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Assessing Risks in the System of Economic and Food Security in the Current Context: Ukrainian Realities and the Global Environment

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Abstract

The problem of food security is the most controversial topic of our time, as ensuring stable access to food remains a critical factor in socio-economic development and geopolitical stability. The article provides a comprehensive analysis of global food security from 2023–2025, focusing on the main factors affecting the level of food security in different regions of the world. Statistical indicators of food insecurity, the level of dependence on imports, the effectiveness of food aid and the financing of measures to ensure food stability are studied. The level of food security is assessed based on calculations of the food security coefficient, the level of food dependence on imports and the effectiveness of food aid, which allows us to determine the degree of vulnerability of individual regions. The results of the study show that Africa remains the most food-vulnerable region with the lowest food security ratio of 0.72 and the highest import dependency of 31.0%. Asia shows relative food stability with the lowest import dependency of 9.5%, while Latin America and North America have sufficient food self-sufficiency. The analysis of food aid effectiveness showed that the largest food deficit remains in Africa, where international food support covers only 40% of the required volume. Particular attention is paid to the analysis of food security financing, which in 2024–2025 demonstrates positive dynamics, in particular, increased investment in humanitarian aid and infrastructure projects. Key challenges to food security are identified, including rising inflation, climate change, geopolitical conflicts, and insufficient strategic reserves. Promising directions for improving food stability are proposed.

Keywords

Food security; Food dependency; Food imports; International food aid; Global food crisis

Introduction

Food security is among today's most important global concerns. Although there are evident advances in agricultural productivity, technological improvements, and international hunger-relief efforts, billions of people worldwide continue to experience food shortages. Climate change, global market volatility, wars and armed conflicts, as well as socioeconomic disparity represent the most serious threats to food security. Moreover, this issue is particularly severe in underdeveloped nations, where access to resources is restricted and inadequate official support systems are observed. The degree of food security and the sustainability of agri-food systems are directly impacted by climate change, which forces farmers in Asia and Africa to modify their farming practices (Gebre *et al.*, 2023).

Various international organizations, in particular, the Food and Agriculture Organization of the United Nations (FAO), the World Food Programme (WFP), as well as the World Bank, are conducting active work to improve global food security through funding, educational initiatives, and technical support. Meanwhile, a significant role is played by local policies and regional economic models promoting sustainable agriculture and resource efficiency. One of the promising approaches is the development of agribusiness as a mechanism for improving access to food, as highlighted, in particular, in the study by Kazungu and Kumburu (2023). These authors claim that the contribution of supporting agribusiness in Tanzania to increased agricultural production and job creation ultimately strengthens the region's food systems.

Solving the issue of food security implies the application of a comprehensive approach that includes policy reforms, the introduction of modern agricultural technologies, as well as effective management of natural resources. Innovation-oriented strategies, in particular, the use of digital technologies for monitoring crops, improvement of supply logistics, and optimizing supply chains, are capable of significantly reducing food shortages risks. At the same time, global crises (such as the COVID-19 pandemic) emphasized the need for food system resilience and the necessity to develop mechanisms to support the most vulnerable groups (Egamberdiev *et al.*, 2023). According to the study by Akbar *et al.* (2023), the pandemic has negatively affected household food security, highlighting the importance of adaptive strategies and social protection within the efforts to ensure sustainable access to food. Thus, further research should be aimed at developing sustainable food systems models which take into account current challenges and prospects for the global economy's development.

The purpose of the article is to analyze the key factors affecting food security in the global and regional context, as well as to determine the level of food security in different regions of the world. The study primarily focuses on analyzing statistical data related to food insecurity, assessing import dependence, evaluating the effectiveness of food aid, and examining the financing of food security measures. Quantitative assessment methods are employed in the study, enabling a comprehensive analysis of the situation across various regions. Special attention is given to regional disparities in food security, with a focus on identifying vulnerable areas and formulating strategic directions for enhancing global food security.

Literature Review

Food security represents an extremely relevant topic in scientific discourse, since global climate change, economic challenges, and political instability directly affect the availability of food for the population. Food security research covers a wide range of aspects, including the role of technology in agriculture, the impact of socio-economic factors on food availability, the effectiveness of international food programs, and the correlation between food security and environmental sustainability.

In contemporary studies, considerable attention is paid to the role of technology and innovation in ensuring food security. Tyczewska, Twardowski and Woźniak-Gientka (2023) consider the use of agrobiotechnology as an effective means to increase agricultural productivity and ensure sustainable food production. Salima *et al.* (2023) investigate the impact of access to financial resources, including credit, on household food security in Malawi, finding that access to finance contributes to increased food security. Ohlan and Ohlan (2023) conduct a bibliometric analysis of scientific research on food security, outlining the main directions and trends in this area. Rusmawati, Hartono and Aritenang (2023) point to the key role of social capital in shaping food security, using the example of Indonesia.

In addition to technological aspects, researchers are looking at the issue of adaptation to climate change and its impact on food security. Gebre *et al.* (2023) analyze the impact of farmers' climate adaptation strategies in Kenya, noting that the proper use of these methods significantly reduces food risks. Kazungu and Kumburu (2023) examine agribusiness as a mechanism for increasing food resilience in Tanzania, suggesting strategies for agribusiness development. Akbar *et al.* (2023) analyze household food security in Indonesia during the COVID-19 pandemic, emphasizing the importance of government support programs. Rabbi *et al.* (2023) examine the challenges of food security in Europe in the context of the protracted conflict between Russia and Ukraine, which affects global food markets.

Osabohien *et al.* (2023) analyze the relationship between social protection, environmental policy and food security in Africa. Zerbian and de Louis Romero (2023) explore the role of cities in ensuring food security, looking at Madrid's experience in implementing urban food strategies. Leal Filho *et al.* (2023) analyze the impact of the war in Ukraine on the global food situation, pointing to the dependence of many countries on Ukrainian grain exports. Bahiru, Senapathy and Bojago (2023), investigating household food security in Ethiopia, identified key factors that influence food security levels.

An equally important factor in the studies is the problem of food waste and inefficient use of resources. In particular, Durán-Sandoval, Durán-Romero and Uleri (2023) analyze the level of food losses in countries facing food crises, noting the need to improve resource efficiency. Weldemariam, Sakdapolrak and Ayanlade (2023) examine the relationship between food security and population migration in Northern Ethiopia. Rono *et al.* (2023) examine the mechanisms of household food security in Northern Kenya using unique empirical data. Byaruhanga and Isgren (2023) consider the issue of

food sovereignty, highlighting its importance for achieving sustainable levels of food security.

Considering the relationship between food security and economic development, one should not in particular the study by Saboori, Alhattali and Gibreel (2023), who investigate agricultural diversification as a factor in strengthening food security in the Gulf countries. Yovo and Gnedeka (2023) attempt to assess food security in Togo based on a food expenditure approach. Adesete, Olanubi and Dauda (2023) analyze the impact of climate change on food security in sub-Saharan Africa. Macalou *et al*. (2023) examine the impact of urbanization on food security in Mali, emphasizing the need for the introduction of adaptation mechanisms in cities.

Thus, contemporary research on food security covers a broad range of topics from technological innovations to economic, environmental, and social aspects. The aggregate of the analyzed studies indicates the need for a comprehensive approach to solving food security problems, combining sustainable development strategies, climate change adaptation and food systems improvement.

Methodology

The research procedure implied several stages, the first of which was the identification of the main problems of food security and the factors influencing it. The first stage involved an analysis of available sources, in particular, reports of appropriate international organizations (FAO, World Bank, USDA), as well as scholarly studies in the field of global food security. The second stage implied the collection and systematization of statistical data on food insecurity, data on the level of import dependence and the effectiveness of food aid within the period 2023–2025. The third stage involved the calculation of key indicators of food security, in particular, the food security ratio (FAR), the food dependency ratio (FIDR), and food aid effectiveness (FAE). The final stage consisted of generalization of the results obtained and their interpretation to formulate conclusions regarding the level of food security in different regions of the world.

Sampling was based on statistical data published by authoritative specialized international organizations dealing with food security and economic development. The analysis includes data for the years 2023–2025, covering the global level of food security, as well as a detailed breakdown of the situation in Africa, Asia, Latin America, North America and Europe. Official reports presenting data on food production, imports, exports, food aid levels, and key economic indicators related to food availability were included in the base for analysis.

Analysis implied a mixed methodology, employing both quantitative and qualitative methods. As the core research approach, we chose the analysis of secondary sources, which included the study of international organizations' reports, statistical databases, and scholarly publications. In the process of assessing the level of food security, three key indicators were calculated: FAR, FIDR, and FAE. For calculating each of these indicators, the corresponding mathematical formulas were used. In particular, the FAR was calculated as follows:

$$FAR = \frac{P_{prod}+I_{imp}-E_{exp}}{P_{need}} \quad (1)$$

Where:
P_{prod} is food production, in million tons.
I_{imp} is food imports, in million tons.
E_{exp} is food exports, in million tons.
P_{need} is the total population's need for food, in million tons.

The calculation of the level of FIDR was carried out with the following formula:

$$FIDR = \frac{I_{imp}}{P_{prod}+I_{imp}-E_{exp}} \times 100\% \quad (2)$$

I_{imp}– is food imports.
P_{prod}– is food production.
E_{exp}– is food exports.

Calculating Food Aid Effectiveness (FAE):

$$FAE = \frac{A_{aid}}{P_{def}} \times 100\% \quad (3)$$

Where:
A_{aid} – volume of food aid received, million tons.
P_{def} – total food deficit, million tons.

While interpreting the results, a comparative analysis between regions was carried out, allowing for the determination of the dependence of food security on domestic production, imports, and international aid.

The methodological approach of this study allowed for a comprehensive assessment of global food security challenges, identification of vulnerable regions, and analysis of the main factors influencing the level of food availability. The use of multi-level analysis, combining statistical calculations, assessment of official data, and comparative analysis, contributed to the formation of an objective picture of the current state of food security and its prospects.

Results

Food security represents a critical component of global development and stability. It shapes the population's ability to obtain sufficient quantities of good quality food and thus lead a healthy and active lifestyle. In today's world, food security problems are associated with economic, social, and environmental factors that shape trends regarding food availability. One of the key indicators that allows us to assess the state of food security in the world is the level of global food insecurity and the number of people facing food shortages.

As can be seen from table 1, in 2023, the share of the population facing food insecurity was 29.6%, or approximately 2.4 billion people. In 2024, this figure decreased to 28.9%,

or 2.3 billion people, and is projected to decrease further to 27.5%, or 2.2 billion people, in 2025 (World Bank, 2025). This trend suggests a gradual improvement in the situation, which may be the result of increased international food aid programs, increased agricultural production capacity, and reduced conflict in regions most vulnerable to food crises. However, despite the positive trend, the number of people suffering from food insecurity remains extremely high.

An important factor affecting food availability is food price inflation. In 2023, it reached 8.5%, which caused an increase in the cost of basic foodstuffs and a decrease in the purchasing power of the population in low-income countries (World Bank, 2025). In 2024, food inflation decreased to 7.2%, and in 2025 it is projected to slow further to 6.8%. This trend is a consequence of the stabilization of world markets, the reduction of logistics costs and the implementation of effective price control policies (FAO, 2023a, 2023b). At the same time, it is worth noting that even a slight increase in food inflation can have serious consequences for the poorest countries, where a significant share of household income is spent on food.

Table 1: World Food Security Statistics (2023–2025)

Year	*Global food insecurity, %*	*Number of hungry people, in millions*	*Food price inflation, %*
2023	29.6%	2.4 billion	8.5%
2024	28.9%	2.3 billion	7.2%
2025	27.5%	2.2 billion	6.8%

Source: FAO (2023a, 2023b), FSIN (2023), World Bank (2025), USDA (2024)

Despite the overall decline in food insecurity, the situation varies considerably by region. As can be seen from table 2, Africa is the most affected region, with 60.9% of the population, or 868 million people, facing food insecurity. This is due to several factors, including adverse climatic conditions, underdeveloped agricultural sectors, armed conflicts and limited international assistance. Climate change, including droughts and floods, has a significant impact on the productivity and availability of food resources in the region.

Asia has a significant number of food insecure people, although its share in the overall structure is smaller than in Africa. In 2024, this figure is 24.2%, which is equivalent to 1.1 billion people. Such a high absolute level of food insecurity is explained by the region's population size and the uneven distribution of resources. In some countries in Asia, such as India and Bangladesh, a significant proportion of the population lives below the poverty line, which makes access to food difficult.

Latin America faces food security challenges, although the level is moderate compared to Africa and Asia. The proportion of the population that is food insecure in the region is 37.5% or 247 million people (FAO, 2022). The main factors affecting food security here are economic instability, income inequality and high levels of dependence on agricultural exports.

The best situation is observed in North America and Europe, where only 8.0% of the population (90 million people) faces food shortages. This fact is explained by the high

level of development of the agricultural sector, effective social policies and stability of the economies of the regions. Despite rising food prices, the majority of the population continues to have sufficient income to meet their nutritional needs.

Table 2: Distribution of food insecurity by region, 2024

Region	*Share of population at risk of food insecurity, %*	*Number of people at risk, million people*
Africa	60.9%	868 million
Asia	24.2%	1.1 billion
Latin America	37.5%	247 million
North America and Europe	8.0%	90 million

Source: FAO (2023a, 2023b), Food Security Portal (2024)

Analysis of global trends shows significant disparities in food security around the world. While some countries with high levels of economic development demonstrate stable indicators, developing regions remain vulnerable to food crises. The main factors influencing the level of food security are the economic situation, climate change, political stability, the level of agricultural development and access to international assistance. The financing of food programs, the effectiveness of international assistance and regional differences in the level of food availability are of great importance.

Financing food security is a key aspect in combating global hunger and ensuring the stability of food markets. As can be seen in Figure 1, total financing in 2024 amounted to $123 billion and is projected to increase to $131 billion in 2025. The largest amount of funds is directed to humanitarian assistance, amounting to $47 billion in 2024 and increasing to $50 billion in 2025 (World Bank, 2025). International organizations and governments actively support countries experiencing acute food crises caused by conflict, natural disasters, or economic instability.

In addition to direct food aid, significant attention is being paid to infrastructure projects and agricultural support. In 2023, $41 billion was allocated for infrastructure projects, and in 2024, $44 billion (IMF, 2023). Such investments are aimed at developing transport and logistics infrastructure, which helps improve access to food markets and reduce product losses due to inefficient storage. Agricultural support includes financing for farms, investments in new technologies, and support for sustainable agriculture. In 2023, this category of financing amounted to $35 billion, and in 2024 it increased to $37 billion.

The efficiency of the use of these funds significantly affects food security in different regions of the world. One of the indicators that assesses this aspect is the FAR, which shows whether there is enough food in a given region to cover the needs of its population. As shown in Figure 2, the most critical situation is observed in Africa, where the FAR is 0.72, indicating a significant food shortage. High levels of dependence on imports, limited domestic production and demographic growth are key factors in this situation.

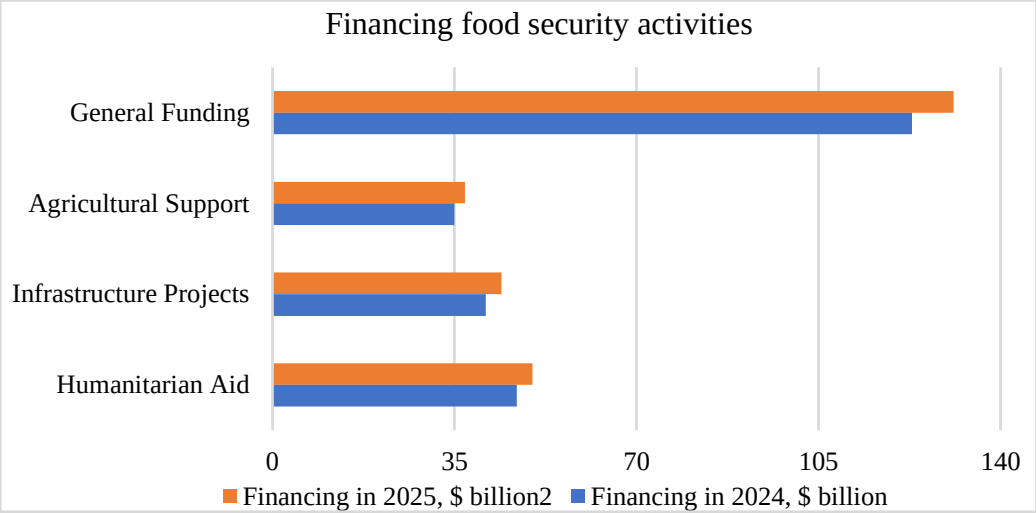

Figure 1: Financing of food security activities (2024–2025) [*Source:* World Bank (2025), Food Security Portal (2024)]

Meanwhile, in Asia, the FAR is 1.03, which means that the region produces enough food to cover its own needs. This is the result of active agricultural policies, significant investments in agriculture and effective resource management. In Latin America, the FAR is 1.12, and in North America and Europe 1.07, confirming the high level of food self-sufficiency in these regions.

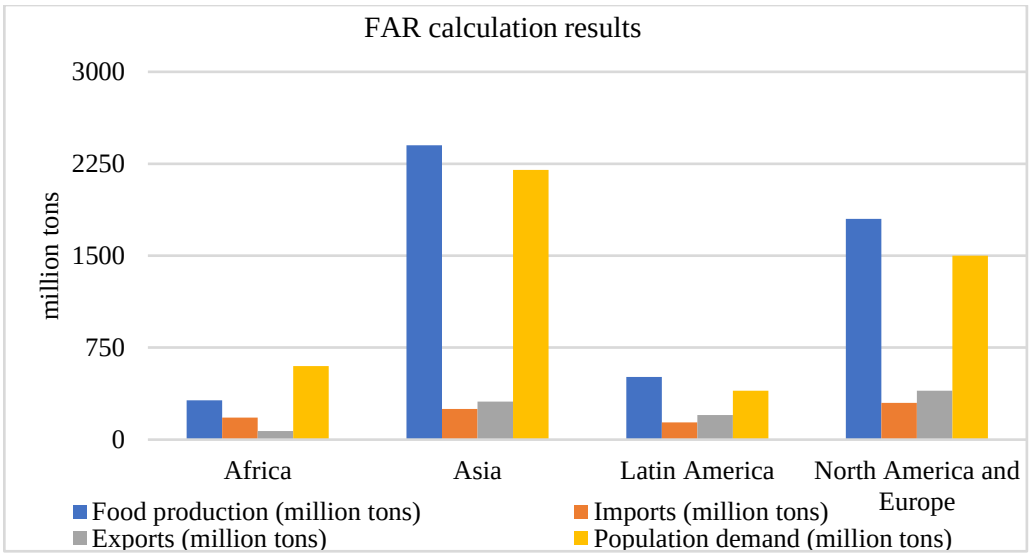

Figure 2: Results of FAR calculation in 2024

FIDR is used to assess this factor, which reflects the share of food supplied through imports in the total amount of available food. The calculations presented in Figure 3 allow for estimating the level of food dependence in different regions of the world using the FIDR. The ratio indicates the proportion of imported food relative to the total food supply available in the region. The situation in Africa is the most critical, 31.0%, which confirms its significant dependence on food imports and vulnerability to global changes

in the food market. Asia 9.5%, Latin America 21.3% and North America, with Europe 13.0%, have significantly lower FIDR indicators, which indicates their higher food self-sufficiency and more sustainable agricultural policies. The main reasons for such high dependence are insufficient domestic production, climate change, as well as weak agricultural infrastructure.

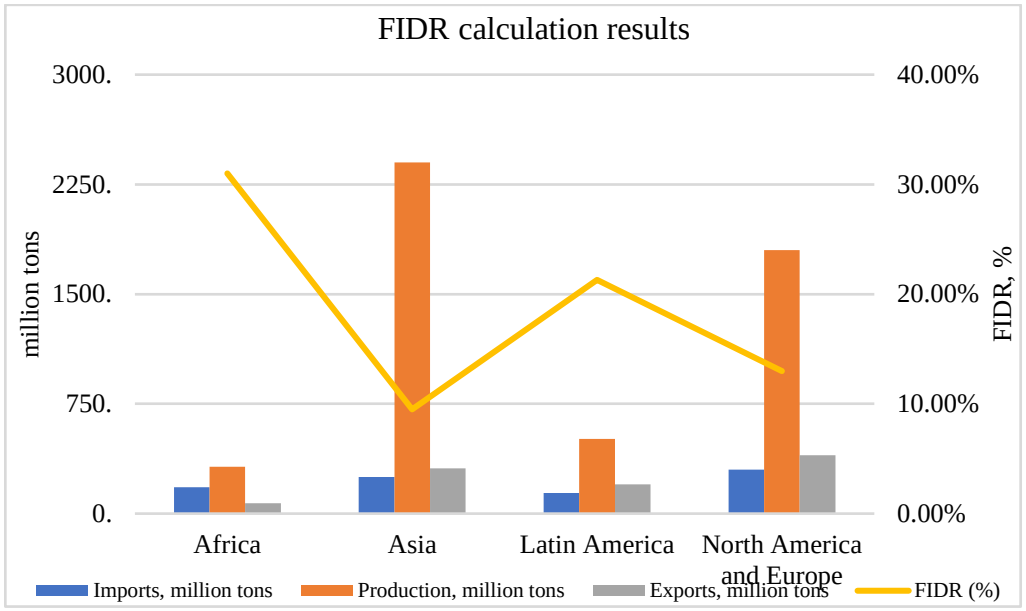

Figure 3: FIDR calculation results in 2024

Asia has the highest aid effectiveness (60.0%), reflecting better-organized humanitarian programs and the active involvement of regional governments in food distribution. The best food aid effectiveness rates are observed in Latin America (66.7%) and North America and Europe (50.0%), reflecting more stable economic conditions and greater self-sufficiency in the regions.

The Food Aid Efficiency is calculated and presented graphically in figure 4. The lowest efficiency level is observed in Africa, 40.0%, which means that most of the deficit remains uncovered by international aid. There are insufficient food supplies and logistical difficulties in the region. In contrast, Asia (60.0%), Latin America (66.7%) and North America, with Europe (50.0%), demonstrate better results, which is explained by a more efficient aid distribution system and a higher level of international financing of food programs.

Thus, the calculations demonstrate that Africa remains the most vulnerable region in the world, both in terms of food import dependence and the effectiveness of international aid. More active action is needed from the international community, including increasing the volume of humanitarian aid, improving logistics, and stimulating local food production.

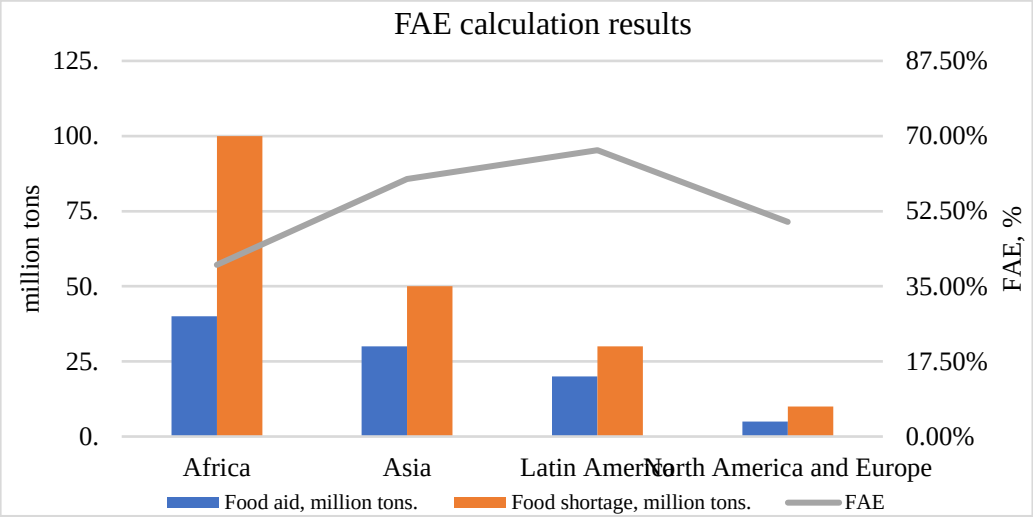

Figure 4: Results of FAE calculation in 2024

The state of food security has deteriorated significantly compared to 2021. This was influenced by the deterioration in the economic affordability of food. It should be noted that the current state of Ukraine's food security is a cause for concern due to the decline in most indicators, and the ongoing military operations in Ukraine could negatively change the system of global grain exports and significantly affect food security in the world. The vast majority of problems in Ukraine's food security system are related to a decrease in the amount of agricultural products produced and an increase in the cost of such products (production, processing, transportation and storage).

A threat to global food security is the complicated export of domestic food products to other countries due to the blockade of Ukrainian ports by the aggressor country. As a result of the Black Sea blockade, more than 22 million tons of grain were blocked in Ukrainian ports, much of which was intended for the UN World Food Program. Analysing food price indices, we can conclude that the decline in Ukrainian exports has had a significant impact on the global food market and security. Although Ukrainian exports account for only 0.3% of total world trade and only 0.2% of world GDP, the blockade of Ukrainian ports has shown that some countries, primarily in Africa and Southeast Asia, are extremely dependent on Ukraine's grain exports.

In order to overcome the consequences of the war and post-war recovery, priority areas of food security should be ensured, including: increasing the production of quality and healthy products; creating agricultural stocks; restoring food security in the territories affected by the military aggression; restoring food chains; demining of sown areas; optimizing logistics routes; and regulating social protection. The basis for ensuring the conditions for a successful food security policy and sustainable socio-economic development is the promotion of interaction between the state, the public and business. This form of cooperation can minimise the cost of food sustainability projects and optimise the performance of the public sector in terms of complementarity with the needs of socio-economic development. At the same time, this interaction has a positive impact on the management of resource potential, promotes the development of labour relations, exports and optimisation of investment policy.

Discussion

The results of the study confirm the relevance of the problem of food security in the global context and highlight the role of various factors that influence the stability of food systems. Africa remains the most vulnerable region, which is consistent with the findings of Shang *et al.* (2024), who note that globalization processes only exacerbate structural problems of food markets in African countries. Yadav *et al.'s* (2023) study indicates that the use of blockchain technologies can contribute to increasing transparency in food systems. These support the research of Castillo Escalante and Ramirez García (2023), who point out the importance of educational initiatives in the field of food security for the formation of sustainable agri-food systems.

Consumer behaviour and market regulation tools have a significant impact on food security. As Trollman, Jagtap and Trollman (2023) point out, crowdsourcing food choices can be an effective mechanism for increasing food sustainability, as it allows for better demand forecasting and reduces food waste. Research by Hamadjoda Lefe *et al.* (2024) showed that climate change is significantly affecting African food systems, reducing food self-sufficiency, which is consistent with our calculations of FAR. Olanrewaju and Balana (2023) confirm that conflict–induced shocks affect global food supply chains.

Our analysis found significant regional differences in food import dependency. These findings are consistent with the results obtained by Sundram (2023), who shows that ASEAN countries are gradually reducing their dependence on imported food thanks to strategic planning and investment in the agricultural sector. Clapp *et al.* (2022) offer a six-dimensional model allowing for assessing food security with taking into account the availability and stability of food systems, as well as issues of environmental sustainability. The findings on the effectiveness of international food aid correlate with the study by Wudil *et al.* (2022), who emphasize the need for reforms in the landscape of humanitarian support mechanisms in the sub-Saharan Africa region.

Moreover, the study demonstrated the phenomenon of meaningful dependence of food security on geopolitical factors. In this vein, Ben Hassen and El Bilali (2022) examine the impact of the Russo-Ukrainian war on global food markets, indicating that restrictions on grain exports from these countries caused food shortages and rising prices, as confirmed also by our food inflation calculations. The regional disparities in food availability, high levels of import dependence, and low effectiveness of food aid indicate the need to design new strategies for ensuring food sustainability. The available results support the need for further research on the impact of digital technologies, policy reforms, and climate change on the global food situation.

Conclusion

The results obtained demonstrate that food security remains a key global challenge, especially for regions characterized by low self-sufficiency and high import dependence. Meanwhile, analysis of statistical data indicated a pattern of gradual decrease in the global level of food insecurity from 2023 to 2025, which is partly explained by the stabilization of food markets and the reduction in food price inflation. At the same time,

significant regional differences mean an uneven distribution of food resources: Africa remains the most vulnerable due to high levels of food shortages, a low food security ratio (FAR = 0.72), and significant import dependence (FIDR = 31.0%). Moreover, the effectiveness of food aid in this region remains insufficient (FAE = 40.0%), which specifies the need to improve international support programs.

The results indicate the critical role of factors determining food security, in particular economic policy, the level of domestic production and international aid. Countries with developed agricultural infrastructure, North America and Europe, demonstrate stable indicators of food independence and have the highest level of self-sufficiency. The high level of food dependence on imports in vulnerable regions makes them sensitive to global crises, political conflicts and climate change. The priority area of further research is the development of strategies to reduce food insecurity by supporting local production, introducing modern agricultural technologies and strengthening international food aid mechanisms.

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Authors' Declarations and Essential Ethical Compliances

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	*Author 1*	*Author 2*	*Author 3*	*Author 4*	*Author 5*
Conceived and designed the research or analysis	Yes	No	Yes	Yes	No
Collected the data	Yes	No	Yes	No	No
Contributed to data analysis & interpretation	Yes	Yes	No	Yes	Yes
Wrote the article/paper	Yes	Yes	No	No	Yes
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