

Impact of Global Challenges on the State of World Food Security

Volodymyr Tkachenko, Alina Tkachenko*, Svitlana Ostryanina

Poltava University of Economics and Trade 36014, Poltava, I.Banka Str. 3, alina_biaf@ukr.net

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Abstract

Food Security Management in the Era of Global Challenges: From Resilience to Innovation. The article examines current problems of ensuring food security under multiple global challenges. The evolution of the food security concept from a narrow definition to a multifaceted system covering economic, social, environmental and political factors is analyzed.

Four main "pillars" of food security (availability, access, utilization, stability) and five levels of its provision (global, regional, national, local, household) are identified. Particular attention is paid to analyzing global and regional hunger indicators: in 2024, 638 to 720 million people suffered from hunger, representing 7.8-8.8% of the world's population. Significant regional inequality in food security provision is revealed. The most critical situation is observed in Africa, where almost a quarter of the population (21.3-24.4%) suffers from undernourishment. Three main drivers of food crises are identified: conflicts (45.9% of population in need), extreme weather events (28.8%), and economic shocks (25.3%). The impact of war in Ukraine on global food security is examined, particularly on African and Middle Eastern countries dependent on Ukrainian grain exports. The necessity of developing innovative, adaptive and resilient food supply chain architecture based on decentralization and digital monitoring principles is substantiated.

By applying a systemic approach, statistical-economic analysis, and the method of logical generalization, the article examines the impact of global challenges on the state of world food security, which allowed for the identification of key determinants of modern food crises and the assessment of regional inequality in access to food.

Key words: Food security, global challenges, hunger, food crises, supply chains, food systems resilience, innovations

Anotacija

Maisto saugumo valdymas pasaulinių iššūkių eroje: nuo atsparumo iki inovacijų. Straipsnyje nagrinėjamos aktualios maisto saugumo užtikrinimo problemos esant daugybei pasaulinių iššūkių. Analizuojama maisto saugumo koncepcijos evoliucija nuo siauro apibrėžimo iki daugialypės sistemos, apimančios ekonominius, socialinius, aplinkosaugos ir politinius veiksnius.

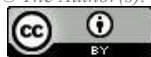
Išskiriami keturi pagrindiniai maisto saugumo „ramsčiai“ (prieinamumas, pasiekiamumas, naudojimas, stabilumas) ir penki jo užtikrinimo lygmenys (pasaulinis, regioninis, nacionalinis, vietinis, namų ūkių). Ypatingas dėmesys skiriamas pasaulinių ir regioninių bado rodiklių analizei: 2024 m. nuo bado kentėjo nuo 638 iki 720 milijonų žmonių, o tai sudaro 7,8–8,8 % pasaulio gyventojų. Atskleidžiama didelė regioninė nelygybė užtikrinant maisto saugumą. Kritiškiausia padėtis stebima Afrikoje, kur beveik ketvirtadalis gyventojų (21,3–24,4 %) kenčia nuo nepakankamo maitinimosi. Išskiriamos trys pagrindinės maisto krizių priežastys: konfliktai (45,9 % gyventojų, kuriems reikia pagalbos), ekstremalūs klimato reiškiniai (28,8 %) ir ekonominiai sukrėtimai (25,3 %). Nagrinėjamas karo Ukrainoje poveikis pasauliniam maisto saugumui, ypač Afrikos ir Artimųjų Rytų šalims, priklausomoms nuo Ukrainos grūdų eksporto. Pagrindžiamas poreikis kurti inovatyvią, adaptyvią ir atsparią maisto tiekimo grandinių architektūrą, grindžiamą decentralizacijos ir skaitmeninės stebėsenos principais.

Taikant sisteminių požiūrį, statistinę-ekonominę analizę bei loginio apibendrinimo metodą, straipsnyje tiriamas pasaulinių iššūkių poveikis pasaulio maisto saugumo būklei, o tai leido nustatyti pagrindinius šiuolaikinių maisto krizių determinantus bei įvertinti regioninę nelygybę užtikrinant galimybę gauti maisto.

Raktiniai žodžiai: maisto saugumas, pasauliniai iššūkiai, badas, maisto krizės, tiekimo grandinės, maisto sistemų atsparumas, inovacijos.

Introduction

The concept of food security (FS) has undergone a complex evolution from a narrow, supply-oriented definition to a multifaceted global system encompassing not only economic but also social, environmental, and political factors. The term originates from the English phrase "food security," which carries a dual meaning in Ukrainian: it can be translated as "prodovolcha bezpeka" (food security) or "prodovolcha zabezpechenist" (food sufficiency/provision). The latter reflects the essence of the "food security" concept as the guaranteed ability of an individual to have physical and economic access to food (Hlushkov, 2025). Today, the food problem is gaining particular relevance and global scale due to its complexity. It concerns nearly all states, and its successful



resolution depends on a wide range of factors that extend far beyond the agricultural sector alone. Furthermore, this issue is inextricably linked to national security, economics, energy, raw materials, and ecology. War has turned food into a weapon of geopolitics, exposed the fragility of global supply chains, and exacerbated hunger in the poorest countries, despite successful efforts to restore Ukrainian exports.

In addition to armed conflicts of which there are over 180 according to the 2025 Global Peace Index report (Global Peace Index 2025, 2025) (the most significant occurring in Ukraine, Sudan, and Gaza) the primary challenges to food security include extreme weather events (floods, droughts), economic shocks, pandemic consequences, and supply chain disruptions. More than 700 million people worldwide suffered from hunger in 2023, and 29% of the global population faced food insecurity, with the most critical situation observed in Africa.

Geopolitical challenges and their impact on global supply chains are highlighted in the works of Clapp & Moseley (2020) and Headey & Fan (2023). Particular attention is paid to the impact of wars and trade restrictions on food security. The concept of food system resilience was developed by Tendall et al. (2021), who define it as the capacity to absorb shocks and adapt. Béné et al. (2022) examine the multidimensionality of food system resilience. The impact of war on food security is explored in the works of Borodina O.M. (2023), who analyzes wartime challenges for the agricultural sector. Shubravska O.V. and Prokopenko K.O. (2022) investigate the problems of restoring food systems in the post-war period. Previous articles by the authors (Tkachenko & Tkachenko, 2025; Tkachenko, Tkachenko, & Ostryanina, 2023) highlight logistical approaches to ensuring food security.

The purpose of the article is to investigate the impact of global challenges on the state of world food security. To achieve this goal, the following research objectives have been defined:

- to examine the fundamental principles and levels of ensuring food security;
- to analyze the dynamics of global hunger and undernourishment indicators from 2020 to 2024, based on FAO and WHO reports and to analyze the regional aspects of global food security;
- to identify the primary risk drivers and challenges to food security.

Materials and methods

The research methodology is based on a comprehensive analysis of global and regional food security from 2024 to 2026, utilizing empirical data from official international reports, including the Food and Agriculture Organization of the United Nations (FAO), the **SOFI Report 2025**, the Global Network Against Food Crises (GNAFC), and the **Hunger Map 2025** by the World Food Programme. To establish the theoretical framework and identify research gaps, a bibliometric analysis was conducted using the **Lens.org** aggregator along with **Scopus** and **Web of Science (WoS)** databases, focusing on keywords such as "*food security*", "*security-oriented management*", and "*supply chain resilience*". The construction of bibliometric maps and research clustering were performed using **VOSviewer** software to visualize conceptual links and assess the current state of security-oriented management studies. The study employs a combination of a systems approach, statistical and comparative analysis, and logical abstraction to examine the global food supply system in the context of geopolitical instability. The object of this study is the global food supply system, while the subject focuses on the mechanisms and tools of security-oriented management that ensure the resilience of food supply chains.

The article analyzes statistical data on food security indicators for the period from 2020 to 2024. Mathematical and statistical processing of the results was performed using the Pearson correlation method.

Results and discussions

Food security remains one of the most pressing global issues of our time. According to data from the Food and Agriculture Organization of the United Nations (FAO) (Guiné, 2024), the global



state of food security is characterized by significant challenges and an uneven distribution of food resources across regions. The modern concept of food security is a complex, systemic, and multi-level category that extends beyond the scope of purely agricultural policy. The so-called "pillars of food security" are illustrated in Figure 1.

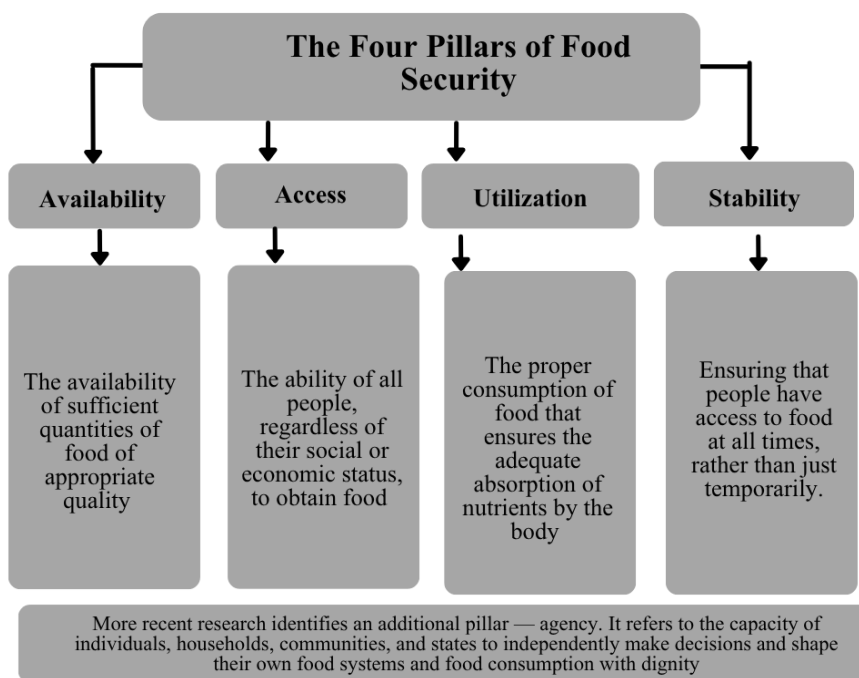


Fig.1. The Four Pillars of Food Security

As noted by António Raposo et al (2021), food security is a multidimensional concept characterised by four pillars related to availability, access, utilisation, and stability. These dimensions are interrelated with, for example, agricultural modernisation, social capital, kitchen equipment, and worldwide shocks. In contrast to the traditional four-pillar model, our study, drawing upon recent scientific advancements, identifies an additional fundamental dimension of food security – agency. This pillar refers to the capacity of individuals and communities to independently make decisions and shape their own food systems with dignity.

Food security functions at several interconnected levels, where disruptions at lower levels can occur even when food security is ensured at higher levels (Fig. 2).

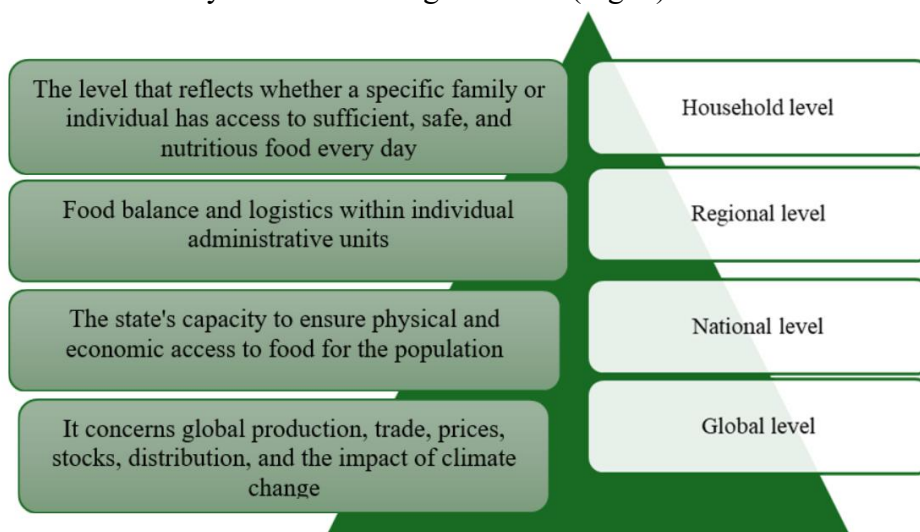


Fig.2. Levels of Ensuring Food Security (Author's Development)

As shown in the figure 2, the household level is at the highest priority, being the most critical as it reflects an individual's access to food. According to the latest FAO estimates, between 638 and 720 million people suffered from hunger in 2024, representing 7.8–8.8% of the global population. Although some progress has been observed compared to previous years, the world remains above pre-COVID-19 pandemic levels and is far from achieving Sustainable Development Goal 2 (Zero Hunger) by 2030.

It should be noted that while various aspects of food security have been addressed by numerous authors, systemic studies covering all its levels remain limited. For instance, Davidson (2026) emphasizes that household food security and individual dietary diversity are crucial factors in child development. In Ukraine, the national level of food security has become a primary object of research since 2022 due to the challenges of the full-scale war (Patytska, 2023; Zelisko, 2022). A significant contribution in this field is the study by Amin and Guddattu (2025), which utilized Moran's-I statistics to determine the degree of geographical clustering of Indian districts in relation to the Global Hunger Index (GHI). The authors performed spatial clustering of Indian regions using univariate LISA cluster maps and significance maps. This research serves as a compelling example of the inextricable link between the national level of food security and the status of individual households. In contrast, our study focuses on the regional and global levels, which are inextricably linked to drivers that impact the system starting from the household level.

An analysis of bibliometric data from the Lens.org aggregator allowed for the creation of a bibliometric research map based on key keywords (Fig.3).

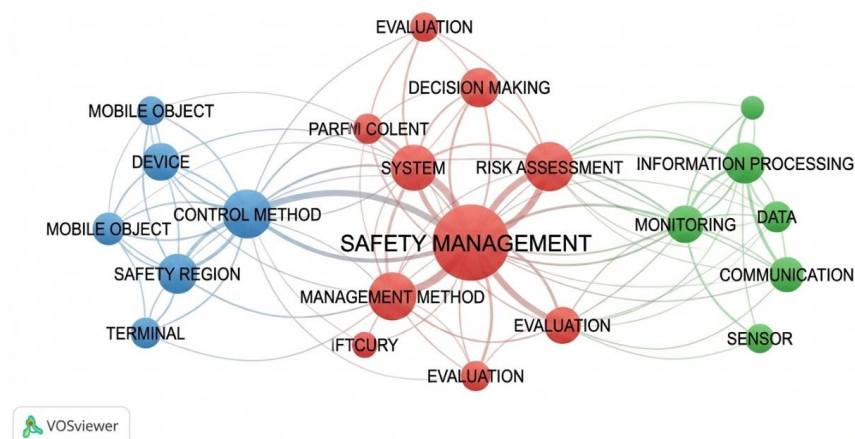


Fig 3. Bibliometric map of research on security-oriented management in Scopus and Web of Science (WoS) databases (created by the author using VOSviewer software based on the Scopus database)

It should be noted that the data in the figure indicate that security-oriented management in the context of food security remains under-researched today.

Table 1 presents the dynamics of hunger and malnutrition indicators from 2020 to 2024, specifically: the number of people suffering from hunger, the prevalence of undernourishment, the number of people facing acute food insecurity, and the number of countries and territories experiencing food crises.

Table 1. Dynamics of Global Hunger and Undernourishment Indicators (2020–2024)

Indicator	2020	2021	2022	2023	2024
Number of people suffering from hunger (million people)	633	702	735	713-757	638-720
Prevalence of undernourishment (%)	8,0	8,9	9,2	8,9	7,8-8,8
Number of people facing acute food insecurity (million people)	257	270	282	281,4	295
Countries and territories with food crises	55	53	53	58	53

Source: Compiled by the authors based on data from FAO, SOFI Report 2024-2025, and the Global Report on Food Crises 2025



As shown in Table 1, following a significant deterioration of the situation in 2021–2022 due to the COVID-19 pandemic and global economic shocks, some improvement in indicators is observed in 2024. Mathematical and statistical data processing (Pearson correlation) revealed a strong correlation ($r = 0.82$) between the total number of undernourished people and the number of individuals facing acute food insecurity. As shown in Table 1, the number of countries and territories facing food crises remained relatively stable throughout the 2021–2024 period. At the same time, prior research, specifically by Otekunrin (2024), notes that while modest improvements in GHI and GFSI scores were observed until 2022 particularly in developed nations most countries in sub-Saharan Africa (SSA) experienced a deterioration in their performance. This was characterized by a significant increase in GHI scores and a corresponding decline in GFSI values. The escalation of the war in Ukraine has emerged as a critical driver, profoundly impacting food security indicators worldwide.

However, the number of people facing acute food insecurity continues to rise, as evidenced by the report on structural problems within the global food system (Table 2).

Table 2. Regional Distribution of Food Insecurity in 2024

Region	Number of undernourished people (million)	Prevalence in the population (%)	Trend compared to 2023
Africa	298–342	21.3–24.4	Increasing
Asia	298–360	7.1–8.6	Stabilization
Latin America and the Caribbean	33–42	5.0–6.4	Slight improvement
Western Asia	38–46	12.2–14.7	Increasing
Oceania	1.2–1.5	12.2–14.7	Stable
Northern America and Europe	<2.5	<2.5	Stable

Source: Compiled by the authors based on data from FAO, *SOFI Report 2025*, and the *Hunger Map 2025*

The data in Table 2 demonstrate significant regional inequality in ensuring food security. The most critical situation is observed in Africa, where nearly a quarter of the population suffers from hunger. Particularly alarming is the projection that by 2030, half of the world's chronically undernourished people will live in Africa.

Africa faces a severe food shortage. The Horn of Africa frequently experiences prolonged droughts and erratic rainy seasons that destroy crops and livestock, leaving millions at risk of starvation. Out of nearly 64 million people requiring humanitarian assistance and protection in the Greater Horn of Africa, this region accounts for nearly 22% of the global humanitarian burden in 2024; Sudan and Ethiopia alone represented two of the five largest humanitarian crises in the world.

It should be noted that the full-scale war in Ukraine has significantly impacted global food security. Countries such as Egypt, Sudan, Yemen, Turkey, and others, which previously received large volumes of wheat and barley from Ukraine, have faced shortages and prohibitive prices. The World Food Programme (WFP) relied heavily on Ukrainian grain. Rising prices have reduced the WFP's purchasing power, thereby decreasing aid volumes for millions in regions already plagued by hunger (e.g., East Africa, as shown in Fig. 1). Thus, the war has turned food into a geopolitical weapon, exposed the fragility of global supply chains, and exacerbated hunger in the poorest nations, despite successful efforts to restore Ukrainian exports.

A significant portion of food security risks is linked to supply chains and logistics. However, in the face of constant geopolitical conflicts, climate change, and economic instability, traditional linear logistical models prove extremely vulnerable to shocks, jeopardizing both national food sovereignty and global stability. Consequently, the scientific problem lies in the need to develop and implement an innovative, adaptive, and resilient architecture for food supply chains. This architecture should integrate principles of decentralization and digital monitoring, ensuring



guaranteed access to food even during crises. Below is an analysis of the primary drivers of food crises in 2024.

In 2023, approximately 281.6 million people (21.5% of the analyzed population) faced high levels of acute food insecurity an increase of 24 million compared to 2022. Furthermore, over 700,000 people found themselves on the brink of famine, especially in the Gaza Strip, Sudan, and Haiti. More than 60% of the population experiencing acute food insecurity resided in just 10 countries.

Table 3. Primary Drivers of Food Crises in 2024

Crisis Driver	Number of Countries	Population in Need of Assistance (million)	Share of the Total Amount (%)
Conflicts	20	135.4	45.9
Economic Shocks	21	74.8	25.3
Weather Extremes	12	85.1	28.8

Source: Compiled by the authors based on data from *Global Report on Food Crises 2025* [13]

The data in Table 3 indicate that conflicts are among the most significant drivers of food crises. Some sources also identify the post-COVID-19 period as a distinct contributing factor. In response to global food security challenges, the international community has intensified efforts to combat hunger. The World Bank has included food and nutrition security among the eight global challenges that must be addressed at scale, mobilizing \$45 billion to tackle these issues and protect vulnerable populations. The Global Network Against Food Crises (GNAFC) coordinates the efforts of the UN, governments, NGOs, and the private sector to prevent and respond to acute food crises.

An analysis of the relative weight of these factors indicates that although conflicts encompass the largest number of countries (20) and the highest percentage of the population (45.9%), weather extremes exhibit the highest intensity of impact per country. On average, a single climate shock affects approximately 7.1 million people, compared to 6.7 million for a single conflict. This suggests that environmental factors possess a more concentrated and devastating character for national food systems. Economic shocks (25.3%), which are often a consequence of post-war destabilization or the disruption of logistics chains (as seen in the case of grain exports from Ukraine), amplify the vulnerability of nations to climate change. This creates a 'triple threat' scenario, where one driver acts as a catalyst for another, necessitating a multisectoral approach to risk management.

Based on the above, the key challenges and risk factors have been identified (Table 4).

Table 4. Key Challenges and Risk Factors

Risk Factor	Factor Level	Risk Zone Level	High-Risk Regions	Examples	Global Risk Management	Regional Risk Management
Weather Extremes	High	Global	Africa, South Asia	Prolonged droughts in the Horn of Africa (Somalia, Ethiopia, Kenya) leading to mass famine	Geographical diversification of food supply sources; diplomatic initiatives to protect agricultural infrastructure as critical assets.	Developing local production and reducing dependence on imports of strategic food products.
Armed Conflicts	High	Global	Africa, Western Asia	In 2024, 281 million people in 53 countries/territories faced acute food insecurity	Development of alternative trade routes (e.g., "grain corridors"); establishing regional food security hubs; simplifying customs procedures in crises.	Strengthening local production in vulnerable regions; grant and micro-credit programs for farmers in high-risk areas.



Table 4 continuation

Risk Factor	Factor Level	Risk Zone Level	High-Risk Regions	Examples	Global Risk Management	Regional Risk Management
Economic Shocks	Medium	Global	Low-income countries	Rising food and energy prices significantly limiting economic access to food	Ensuring free and transparent international food trade; avoiding unjustified export restrictions; global programs to reduce food loss at all stages.	Creating strategic food reserves for emergencies or price spikes.
Supply Chain Disruptions	High	Global	Import-dependent countries	Challenges with transportation, storage, and distribution of food	Multi-sourcing strategies instead of single suppliers; multimodal logistics (alternatives to Suez/Malacca); AI-driven disruption forecasting.	Local production of critical goods; development of a digital logistics ecosystem.

While these challenges have been addressed by other authors, this study offers a more systematic categorization. Beyond traditional factors, the authors identify additional threats to food security. For instance, Guiné (2024) argues that the rise of populism combined with nationalism has intensified trade protectionism, creating significant constraints on the global commercialization of food and weakening state resilience. Boratyńska (2024) specifically highlights food safety and quality as integral components of food security. Furthermore, Yusof (2023) identifies food waste as a critical global challenge. Food loss and waste represent a squandering of labor, capital, energy, and land resources; the author estimates that eliminating global food waste could provide enough food to feed an additional billion people.

Thus, the primary challenges to food security at the global and regional levels include climate change (extreme weather events), wars and armed conflicts (over 180 today, with the most acute in Ukraine, Gaza, and Sudan), economic shocks, and supply chain disruptions. At every level, risk management measures must be meticulously planned, incorporating innovative solutions. Future trends are expected to include the automation of food logistics routes (the use of drones and reduced dependence on human resources), additive manufacturing (local production of components for production lines and agriculture via 3D printing), and the development of a circular economy (recycling and full utilization to reduce reliance on primary raw materials).

Conclusions

The modern concept of food security is multidimensional, encompassing not only the traditional pillars (availability, access, utilization, and stability) but also social, environmental, and political factors. Effective management requires the synchronization of actions across all five levels from the global scale down to the household level, which remains the most critical indicator of food access.

Despite a slight improvement in overall indicators in 2024 compared to the peak values of 2022, the world remains far from achieving Sustainable Development Goal 2. Between 638 and 720 million people continue to suffer from hunger. Critical regional inequality has been identified: Africa remains the most vulnerable region, where nearly a quarter of the population (21.3–24.4%) is chronically undernourished, and the number of people facing acute food insecurity (295 million in 2024) continues to rise.



The primary challenges to food security at both global and regional levels are climate change (extreme weather events such as droughts and floods), wars and armed conflicts (over 180 currently active, most notably in Ukraine, Gaza, and Sudan), economic shocks, and supply chain disruptions. Risk management strategies at every level must integrate innovative solutions to address these systemic vulnerabilities.

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