, production in farming enterprises – 282.7 thousand tonnes, and household production – 4,620.5 thousand tonnes. Almost all milk produced by household farms was non-graded. The cost of keeping dairy cows continues to rise due to declining profitability of milk production and increasing expenses for feed, diesel fuel, and electricity.

As Ukraine entered the free trade area, the dairy sector was facing new challenges, especially in terms of its competitiveness on the global market. In the cost structure of dairy products, raw milk accounts for 70%, energy resources (electricity, fuel and lubricants) represented another 10%, and the remaining costs included packaging, wages, and enterprise profit. In 2024, the average price range for raw milk (extra, higher, and first grade) was 13.2-14.2 UAH/kg excluding VAT (Chernyshov, 2024). At the same time, according to the Ukrainian Dairy Enterprises Association, the average profitability of dairy farms was 23.1% in 2022 and 26.1% in 2023, with an expected increase to 35% in 2024 (Rodak, 2024). In the second half of 2024, dairy farms increased the price of raw milk by 40%, causing losses to dairy processing plants of nearly UAH 1 billion (Association of Milk Producers, 2025). According to the State Statistics Service of Ukraine (n.d.), the profitability of milk processing and dairy product manufacturing averaged 2.3% in 2022 and 3.0% in 2023. This disparity in profitability between raw milk production and processed dairy products forced processing enterprises to reduce the purchase price of raw milk. Under these conditions, milk producers and processors must work together to seek common solutions for the sustainable development of the dairy value chain and to guarantee fair conditions for both farming and processing operations.

Thus, the study of the retrospective causes and consequences of crisis phenomena indicated the cyclical nature of economic crises and the constant pressure on the food system from economic, political, and other triggers, which led to disruptions in food security in countries worldwide. The vulnerability of food systems had been caused by the economic imbalance between food-importing and food-exporting countries, insufficient food raw materials, and other factors. The consequences of crises for the food system were manifested in rising food prices, a decline in population welfare, low product quality, reduced access to food, profitability disparities, and other related effects. The food sector demonstrated the greatest resilience to crisis phenomena compared to other economic sectors; however, it needed to implement appropriate measures to ensure food security.

▸ Conclusions

The global food crisis may be triggered by wars and conflicts, the negative effects of global warming, soil degradation, neglecting crop rotation, the inability to supply food to countries in need, and accelerated population growth. Economic and military-political instability may lead to a deterioration of food security, especially in needy regions. Risks were exacerbated by changes in global scientific research funding (reduced investments in agrotechnology and increased allocations for military purposes) and by a labour resource crisis. The Ishikawa diagram, developed in the study, showed the cause-and-effect relationships that

may lead to a food crisis and provided the basis for the following conclusions. The food crisis cannot be considered a local phenomenon, as it can occur simultaneously in multiple regions, and most of the factors that contribute to it were global in nature. The basic set of food products, whose absence may cause a food crisis, remained small and unchanged (grains, milk, meat) and lacks effective substitutes for a balanced human diet. Droughts, floods, and other climate change-related disasters were becoming more widespread, creating additional threats to the emergence of food crises. In the modern world, a food crisis may arise not from a complete lack of food products, but from their economic inaccessibility, when the purchasing power of the population fails to keep up with rising food prices. Critical manifestations of a food crisis (hunger, malnutrition) in the modern world may occur, when a country's population loses access to food sources. This loss was often caused by artificially created barriers preventing the exchange of personal assets for food. Such artificially induced conditions arose from flawed food policies, which can ultimately lead to catastrophic famine. A strong correlation was identified between food production indicators and GDP, particularly during 2001-2010, when the correlation coefficient for most food products exceeded 0.9. It was found that during the period of active military actions in Ukraine and the COVID-19 pandemic (2020-2024), global food prices increased 2.7-fold, while global wheat stocks decreased by 4.2%. In Ukraine, the area under grain and leguminous crops decreased by 30.5%, whereas the area under sugar beet cultivation increased by 13.6%, and that of energy crops tripled. Future research will focus on forecasting food crises based on an in-depth analysis of adverse factors in specific sectors of the food industry.

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Продовольча криза в сучасному світі: причини виникнення та можливі наслідки для України

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Анотація. Запобігання виникненню та ескалації продовольчих криз у кожній країні залежить від своєчасного виявлення їх характерних попереджувальних ознак з метою захисту продовольчої безпеки. Метою дослідження було виявити та узагальнити причини й наслідки продовольчих криз в Україні та у світі для запобігання їх виникненню та пом'якшення негативних наслідків. У дослідженні виявлено специфічні риси системної вразливості продовольчих систем. Обґрунтовано, що багатовимірний і багатовекторний характер одночасних глобальних криз (фінансової, енергетичної, екологічної) створює синергетичну полікризу, складовою якої є продовольча криза. За допомогою діаграми Ішікави було визначено причинно-наслідкові зв'язки, що призводять до продовольчої кризи в Україні, та структуровано причини за основними категоріями. У статті встановлено, що потенційними причинами продовольчої кризи та зниження продовольчої безпеки в Україні можуть бути: невирішені наслідки попередніх криз; глобальна пандемія; прояви світових економічних шоків (зростання світових цін на продовольство, уповільнення зростання сільськогосподарського виробництва, скорочення світових запасів зерна, високі ціни на енергоносії, зростання чисельності населення світу); екологічна криза та екстремальні погодні явища; війни; локальні галузеві кризи, зокрема криза молочної промисловості. У 2020-2024 роках, на тлі пандемії COVID-19 та повномасштабного вторгнення росії в Україну, світові ціни на продовольство зросли у 2,7 рази, тоді як запаси пшениці скоротилися на скоротилися до 272 мільйонів тонн у 2023/2024 маркетинговому році. Результати дослідження показали, що за наявного аграрного, промислового, інноваційного та науково-виробничого потенціалу виникнення критичного голоду в Україні можливе лише за умов штучно створених викликів: війн, що спричиняють руйнування орних земель, захоплення врожаїв, обмеження доступу до продовольства; глобальних техногенних та екологічних катастроф. Теоретичні, методологічні та прикладні положення щодо причин і потенційних наслідків продовольчих криз у сучасному світі можуть слугувати джерелом наукової інформації для розроблення стратегій і програм забезпечення продовольчої безпеки

Ключові слова: полікриза; криза голоду; продовольча безпека; синергетичний вплив; продовольче забезпечення; діаграма Ішікави