

**ЕКОНОМІЧНІ НАУКИ**

UDC 338.439

**BASIC INSTITUTIONAL AND TECHNOLOGICAL FACTORS OF FOOD SECURITY**

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<https://doi.org/10.31073/foodresources2024-23-26>

**Subject.** Food security is the state's ability to provide its population with sufficient quantities of food that meet scientifically based norms, ensuring the availability of essential resources and capacities for domestic production, regardless of internal or external challenges and threats. This encompasses maintaining positive demographic dynamics, preserving the national gene pool, fostering sustainable development, supporting integration into the global economy, and safeguarding sovereignty and independence. The article examines the interrelation between food security and the institutional, technological, and regulatory solutions required to sustain it, particularly during emergencies. **Purpose.** To identify institutional and technological factors influencing food security and develop recommendations to enhance the resilience and sustainability of food systems. This includes analyzing the modernization of the agricultural sector, expanding processing capacities, and promoting local food production. The study also emphasizes raising public awareness about food safety and sustainable consumption practices, as well as implementing early warning systems and social support programs to protect vulnerable populations. **Methods.** The study employs a systematic approach to analyze the current food security context, combining data analysis with the evaluation of innovative technologies and international cooperation frameworks. The research integrates statistical data, case studies, and regulatory reviews to draw comprehensive conclusions. **Results.** The findings underline that food security demands a multi-dimensional approach, integrating advanced technologies, sustainable practices, and coordinated efforts at state, local, and international levels. The study highlights disparities in food security indicators across income levels, emphasizing the need for tailored strategies. **Scope of results.** The results are aimed at supporting policymakers, researchers, and practitioners in creating resilient and sustainable food systems capable of adapting to future crises and promoting equitable access to safe and nutritious food.

**Key words:** food security, institutional factors, technological advancements, agricultural modernization, sustainable consumption, emergencies, early warning systems

**ОСНОВНІ ІНСТИТУЦІЙНІ ТА ТЕХНОЛОГІЧНІ ЧИННИКИ  
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**Предмет.** Продовольча безпека – це здатність держави забезпечувати населення достатніми обсягами продовольства, які відповідають науково обґрунтованим нормам, гарантуючи наявність необхідних ресурсів і потужностей для внутрішнього виробництва, незалежно від внутрішніх або зовнішніх викликів та загроз. Це включає підтримку позитивної демографічної динаміки, збереження національного генофонду, сприяння сталому розвитку, інтеграцію у світову економіку та захист суверенітету і незалежності. У статті досліджується взаємозв'язок між продовольчою безпекою та інституційними, технологічними й нормативними рішеннями, необхідними для її стабільності, особливо в умовах надзвичайних ситуацій. **Мета.** Визначити інституційні та технологічні чинники, які впливають на продовольчу безпеку, і розробити рекомендації для підвищення стійкості та сталості продовольчих систем. Це включає аналіз модернізації сільського господарства, розширення переробних потужностей та сприяння розвитку місцевого виробництва. Дослідження також акцентує увагу на підвищенні обізнаності населення щодо безпеки продуктів харчування та раціональних методів споживання, а також впровадженні систем раннього попередження та програм соціальної підтримки для захисту вразливих верств населення. **Методи.** У дослідженні використано системний підхід для аналізу сучасного контексту продовольчої безпеки, який поєднує аналіз даних з оцінкою інноваційних технологій та міжнародних рамок співробітництва. У роботі використовуються статистичні дані, кейс-стаді та огляди нормативно-правових документів для формування всебічних висновків. **Результати.** Результати свідчать, що забезпечення продовольчої безпеки потребує багатовимірного підходу, який інтегрує передові технології, сталі практики та скоординовані дії на державному, місцевому та міжнародному рівнях. У дослідженні наголошується на відмінностях у показниках продовольчої безпеки залежно від рівня доходів, підкреслюючи необхідність адаптованих стратегій. **Сфера застосування результатів.** Отримані результати спрямовані на підтримку розробників політик, дослідників та практиків у створенні стійких і сталих продовольчих систем, здатних адаптуватися до майбутніх криз і забезпечувати рівний доступ до безпечного та якісного продовольства.

**Ключові слова:** продовольча безпека, інституційні чинники, технологічні досягнення, модернізація сільського господарства, сталі практики споживання, надзвичайні ситуації, системи раннього попередження

**Problem statement.** Food security is a fundamental aspect of national security, playing a crucial role in maintaining the health, well-being, and economic stability of populations. It encompasses several key dimensions, including the availability of sufficient food supplies, the accessibility of food to all people, the stability of supply chains, and the appropriate use of food in terms of safety and nutritional quality. The importance of food security has grown significantly over recent decades, especially in light of global challenges such as climate change, economic crises, political instability, and natural disasters. In these contexts, ensuring that people have continuous access to safe, nutritious, and affordable food has become a critical priority for governments, international organizations, and local communities.

The concept of food security was formally defined at the World Summit on Food Security in 1996, organized by the Food and Agriculture Organization (FAO) of the United Nations. According to the Rome Declaration on World Food Security, food security is achieved when “all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life” [1]. This

definition highlights the multi-dimensional nature of food security, which goes beyond the mere availability of food to include issues of quality, safety, and cultural relevance.

In developed countries, food security efforts tend to focus on ensuring the quality and safety of food products, with robust regulatory frameworks and technological advancements ensuring that food meets high standards. In contrast, developing countries often face more immediate challenges related to the physical availability of food and its economic accessibility. These regions are often more vulnerable to disruptions in food production and supply due to factors such as poverty, political conflict, and natural disasters. Ensuring food security in these contexts requires targeted interventions aimed at improving agricultural productivity, enhancing market access, and reducing inequalities in food distribution.

Emergency situations, such as natural disasters, wars, or pandemics, underscore the fragility of food systems and the urgent need for coordinated action. In such cases, food security becomes a matter of life and death, with people facing the risk of food shortages, malnutrition, and even famine. Effective food security strategies during emergencies must focus on stabilizing production, ensuring the continuity of supply chains, and providing immediate assistance to the most vulnerable groups. At the same time, building long-term resilience into food systems is crucial to ensure they can withstand future shocks and continue to meet the needs of populations under changing global conditions.

The relationship between agriculture and food security is central for understanding how nations can protect themselves from food insecurity. Agricultural systems must be both productive and sustainable, balancing the need for increased output with the imperative to protect natural resources. Innovations in farming technologies, improvements in infrastructure, and the adoption of sustainable practices are all necessary to ensure that food systems remain resilient in the face of crises. Additionally, the role of local production, smallholder farmers, and cooperatives is increasingly recognized as a vital component of food security, as they can provide more localized and sustainable solutions to food shortages.

In the following sections, this article will explore how modernization of the agricultural sector, increasing agro-processing capacities, building infrastructure, and strengthening international cooperation can enhance food security, particularly during times of crisis. It will also discuss the role of public education and social support programs in fostering awareness about food security and encouraging sustainable consumption practices.

In a broad and universally accepted sense, food security refers to a state where all people, at all times, have both physical and economic access to enough safe and nutritious food to lead active and healthy lives. This definition emphasizes the multifaceted nature of food security, where both the availability of food and the ability to afford it are crucial components. In this context, food security is not only about the presence of food but also about ensuring that the food is of sufficient quality and nutritional value to meet the needs of individuals and communities. Access to such food must be continuous and reliable, without interruptions caused by emergencies, economic disparities, or supply chain disruptions [1, 2].

The need to secure these aspects becomes even more critical when addressing vulnerable populations, who are often the most affected by disruptions in food supply. Effective food security strategies are thus closely tied to broader development goals, including poverty reduction, public health, and sustainable agricultural practices, making it a key focus for national policies and international efforts aimed at sustainable development.

**Materials and methods.** Within the framework of the research fulfilled, the principles of a systematic approach to the study of factual materials, normative and legal acts and documents as well as technical and commercial information were used as well as abstract logical approach to the generalization of research results and the formulation of conclusions made.

**Findings and discussion.** The formal definition of food security was established at the World Summit on Food Security in 1996, a significant milestone organized by the Food and Agriculture Organization (FAO) of the United Nations. This summit was instrumental in framing

the global understanding of food security and highlighting its importance in the context of both national and international policy. According to the Rome Declaration on World Food Security, food security is defined as a condition where "all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life" [1]. This comprehensive definition underscores the idea that food security is not just about the availability of food but also its quality, safety, and cultural relevance.

In developed countries, the emphasis is often placed on the quality and safety of food products. With advanced food systems, technological innovation, and stricter regulatory frameworks, developed nations focus on ensuring that food not only meets basic nutritional needs but also adheres to high standards of health and safety. Issues like food contamination, chemical residues, and the nutritional content of processed foods are central concerns. Governments and regulatory bodies work closely with industry stakeholders to develop and enforce standards that ensure food safety and quality throughout the supply chain.

On the other hand, in developing countries, the primary concern is often more focused on the physical availability of food and its economic accessibility. In many regions, populations face challenges related to poverty, infrastructure, and agricultural capacity, which can hinder both the production and distribution of food. Here, the core focus of food security strategies is on ensuring that basic food staples are available in sufficient quantities and at prices that people can afford. Many developing nations must also deal with climatic vulnerabilities, political instability, and market disruptions, which can further complicate efforts to secure a stable food supply.

The concept of food security is built around four key pillars:

1. Food availability: This refers to the presence of sufficient quantities of food in the market to meet the needs of the population. Availability depends on domestic food production, imports, and food reserves. A stable food supply chain ensures that communities have reliable access to food, whether through local production or global trade.

2. Access to food: Access refers to individuals' and households' ability to acquire food, either by purchasing it or through their own production. It involves both physical access (proximity to markets or farms) and economic access (the financial resources needed to buy food). Social and economic inequalities can severely limit access to food for vulnerable populations, making it a critical component of food security strategies.

3. Stability: Stability focuses on the consistency of food availability and access over time. It means ensuring that access to food is not disrupted by factors such as market fluctuations, economic crises, conflicts, or natural disasters. A stable food system should be able to withstand shocks and maintain consistent access to food, even in times of crisis.

Proper use of food: this pillar concerns the safe and efficient utilization of food, which includes its storage, preparation, and distribution within households. Proper use ensures that food is handled in ways that preserve its nutritional value and safety, preventing spoilage, contamination, and waste. Additionally, cultural and dietary preferences are considered in this aspect, as food security also involves ensuring that people can access foods that align with their cultural and personal preferences [3, 4, 5].

The FAO's definition of food security and these four pillars provide a comprehensive framework for addressing the multi-dimensional nature of food security, recognizing that different countries and regions may face varying challenges in ensuring that their populations have reliable access to safe, nutritious food.

In emergency situations, such as economic crises, natural disasters, or armed conflicts, it becomes critical to develop strategies that ensure the stabilization and expansion of agro-processing capacities. These capacities are essential for ensuring a steady food supply and mitigating the negative impacts that crises can have on national economies and food systems. By increasing the depth of raw material processing and expanding agro-processing infrastructure, countries can significantly reduce GDP losses that may arise from disruptions in the agricultural



sector. Enhanced agro-processing capabilities also allow for a more diversified range of high-quality products, which contributes to the domestic market's supply of value-added products and improves overall food security [6].

One of the most effective ways to achieve these goals is the modernization of the agricultural sector. Introducing innovative technologies and advanced production processes can dramatically increase the sustainability and productivity of agricultural activities. By adopting automation, precision agriculture, and other cutting-edge techniques, farmers and food producers can optimize their use of resources, reduce waste, and enhance their output. Moreover, innovations such as climate-smart agriculture and sustainable land management practices help to protect the environment while simultaneously boosting yields, making agriculture more resilient to climate change and other external shocks.

The technological and regulatory aspects of food security are not confined to economic considerations alone. They also encompass scientific and technical components that are necessary for ensuring food quality and safety throughout the production chain. Ensuring high-quality and safe food requires the introduction of innovative approaches that enable the efficient use of resources and minimize the risk of food contamination. This includes the implementation of HACCP systems, Good Manufacturing Practices (GMPs), and traceability technologies, which help monitor and control food safety hazards throughout the production process [7].

Amid crises, it is crucial to ensure that all stakeholders involved in food production, distribution, and regulation are coordinated at the state, local, and international levels. This means that governments must play a leading role in supporting the agricultural sector by providing state support, such as subsidies or tax relief for farmers and food producers affected by the crisis. Local initiatives can also play a significant role in supporting small-scale farmers and producers who are particularly vulnerable to market disruptions. At the same time, attracting international grants and technical assistance from global organizations, such as the FAO or World Food Program, can provide the financial and technical resources necessary for the recovery and further development of the food industry.

An integrated approach is essential for ensuring the sustainable development of the agro-food complex, especially during times of crisis. This approach requires collaboration between governments, local authorities, agricultural producers, and international partners. By combining resources and expertise, these actors can develop coherent strategies that strengthen food production, improve supply chains, and ensure that food systems remain resilient even in the face of significant challenges. The integrated approach also emphasizes the importance of regional cooperation, where neighboring countries and international organizations work together to develop food security policies that benefit all parties involved [8].

In summary, the modernization of agricultural systems and agro-processing capacities, along with the application of innovative technologies, plays a pivotal role in safeguarding food security during emergencies. The focus should not only be on short-term recovery but also on building long-term resilience in food systems. By fostering cooperation between state, local, and international actors, the agro-food sector can continue to thrive, even in the most challenging circumstances.

Ensuring food security is not just producing enough food but also about creating effective systems for monitoring and responding to threats. In today's world, food systems are vulnerable to a wide range of potential disruptions, including climate change, natural disasters, political instability, and economic crises. To address these risks, it is essential to establish robust mechanisms that can anticipate, monitor, and respond to such challenges. One of the most critical tools in this context is the implementation of early warning systems. These systems are designed to detect potential crises in advance, enabling governments and international organizations to take timely interventions that mitigate the impact of these crises. Early warning systems use a combination of data collection, satellite imagery, and predictive models to identify

risks such as droughts, floods, and market fluctuations, and provide decision-makers with the information they need to act quickly and reduce negative consequences [9].

The development of information technologies and data management systems is also vital for improving the transparency and efficiency of food resource management. Advanced digital platforms and data analytics can facilitate real-time monitoring of food production, distribution, and consumption patterns, providing valuable insights that help optimize food security strategies. By using big data, artificial intelligence, and block-chain technology, governments and organizations can enhance the traceability of food products, ensuring that food safety standards are met while also improving accountability throughout the supply chain. These technologies also enable more accurate forecasting, allowing for better resource allocation and planning during times of scarcity.

Sustainability is a key principle in building resilient food systems. To ensure the long-term viability of food security, it is essential to support local production and strengthen supply chains. By focusing on local farmers and cooperatives, countries can reduce their dependence on external supplies and make their food systems more self-reliant and resilient during crises. Local production ensures that food is available closer to the point of consumption, which helps to minimize transportation costs and carbon emissions, while also fostering economic development in rural areas. Effective logistics chains further enhance the stability of food systems by ensuring that food can be efficiently transported from production centers to markets, even in the face of logistical challenges during emergencies.

In addition to supporting local production, the introduction of sustainable practices in agricultural production is crucial for ensuring food security. Sustainable agriculture focuses on environmentally friendly technologies that conserve resources, reduce pollution, and promote long-term productivity. Key practices include reducing the use of pesticides and chemical fertilizers, which can have harmful environmental and health effects, and instead focusing on organic farming methods and the use of biological pest control. Water management systems are another important component, particularly in regions prone to drought or water scarcity. Efficient irrigation techniques, such as drip irrigation and rainwater harvesting, help to conserve water while maintaining crop yields. Finally, preserving biodiversity is critical for sustaining ecosystems and ensuring that agriculture can adapt to changing environmental conditions. By promoting agro-ecological systems that integrate a variety of crops and livestock, farmers can reduce their vulnerability to pests and diseases, and improve the overall resilience of their agricultural systems [10].

A critical aspect of food security is ensuring access to food for the most vulnerable segments of the population, especially during times of crisis. Emergencies often disproportionately affect groups such as low-income families, children, the elderly people, and disabled individuals, who may already be struggling with food insecurity. For these consumers, even minor disruptions in food supply can cause drastic consequences. Therefore, it is crucial to develop and implement social support programs that ensure equitable access to food for all. These programs may include food assistance initiatives, where governments or organizations provide direct food aid to those in need. This can be in the form of food packages, vouchers, or cash transfers, depending on the context.

In addition to direct assistance, developing nutrition programs tailored to specific vulnerable groups, such as children and the elderly consumers is essential for addressing their unique dietary needs. School meal programs, for example, play a vital role in ensuring that children, particularly in low-income households, receive adequate nutrition. For the elderly people, programs focused on meal delivery services or community-based nutrition support can help ensure that they maintain access to nutritious food even when they face mobility or health-related challenges. Supporting community initiatives aimed at ensuring food security at the local level is also crucial. Community gardens, cooperatives, and local food banks can create locally-

driven solutions to food insecurity, fostering a sense of community ownership and resilience in the face of broader systemic challenges [11].

Public education programs on food security and sustainable consumption are also vital. These programs include educational events and information campaigns to raise awareness about food safety, healthy eating, and the rational use of resources [12].

Ensuring food security in emergency situations requires a comprehensive approach that includes modernizing the agricultural sector, increasing the depth of raw material processing, developing infrastructure, and involving international aid [9, 13].

Public education programs play a crucial role in promoting food security and sustainable consumption. These initiatives are vital for raising awareness about the importance of food safety, healthy eating habits, and the rational use of resources. In an increasingly interconnected world, where food systems are influenced by various environmental, economic, and social factors, it is essential that the public understands the complexity of these systems and how their choices impact both personal health and the broader environment [12].

Educational programs on food security can take many forms, including workshops, seminars, school curricula, and community outreach initiatives. Such programs focus on teaching individuals and communities how to make informed decisions regarding food production, purchase, preparation, and consumption. For example, in regions where food safety might be compromised by poor hygiene practices or contamination, these programs can teach safe handling, proper storage, and preparation techniques to minimize health risks. Furthermore, information campaigns can target various demographic groups, ensuring that both children and adults are well-informed about the nutritional value of the food they consume and how to maintain balanced diets that meet their health needs.

In addition to raising awareness about food safety, public education programs often emphasize the importance of sustainable consumption. This includes promoting the rational use of resources, such as water and energy, in food production and consumption, as well as reducing food waste. Reducing food waste not only contributes to environmental sustainability but also helps improve food security by ensuring that more food is available to those in need. Educational campaigns might, for instance, encourage people to buy locally-produced foods, reduce their carbon footprint, and adopt sustainable dietary practices, such as consuming plant-based foods or reducing excessive meat consumption. These practices help mitigate the environmental impacts of large-scale agricultural production while supporting local farmers and reducing dependence on global supply chains [12].

Ensuring food security in emergency situations requires a comprehensive and multi-faceted approach. Such an approach must address both immediate needs and longer-term structural challenges within the agricultural sector. First, modernizing the agricultural sector is essential for improving its resilience and capacity to respond to crises. This modernization involves the introduction of advanced technologies in farming practices, such as precision agriculture, automated systems, and smart irrigation, which enhance efficiency and productivity. By leveraging these technologies, farmers can optimize their use of resources, improve yields, and reduce waste, thereby strengthening the overall food system's ability to withstand shocks [9,13].

Increasing the depth of raw material processing is another critical component. By expanding the agro-processing industry, countries can add value to raw agricultural products, making them more economically viable and nutritionally valuable. This not only helps to reduce food loss during post-harvest stages but also provides more diverse food options for consumers, especially in times of scarcity. Developing infrastructure, such as storage facilities, transportation networks, and cold chains, is equally important to ensure that food products are efficiently distributed and safely stored, even during periods of crisis.

International assistance plays a pivotal role in supporting national efforts to enhance food security. This can take the form of financial aid, technical expertise, and capacity-building programs provided by global organizations such as the FAO, World Food Program (WFP), or

international non-governmental organizations. During emergencies, international aid helps fill critical gaps in food supply and distribution systems, ensuring that vulnerable populations receive the assistance they need. Moreover, international partnerships can facilitate the transfer of best practices and innovative solutions that bolster long-term resilience in the agricultural and food sectors [9,13].

The public education, combined with strategic efforts to modernize agriculture, improve raw material processing, develop infrastructure, and attract international support, is integral to building a resilient food system. By promoting awareness and sustainable practices while addressing structural challenges, nations can ensure food security for their populations, even in the face of emergencies or long-term crises.

**Conclusion.** The food security is an essential pillar of national security, encompassing various dimensions such as availability, accessibility, stability, and the proper use of food. It is a multi-faceted concept that requires a comprehensive approach, particularly in emergency situations where disruptions to food systems can have severe consequences for people. The importance of ensuring access to safe, nutritious, and high-quality food is evident while also addressing the technological, regulatory, and economic factors that underpin a resilient and sustainable food system.

The foundation of food security lies in the modernization of the agricultural sector, which includes the adoption of innovative technologies and sustainable practices to increase productivity, efficiency, and environmental sustainability. The expanding agro-processing capacities and improving infrastructure are key steps in ensuring that food products are properly stored, processed, and distributed, reducing post-harvest losses and enhancing the supply of value-added products. Such developments not only mitigate the risk of food shortages but also strengthen the overall agro-food complex, contributing to national economic growth and resilience.

Amid crises, the coordinated efforts at the state, local, and international levels are critical to maintaining food security. The integration of early warning systems, data management technologies, and monitoring frameworks enables timely responses to emerging threats and ensures that food resources are allocated effectively. Equally important is the support for local production systems, which enhances food system resilience by reducing reliance on external supplies and promoting self-sufficiency.

Another key takeaway is the importance of addressing the needs of the most vulnerable populations during crises. Social support programs, such as food assistance and nutrition initiatives for children and the elderly, play a vital role in ensuring that no one is left behind. These programs, combined with community-based initiatives, help to mitigate the effects of food insecurity for the people especially affected by economic or environmental disruptions.

The public education programs focused on food safety, sustainable consumption, and the rational use of resources are indispensable for raising awareness and fostering responsible behaviors among individuals and communities. By promoting healthy eating habits and sustainable agricultural practices, these programs contribute to a more resilient and sustainable food system.

It can be stated that ensuring food security requires an integrated and holistic approach that addresses both immediate and long-term challenges. From modernizing agriculture to promoting sustainable practices, supporting local initiatives, and leveraging international cooperation, the strategies outlined in this article provide a roadmap for enhancing food security and resilience, particularly in the face of emergencies and global challenges. By fostering collaboration across sectors and scales, nations can safeguard the food security of their populations and promote the sustainable development of their agricultural and food systems.



## References

1. FAO. Rome Declaration on World Food Security and World Food Summit: Plan of Action. Official document. Food and Agriculture Organization of the United Nations, Rome, Italy, 1996.
2. Peng, W., Berry, E. M. (2019) The Concept of Food Security. *Encyclopedia of Food Security and Sustainability*. P. 1–7. <https://doi.org/10.1016/B978-0-08-100596-5.22314-7>.
3. Raven, B., Stewart-Withers, R. (2019). Using critical discourse analysis and the concept of food security to understand pregnant women's nutrition in Aotearoa/New Zealand. *New Zealand College of Midwives Journal*. 55, 35–43. <https://doi.org/10.12784/nzcomjnl55.2019.5.35-43>.
4. Clapp, J., Moseley, W. G., Burlingame, B. & Termine, P. (2022). The case for a six-dimensional food security framework. *Food Policy*. V. 106, P. 102164. <https://doi.org/10.1016/j.foodpol.2021.102164>.
5. Santeramo, F. G. (2024) Research in agriculture and food security: retrospects and prospects. *Agric & Food Secur.* 13, 42. <https://doi.org/10.1186/s40066-024-00495-z>.
6. Pawlak, K., Kołodziejczak, M. (2020). The Role of Agriculture in Ensuring Food Security in Developing Countries: Considerations in the Context of the Problem of Sustainable Food Production. *Sustainability*. 12 (13), 5488. <https://doi.org/10.3390/su12135488>.
7. Allata, S., Valero, A. & Benhadja, L. (2017). Implementation of traceability and food safety systems (HACCP) under the ISO 22000:2005 standard in North Africa: The case study of an ice cream company in Algeria. *Food Control*, V. 79, P. 239–253, <https://doi.org/10.1016/j.foodcont.2017.04.002>.
8. Figurek, A. & Thrassou, A. (2023) An Integrated Framework for Sustainable Development in Agri-Food SMEs. *Sustainability*. 15 (12), P. 9387. <https://doi.org/10.3390/su15129387>.
9. Gitz, V., Meybeck, A., Lipper, L., Young, C. D., Braatz, S. (2016). Climate change and foodsecurity: Risks and responses. Food and Agriculture Organization of the United Nations (FAO) Report, 110 (2), 3–36.
10. Altieri, M. A. (2016). Developing and promoting agroecological innovations within countryprogram strategies to address agroecosystem resilience in production landscapes: a guide:Global Environment Facility-Small Grant Programme. Available at <http://foodfirst.org/wp-content/uploads/2016/02/latest-version-guidance-note-GEF-SGP.pdf>.
11. Booth, S., Pollard, C. M., Pulker, C. E. (2022). Citizen-Driven Food System Approaches in Cities. In: Galanakis, C.M. (eds) *Environment and Climate-smart Food Production*. Springer, Cham. [https://doi.org/10.1007/978-3-030-71571-7\\_11](https://doi.org/10.1007/978-3-030-71571-7_11).
12. Reisch, L., Eberle, U., Lorek, S. (2013). Sustainable food consumption: an overview of contemporary issues and policies. *Sustainability: Science, Practice and Policy*, 9 (2), P. 7–25. <https://doi.org/10.1080/15487733.2013.11908111>.
13. Kovalenko, O., Yashchenko, L., Verbytskyi, S., Patsera, N. (2022) Economic, technical and regulatory aspects of food security amid emergencies. *Vector European*, 2, P. 57–65. <https://doi.org/10.52507/2345-1106.2022-2.12>.