



Food Security and the Agri-Food Sector of Ukraine: an Inclusive Approach

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Abstract: This article examines the issue of food security in Ukraine, focusing on the impact of war and other factors on this problem. It highlights the connection with the development of the agri-food sector, as well as the importance of taking into account an inclusive approach in managing the agrarian sector and addressing the problem of food insecurity in Ukraine under modern conditions. An inclusive approach enables the balanced development of the agri-food sector, ensuring food security in Ukraine, while also aligning with modern principles, such as the European Green Deal. The analysis of food security indicators in Ukraine shows uneven dynamics: indicators that characterize the state of undernourishment among the population and the Global Hunger Index, although showing a tendency to grow, have not reached critically high figures; both food production indices are decreasing, which negatively characterizes the state of food security; the growth in the index of food production in 2023 and the decline in the volatility of consumer food prices for stand out as positive dynamics. The analysis of agri-food sector dynamics reflects the impact of pandemic and war factors on it, with the subsequent restoration of positive dynamics, indicating the significant agricultural potential of Ukraine. It is proposed to develop the agri-food sector of Ukraine as the foundation for food security based on an inclusive approach. Also important is the orientation towards the Sustainable Development Goals and the European Green Deal, which will allow Ukraine to achieve energy independence.

Keywords: food security, agri-food sector, inclusivity, sustainable development, European Green Deal, bioeconomy, full-scale war

1. Introduction

The investigation of the development of the Ukrainian agri-food sector at this stage has to take into account the Russian-Ukrainian war taking place in Ukraine. Under the conditions of a full-scale war, it is necessary to preserve not only the physical security of the population of Ukraine, but also food security. This is due to the fact that in conditions of hostilities, there is also a threat of famine, due to the impossibility of carrying out agri-food work and obtaining food products. Such obstacles include the occupation of the Ukrainian territories, which makes it impossible to collect or deliver the collected products, shelling of territories, active hostilities on them, and land mining, also making sowing and harvesting work impossible. These factors result in shortages of agri-food products on the market, causing price increases and growing dependence on imports. While imports partially solve the problem of food security, they also have a negative socio-economic impact, as domestic producers are less protected and prices for imported products are usually higher than for domestic



ones. But, under the conditions already described, Ukraine is now truly facing a threat to food security and hunger of the population, which must be addressed through various instruments. It is worth noting that due to the war in Ukraine, the problem of food security has arisen not only for our state but also for the whole world. Since a large part of agricultural products could not be delivered under the concluded agreements, however, it is essential to solve the problem of providing, first of all, the domestic population with food, and then exporting abroad. Although, from an economic point of view, of course, exports of products are also important, even vital for economic development.

To address the problem of food security in Ukraine, the agri-food sector and managing its development based on an inclusive approach play a crucial role. In this case, inclusivity implies a balanced approach to the development of the agri-food sector, taking into account the interests of different groups of the population, including vulnerable ones, when determining the priorities of its management and stimulating growth. The relevance and feasibility of an inclusive approach in the agri-food sector and ensuring food security is justified by the fact that inclusivity provides a balance of various aspects that are important for the sustainable functioning of the state, namely: social, economic, and food. Modern world development involves achieving sustainability through the full involvement of all members of society in the life of the country. This has a significant social effect: the inclusion of different groups in the economic, social, and cultural life of society. Inclusion means not only considering the needs of people with disabilities but also achieving gender equality, actively engaging young people, involving older people as much as possible, integrating migrants, people who are below the poverty line, etc. That is, an attempt to involve all members of society. Achieving this has significant socio-economic benefits, manifested in positive economic, social, and psychological outcomes. In Ukraine, all these issues are currently being actualized to a large extent due to the war, which caused a mad wave of migration, the evacuation of the population to safer regions, and also had a significant negative impact on the economic well-being of the population (Dankevych et al. 2024, Petrychenko et al. 2022).

From the economic aspect, the inclusive approach provides, in addition to involving people, a balanced development of various sectors of the economy. It directs attention to those sectors that have potential for development in a particular country, but for a number of reasons are not developing sufficiently. The orientation should not be on a mono-industry, but on a multi-industry of the economy as a whole and the agri-food sector in particular. This will ensure food security in Ukraine during wartime. Moreover, inclusivity involves functioning due to the paradigm of sustainable development, orientation on its Goals, and Ukraine's European integration path is impossible without taking into consideration the European Green Deal, which leads Europe to a climate-neutral continent. The importance of developing environmentally responsible agricultural practices is also justified by the need for Ukraine to transition to alternative energy sources, which will allow it to achieve energy independence and build an economy on new, innovative principles. It is the agri-food sector that becomes a link that can ensure energy independence and increase the level of food security.

When studying food security and the agri-food sector in Ukraine under modern conditions on the basis of inclusiveness, it is essential to compare the pre-war period and the war period. This allows us to see the impact of the war factor on the development of the agri-food sector and food security, as well as to suggest effective management solutions, taking into account the modern directions of development of countries.

2. Methods

The methodological basis of the conducted scientific research is an interdisciplinary approach that combines indicative, comparative, structural, and systemic analyses. This allowed us to assess the impact of the war and other factors on food security and the state of the agri-food sector using an inclusive approach. To achieve the research goal, we applied statistical analysis (analysis of indicators of the development of the agri-food sector of Ukraine in the period 2019-2023), comparative analysis (to compare the pre-war period and during the war in Ukraine), and analysis of food security indicators. We also used dynamic series methods (calculation of absolute changes in food security indicators and absolute and relative changes in agri-food sector indicators, based on a year index, CAGR, and acceleration), as well as the tabular and data visualization methods. The study was based on statistical data from the Food and Agriculture Organization of the United Nations (FAO), the World Bank, the State Statistics Service of Ukraine, etc. In accordance with the martial law in Ukraine, the collection of statistical data in the country since 2022 is limited; therefore, the above analysis was based on the data that is available in official global and national databases. We acknowledge that the analyzed indicators in the article should demonstrate the same period; however, some indicators are limited in the available official data for recent years and are of a demonstrative nature for understanding the overall trend. However, for a more in-depth analysis of important indicators of the development of the agricultural sector of Ukraine, applying the method of dynamic series and comparing the pre-war period with the period

after the start of the war, we choose the period 2019-2023. This will allow us to see more deeply the latest trends in the development of the agricultural sector and identify the main changes after the start of the full-scale invasion.

3. Results

The impact of war on food security

Rudolfson et al. (2024) investigated how war affects food insecurity in Ukraine. Based on other studies, they note that military conflicts are the primary driver of food insecurity.

Vesco et al. (2025) with co-authors conducted an in-depth study of the impact of military conflicts on human capital, considering it in different aspects such as health, education, income and livelihoods, economic growth and investment, political institutions, the agri-food sector, and food security etc. The researchers note that military conflicts affect human development both directly and indirectly. Previous studies confirm the negative impact of war on access to and availability of food. They emphasize that violence reduces food production, which is fully correlated with what we are facing in Ukraine today.

Leal Filho W. and co-authors note that until 2014, the issues of overcoming the problem of food security were successfully resolved, but after that, the deterioration of this trend started. The global community had not yet recovered from the COVID-19 pandemic when the war in Ukraine, unleashed by Russia, began. This could not help but affect food markets and food security (Leal Filho et al. 2023, Shovkun-Zablotska et al. 2024). Thus, the war in Ukraine influenced the entire world community precisely in terms of food security, since Ukraine is a global producer and exporter of grain products in the world (Petrychenko et al. 2022, Lin et al. 2023).

In developing our further research, we turn to the interpretation of the concepts of food security and food insecurity (Table 1). Table 1 illustrates the main interpretations of the concepts we have mentioned. It was essential to highlight them because they show that the basis of food security is not only the provision of food, but also safe and nutritious food that enables an active, complete, and healthy life.

Table 1. Main approaches to the interpretation of the concepts of "food security" and "food safety"

	Category	Characteristics
1996 World Food Summit	Food security	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.
World Food Programme		When people have access to enough safe and nutritious food for normal growth and development, and an active and healthy life.
World Food Programme	Food insecurity	Refers to when the aforementioned (see "Food security") doesn't exist.
World Food Programme	Chronic food insecurity	When a person is unable to consume enough food over an extended period to maintain a regular, active, and healthy life.
Food and Agriculture Organization of the United Nations (FAO)	Food insecurity	When people lack regular access to enough safe and nutritious food for normal growth and development, and an active and healthy life.

Source: compiled by the authors based on World Bank Group (n.a.); World Food Programme (2025a); FAO (2024)

In addition, food security includes not only the possibility of obtaining food but also the physical and economic components of this process. In other words, a person must have access to purchase this food or physically obtain it. Food insecurity, on the contrary, is the reverse process of food security; that is, when a person does not have access to nutritious food, there are no resources to obtain it directly, which does not allow him/her to lead an active and healthy life. Thus, it can be distinguished that these interpretations are aimed at ensuring a regular and healthy life, human development, and growth (Fatkhutdinov et al. 2021, Yarmol et al. 2022, Misiuk et al. 2023, Sánchez-Almeyda et al. 2025).

Essential aspects of food security are its following dimensions: physical availability of food, economic and physical access to food, food consumption, stability of previous dimensions over time (World Bank Group, n.a.; FAO 2008) It is necessary to consider these dimensions in more detail in order to identify current factors influencing food security in Ukraine and to propose more effectively ways to manage the agri-food sector as

a key sector addressing food security problems. Thus, physical availability implies the availability of products on the market, their stocks to ensure the need for food on a permanent basis. Economic and physical access to food means the ability of the population to have access to quality products on the market, as well as their timely delivery. Such a dimension as food consumption (utilization) implies its diversity, a maximally saturated diet that satisfies the needs for vitamins and nutrients. The stability of all these dimensions over time means that a secure situation is considered to be one in which people have constant access to food, without interruptions in supply, diverse, rich in vitamins and nutrients. If this cycle is disrupted, a person can be considered unprotected and food insecure. Analyzing the above and extrapolating to the situation in Ukraine, we understand that all these dimensions are mostly disrupted due to military actions. Farmers are unable to ensure a timely supply of products to the market due to difficulties or the impossibility of sowing or harvesting. Economic problems among the population are also exacerbated, which negatively affects the quality of nutrition and food consumed. Thus, stability over time is disrupted, leading to food insecurity. In confirmation of our words, the World Food Programme notes that the key drivers that cause food insecurity are conflicts, extreme weather conditions, and economic shocks, which often intersect and can be interconnected (World Food Programme 2025a). In Ukraine, these factors are also interconnected, as an example of which is the weather conditions in 2022, when there was very hot and dry weather, which further aggravated the situation with the cultivation of various crops. Thus, in addition to military factors, weather factors were also added, which further worsened the economic situation in the country. Negative economic consequences are justified by various reasons: the inability of enterprises to harvest or sell their products results in a decrease in income or, in general, their absence, which reduces the profitability of entrepreneurship. At the same time, shortages of products on the market cause an increase in product prices, which negatively affects the economic situation of consumers. Population migration also exacerbates economic difficulties. This has significant socio-economic consequences that negatively affect society. In this case, there is a need to develop a full-fledged balanced state policy for regulating the agri-food sector on an inclusive basis, that is, taking into account the interests of different population groups.

According to the State of Food Security and Nutrition in the World report, approximately 757 million people faced chronic hunger in 2023. World Food Programme estimates indicate that as of November 2024, 343 million people were experiencing acute food insecurity in 74 countries (data for countries where the World Food Programme operates) (World Food Programme 2025a). According to the same World Food Programme estimates, a total of 5 million Ukrainians are in need of food assistance and livelihoods (World Food Programme 2025b).

Inclusive approach in food security policy

To address the challenges of providing the population with food and developing the agri-food sector as the foundation for sustainable food security in society, it is necessary to build an agri-food policy on the principles of inclusivity, that is, using an inclusive approach.

The FAO itself defines inclusivity as an approach that ensures the full and active participation of a person in public life and equal access to all benefits regardless of social, economic, or political status and identity (FAO n.a.b). The FAO envisages the implementation of inclusivity in the following areas: orientation on multi-sectoral policies and territorial approaches to reduce inequality and isolation; investments in sustainable and inclusive livelihoods, income diversification, creation of inclusive jobs, which will allow attracting people from various vulnerable groups; providing access for vulnerable groups to natural and production resources to maximize their involvement in the agri-food sector, etc (FAO n.a.b).

The issue of social isolation or exclusion is fundamental and relevant in the formation of an inclusive approach, since isolation itself has significant adverse social, economic, and psychological consequences for both individuals and society. A person, being socially isolated, lacks equal access to all benefits, is excluded from society, suffers from low self-esteem, etc. Such conditions further exacerbate socio-economic problems and do not allow a person to be a full-fledged member of society. Therefore, the policies of developed countries are aimed at breaking the cycle of disadvantage and preventing social exclusion by stimulating and implementing inclusive policies and practices.

Thus, it is clear that FAO pays enough attention to addressing food security issues precisely on the basis of inclusivity, which is quite logical and takes into consideration modern approaches of developed countries. By advancing different areas and promoting the involvement of various vulnerable groups and not only vulnerable groups, but also, in general, the balanced development of the agri-food sector, several important problems are solved: people, gaining access to resources, technologies, innovations, improve their socio-economic status, mastering economic resources, which allows them to improve the quality of nutrition, obtain more healthy food, etc. Balanced development of the agri-food sector means the inclusion of enterprises of various scales,

including small and medium-sized businesses (SMEs), alongside the diversification of industries (Lupenko et al. 2018, Nitsenko et al. 2024, Mykhailenko et al. 2023). Such a transition to a multi-sector orientation and production allows diversifying risks and having more competitive advantages on the global stage.

The importance of promoting the development of SMEs in Ukraine is currently being actualized by the realities in which our country finds itself: under conditions of worsening socio-economic situation, population migration, impossibility or difficulties of carrying out agricultural work, rising unemployment, and other reasons, the small and medium-sized business sector has found itself in conditions where they are on the verge of survival. But its role in supporting the economy of any state is crucial, as SMEs ensure constant replenishment of the budget, address the problem of self-employment of the population, create innovations, and improve the quality of products and services to support its own image and increase competitiveness. Therefore, it is essential to stimulate the development of SMEs in Ukraine (Balanovska et al. 2021). This is further justified by the fact that small farmers play an important role in solving the problem of food security during wartime, producing up to 80% of dairy products, fruits, and vegetables consumed by the population of Ukraine, as noted by the International Fund for Agricultural Development in 2023 (The Associated Press 2023).

The World Bank also launched the Ukraine Agriculture Recovery Inclusive Support Emergency Project (ARISE), which aims at addressing two critical problems that Ukraine faced after the full-scale invasion: 1. Ensuring stable and continuous sowing and harvesting, which will allow for avoiding the potential problem of food insecurity; 2. Inclusive restoration of the agri-food sector by providing greater opportunities for small farmers (The World Bank 2023). This document also emphasizes that building an inclusive country aligns with the standards of the European Union, which we intend to join. Therefore, comprehensive development is required, involving an inclusive approach, namely, participation of all members of society in a full-fledged life, balanced economic growth, proportional stimulation of key industries, and taking into account EU standards in shaping and implementing domestic policy, including the establishment of the European Green Deal.

In addition, FAO, understanding all the threats facing society, and also that by 2050 the world's population will reach 10 billion people requiring food, notes that it is necessary to build such food systems capable of providing decent jobs and livelihoods for food producers. The organization encourages states and other stakeholders to develop inclusive and sustainable food systems. Moreover, they give a key role in these inclusive food systems to gender equality and the expansion of women's economic opportunities (FAO n.a.a). This is fully correlated with the current situation in Ukraine, when most men serve in the Armed Forces of Ukraine, and part of the previous work has been transferred to women. Therefore, their full inclusion is an entirely logical consequence of the full-scale war in our country.

Analysis of statistical indicators

In the development of our research, we now proceed to the analysis of the main indicators that characterize food security in Ukraine. The results are presented in Fig. 1.

We analyzed 7 indicators that reflect the state of food security in Ukraine during the period from 2015 to 2024. For the most part, data are available as of 2022, after which global databases did not provide updated indicators for Ukraine or for the world as a whole. The indicator "share of food expenditures in total household spending, %" is provided until 2021, after which data were not published, which is due to the full-scale invasion of Ukraine and the lack of a survey by state statistics bodies.

First, we analyze the data on the prevalence of undernourishment (PU, % of population), which means the percentage of the population whose food consumption is insufficient to provide the level of energy needed for a normal, active, and healthy life. This directly correlates with the concept of food security. As we can see, Ukraine's indicators have tended to increase since 2015. The 2022 figure is more than twice as high as the 2015-2017 level. It is worth noting that the result of 2.5% may in fact be lower than 2.5%, according to the FAO methodology. The most significant increase is observed in 2021, when it rose by 1% compared to 2020 (5.3% and 4.3%, respectively). In 2022, it reached 5.8% of the population of Ukraine. Further data were not provided. The undernourishment indicator is also measured as a component of another vital index – the Global Hunger Index. However, the methodology for its calculation does not allow direct comparison between the FAO data and this Index.

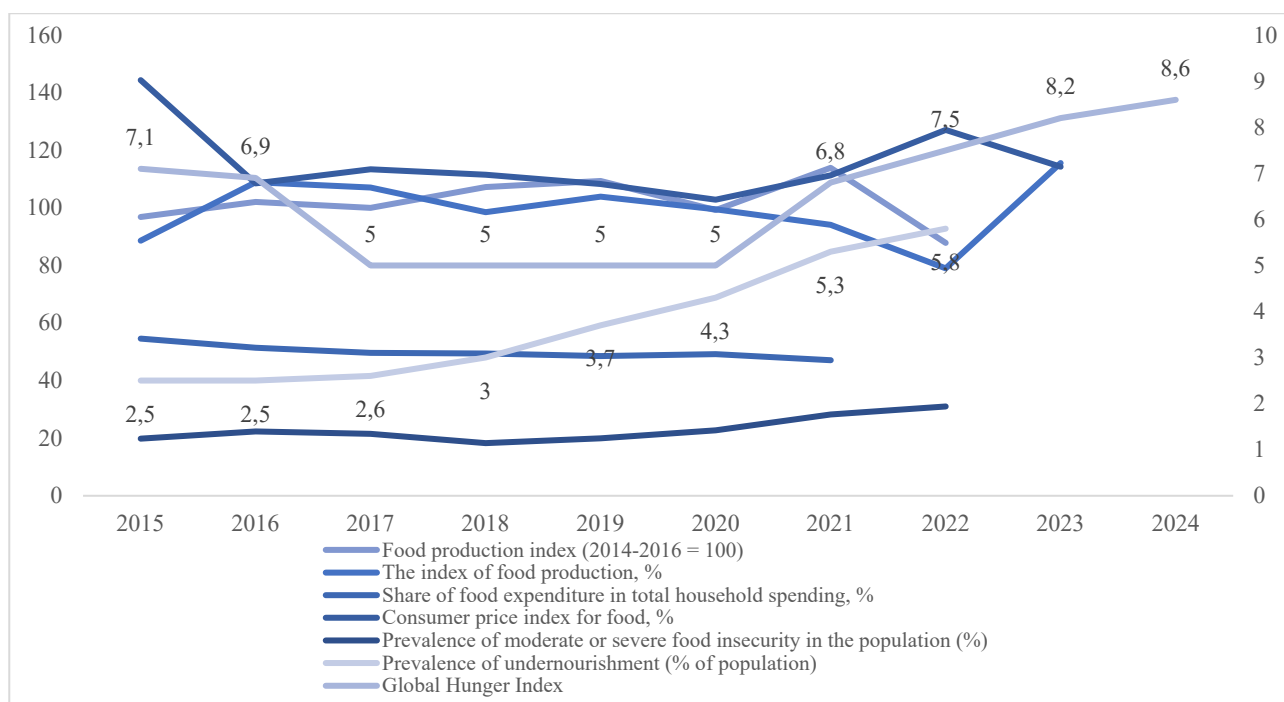


Fig. 1. Main indicators characterizing the state of food security in Ukraine*, **

* The Prevalence of undernourishment indicator – 2.5 (2015-2016) may be less than 2.5

**The Global Hunger Index indicator 5.0 (2017-2020) is less than 5 (<5)

Source: compiled by the authors based on World Bank Group, Global Hunger Index (2025); State Statistics Service of Ukraine (2025)

The Global Hunger Index (GHI) is a tool that measures hunger at the global, regional, and national levels. It is calculated based on four indicators that reflect the multidimensional nature of hunger. It consists of the following components: undernourishment, child stunting, child wasting, and child mortality. The data used to calculate this index are available in various databases, including FAO. However, the peculiarity of this index is that it calculates the annual indicator based on the previous 3-4 years (on average). For this reason, we are unable to compare the result of malnutrition according to this index with the FAO indicator directly for a specific year (Global Hunger Index n.a.). An indicator that is numerically less than 5.0 is indicated as <5. Accordingly, in Fig. 1, these results in Ukraine are displayed as 5; however, they are less than 5, but according to the visualization in MS Excel, their values are 5. The analysis of this index in Ukraine reflects uneven trends during the analyzed period. Thus, in 2015 it was higher than in 2016, and subsequently a stable low level was observed during the results of 2017-2020. However, we must recall that according to the methodology, these results are a reflection of averaged indicators for previous years. Since 2021, this index has shown a fairly noticeable growth, which has continued until 2024 inclusive. Thus, compared to the result of 2020, the indicator for 2024 is more than 3.6 times higher (8.6). The growth of this index since 2021 is explained by the onset of the COVID-19 pandemic, the results of which could already be included in this indicator. Ukraine's further results are also justified by the pandemic, and from 2023 by the beginning of a full-scale war, which was reflected in the results of 2022. That is why we can observe this trend. Reports on this index emphasize that the war in Ukraine negatively affects food security around the world and results in a deterioration of the index. However, it should be noted that an indicator below 10 is considered low, according to the methodology. Thus, Ukraine still has this indicator at a low level. In 2024, Ukraine ranked 46th out of 127 countries included in the report (Global Hunger Index 2025).

The indicator Prevalence of moderate or severe food insecurity in the population (PMSI, %) characterizes the share of the population where at least one adult in the household reports eating low-quality food, less than the amount needed for consumption, due to lack of money or other resources. Ukraine's result has an uneven tendency to change but is not characterized by large fluctuations. The lowest value was observed in 2018 (18.3%), and the highest in 2022 (31%). Starting from 2019, there has been a steady increase in this indicator, which is also due to the pandemic in 2020 and the subsequent full-scale invasion. It should be emphasized that 31% is a relatively significant result of a decrease in the quality of life of the population. Compared to 2018, it is 12.7 % higher. This negatively characterizes the state of food security in Ukrainian society.

It is also worth analyzing the Food Production Index (FPI), which includes the production of all food crops that can be consumed. The methodology of its calculation is a weighted average with the base period of 2014-2016. Ukraine's result on this index reflects uneven dynamics during the researched period. In 2016, there was a significant increase of 5.25 with a subsequent decrease, which was again replaced by growth until 2019. In 2020, a noticeable decrease of 10 compared to 2019, which is explained by the onset of the COVID-19 pandemic, which significantly affected the work of enterprises due to quarantine restrictions. Further significant growth in 2021 was replaced by a decline in 2022 of 26.09. That is attributed to the beginning of a full-scale invasion in 2022 and the occupation of a significant part of the territory, which made sowing and harvesting impossible, and disrupted the production of processed food. Further updated data for Ukraine are not currently provided, so it is not possible to analyze the dynamics of this indicator after 2022.

However, we consider it necessary to examine another Index of food production (IFP, %), which is calculated by the State Statistics Service of Ukraine. According to this index, the trends at the beginning of the investigated period are somewhat similar to the previous indicator. However, in 2018, there was a rather significant decrease in it, by 8.6%, with a further increase in 2019. Starting from 2020, the index decreased for the 3 following years. In 2022, there was the most significant decline, to 79%. However, in 2023, the trend changed, reflecting an increase of 36.6%. This is a positive shift and reflects specific development within the country in improving the situation in the agricultural sector. It should also be noted that the two food production indices analyzed in our study are not identical, but differ in calculation methods, so it is advisable to consider both.

The share of food expenditure in total household spending (SFE, %) provides data for 2021 inclusive, after which statistical authorities were unable to conduct a survey due to the war in Ukraine. However, this indicator is of great importance for assessing food security, as it refers to indicators that measure the Sustainable Development Goals (SDGs). As we can see, this indicator had a downward trend during the analyzed period (excluding 2020). The lowest value was in 2021, which was 7.5% less than the highest indicator in 2015. This indicates that households began to spend less on food for various reasons.

Another indicator that we examined in assessing the state of food security in Ukraine under modern conditions is the Consumer Price Index for Food (CPIF, %). This index is also calculated by the State Statistics Service and can be linked to the SDGs, by which the volatility of food prices can be measured. It is an essential indicator of socio-economic inclusion, because volatility means price fluctuations, that is, instability or imbalance. The primary guideline is a decrease in the volatility of food prices, which will allow for a balanced forecast and plan of someone's expenses. This index reflected a reasonably high value in 2015, after which there was a significant decrease and small fluctuations throughout almost the entire investigated period. A significant increase (by 15.8%) was observed in 2022, which is quite expected given the shortage of products on the market due to insufficient production and rising food prices, respectively. However, already in 2023, there was a decrease in this index, which is a positive trend. Also notable is the low result of this indicator in 2020 – 102.9%, which is the lowest during the analyzed period, which was then replaced by a significant increase (by 8.4%), and the result of 2022 exceeded 2020 by 24.2%.

In summary, having examined the indicators that characterize the state of food security in Ukraine and that affect its dynamics, we can conclude that the indicators of undernourishment or hunger in Ukraine, although they are growing over a specific period, are not significant. According to the GHI, Ukraine is among the countries with a low indicator. Of course, this positively characterizes the state of food security in Ukraine; however, it is worth noting the upward trend in these indicators. A significant number of indicators are not given after 2022, but reflect an increase in indicators that negatively characterize the state of food security in Ukraine with the beginning of a full-scale invasion. Thus, both analyzed food production indices are decreasing, as is the indicator of the prevalence of moderate or severe food insecurity among the population. However, there is also a positive dynamic of food security indicators in 2023 – an increase in the food production index, which is calculated by the State Service of Ukraine, and a decrease in the volatility of consumer prices for food products. This positively characterizes the state of food security in Ukraine.

The dynamics of the above indicators are summarized in Table 2.

To analyze the prerequisites for the dynamics of food security in Ukraine, we investigate the leading indicators of the development of the agricultural sector (Fig. 2-4, Table 3-4). For this purpose, we selected key indicators relevant to food security, namely: the area harvested by annual and biennial crops, the volume of production (gross harvest) of annual and biennial crops, and the yield of annual and biennial crops in Ukraine during 2019-2023. The data are provided by the State Statistics Service of Ukraine.

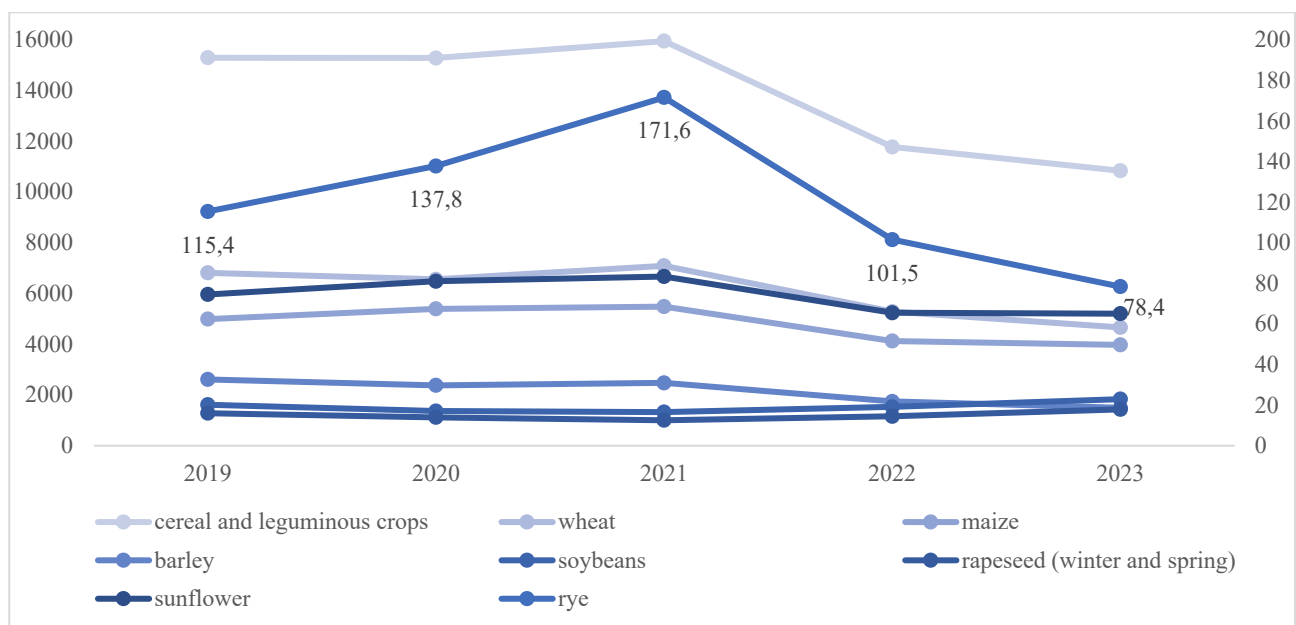
Table 2. Dynamics of food security indicators of Ukraine, 2016-2024*

	PU	GHI	FPI	IFP	SFE	CPIF	PMSI
2016	0.0	-0.2	+5.3	+20.3	-3.2	-35.9	+2.5
2017	+0.1	-1.9	-2.1	-1.8	-1.8	+4.9	-0.8
2018	+0.4	0.0	+7.2	-8.6	-0.2	-1.9	-3.2
2019	+0.7	0.0	+2.1	+5.4	-0.9	-3.2	+1.6
2020	+0.6	0.0	-10.1	-4.4	+0.7	-5.4	+2.8
2021	+1.0	+1.8	+14.7	-5.4	-2.1	+8.4	+5.5
2022	+0.5	+0.7	-26.1	-15.1	-	+15.8	+2.8
2023	-	+0.7	-	+36.6	-	-12.8	-
2024	-	+0.4	-	-	-	-	-

*"-no data available for this year

Source: calculated by the authors based on statistical data

These indicators allow us to assess the agricultural potential, production efficiency, and food balance of the country. For analysis by species, we selected various crops that are important both directly for ensuring food security and for the development of livestock farming (i.e., indirectly affect food security), as well as essential for inclusive sustainable development and sustainable production. We chose such crops as: cereal and leguminous crops, wheat, maize, barley, rye, soybeans, rapeseed (winter and spring (colza)), and sunflower. The choice of these crops is justified in particular by the fact that Ukraine, before the full-scale invasion, was a leader on the global market by exporting wheat, maize, and sunflower oil (10% of world wheat exports, 14% of maize, and more than 47% of sunflower oil, respectively) (Tul et al. 2023). Therefore, we analyse the dynamics of sunflower cultivation as a basis for sunflower oil production. Moreover, sunflowers it is a crop that creates high added value, which is also crucial for the economy. As well, selected crops were chosen since they are essential for ensuring food security and the main export-oriented agricultural products. The category of cereal and leguminous crops was added to the research as it represents, in addition to the above-mentioned reasons, also a sustainable practice of sole management due to their role in nitrogen fixation. Investigation of the dynamics of soybean and rapeseed is also acute because of their great potential in the development of the Ukrainian bioeconomy. That makes it possible to contribute to the production of alternative energy sources and fits within the framework of the implementation of the European Green Deal. So, it is a great input for deeper integration with the EU. Deep analysis of the Ukrainian agricultural sector is also justified by the value that this sector plays for our economy. According to scientists, agriculture was indicated as a key sector of the economy (Cramon-Taubadel et al. 2023). This highlights the great importance of investigating this issue.

**Fig. 2.** Harvested area of annual and biennial crops in Ukraine, 2019-2023 (thousand hectares)

Source: compiled by the authors based on data from the State Statistics Service

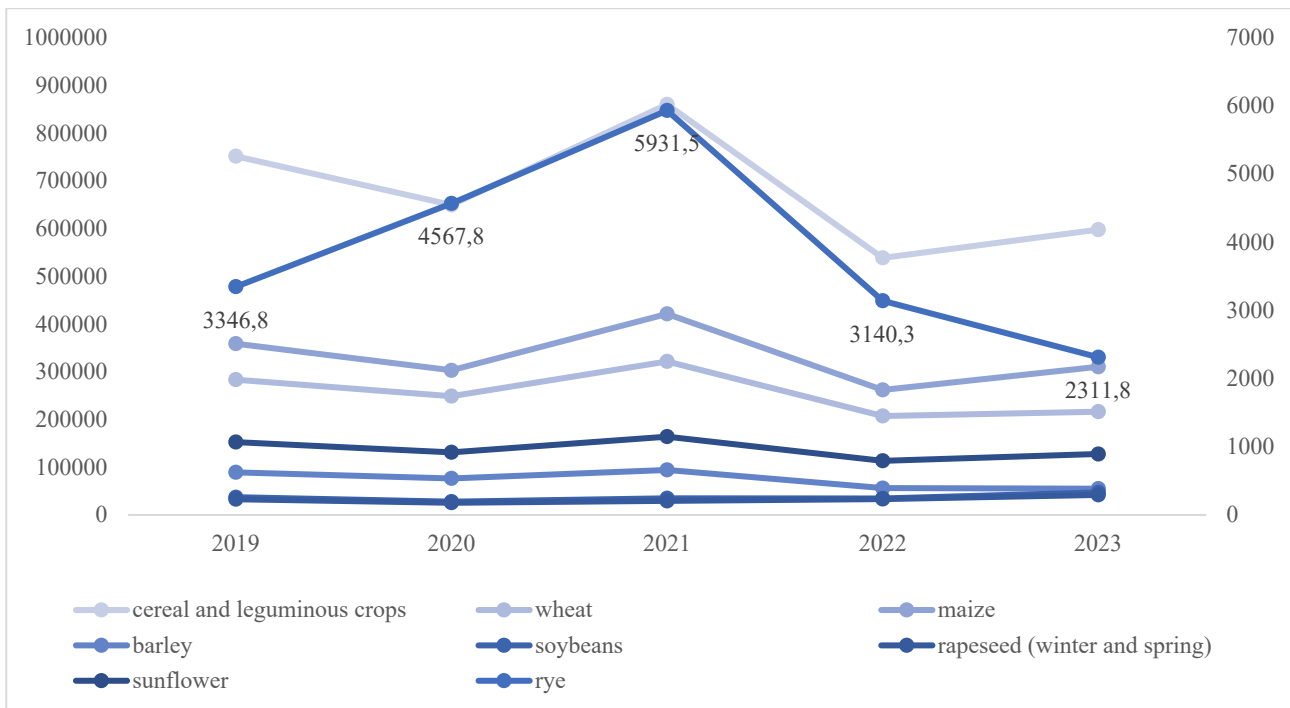


Fig. 3. Production volume (gross harvest) of annual and biennial crops in Ukraine, 2019-2023 (thousand centners)

Source: compiled by the authors based on data from the State Statistics Service

Thus, the analysis of the harvested area of annual and biennial crops (thousand hectares) during 2019-2023 allows us to see relatively stable dynamics in 2019-2021 for all selected crops, except for soybeans and rapeseed, the harvested areas of which increased during the given period. Both of these crops are important components of Ukraine's exports, and also play a significant role in the transition to sustainable production and the development of the bioeconomy. In 2023, the dynamics of this indicator maintained the same trends – a decrease was noted for all crops, except for these two. The harvested areas of soybeans and rapeseed, on the contrary, increased quite noticeably (by 20.09% and 23.82%, respectively).

An important indicator that affects the country's food security and characterizes the agri-food sector is the volume of production or gross harvest of crops. The trends of this indicator do not coincide with the dynamics of the previous one: in 2020, all crops had negative dynamics with gross harvest, and already in 2021, the absolute growth in production volume was positive. In 2022, there was a decrease in the gross harvest of almost all analyzed crops, except rapeseed, the production volume of which increased by 12.9% compared to the previous year. For soybeans, production indicators were negative (a decline of 1.41%), despite the increase in harvested areas. The dynamics in 2023 were positive for almost all crops, except for barley and rye (a decrease of 1.8% and 26.38%, respectively).

For a more thorough analysis of the development of the agri-food sector and the prerequisites for the development of food security in Ukraine, we also examine the yield index of the selected crops (Fig. 4).

Data on the dynamics of the yield of the studied crops differ slightly from the previous indicators. Thus, in 2020, a decrease in yield could be noted for all crops, except rye (an increase by 14.88%). The decline in yield was uneven across crops: the largest decreases in yield were recorded for maize and sunflower (21.84% and 21.09%, respectively), and the smallest for barley and wheat (5.85% and 8.65%, respectively). In 2021, the yield of all crops increased with a minimum of 3.92% in rye and a maximum of 36.65% in maize. 2022 was marked by a decrease across all analyzed crops (the minimum decrease in rapeseed was 2.05% and the maximum in maize was 17.32%). In the year following the full-scale invasion – 2023 – all crops, except rye, showed an increase in yield compared to the previous year and a return to pre-pandemic levels.

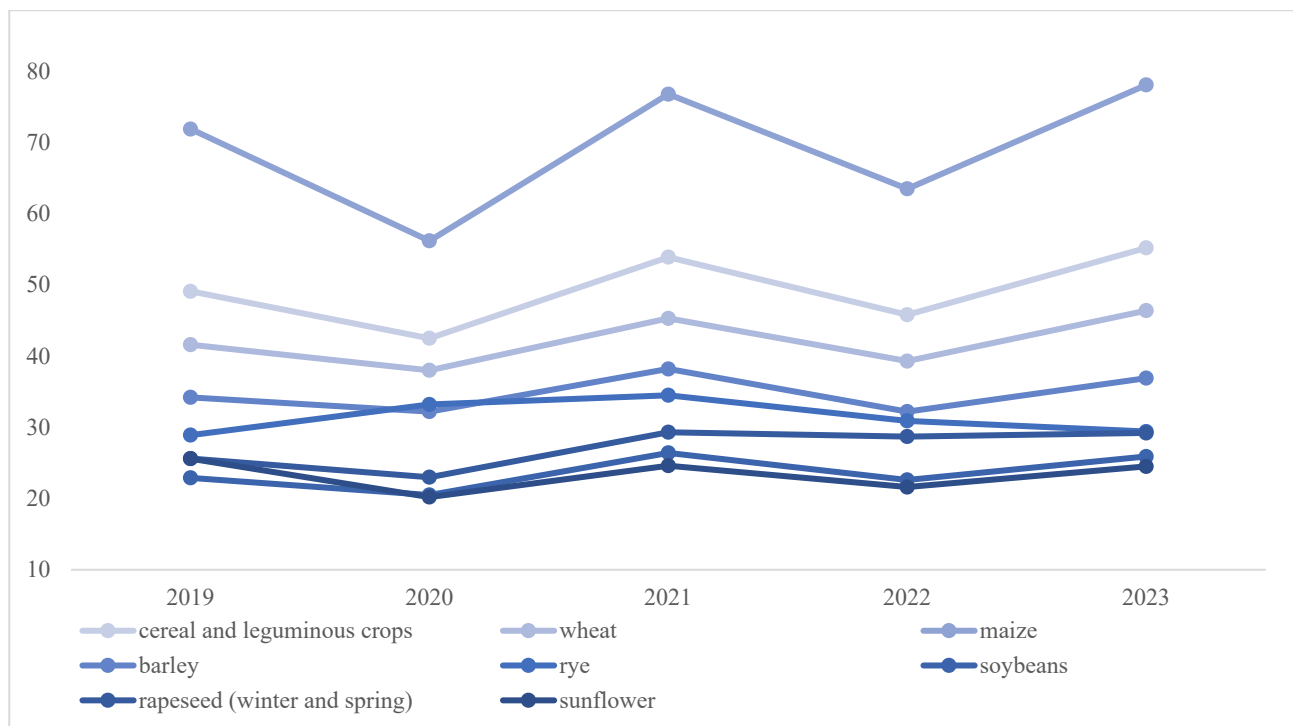


Fig. 4. Yield of annual and biennial crops in Ukraine, 2019-2023 (c/ha)

Source: compiled by the authors based on data from the State Statistics Service

Table 3 presents the calculation of the absolute change indicator compared to the previous year (nominal difference) and annual percentage change (YoY change). Table 4 shows calculations of the base-year index, CAGR, and acceleration. The base-year index allows us to see changes relative to the base year, which we took to be 2019. We can see the accumulated effect after the start of the pandemic and the war. CAGR (Compound Annual Growth Rate) performs the average annual cumulative rate of growth or decline. It summarizes the indicators for the entire analyzed period. Acceleration highlights the dynamics of growth, pace, acceleration, or deceleration. This is an extension of YoY change analysis.

The results obtained indicate the impact of pandemic and war factors on the development of Ukraine's agri-food sector (decrease in indicators in 2020 and 2022). However, we can observe a rapid return to positive dynamics in the years following the onset of crisis states. This positively characterizes the potential of Ukrainian agriculture. It is essential to note the growth in indicators not only of those that directly provide the population with basic food products (e.g., wheat or cereal and leguminous crops in general), but also of those that play a significant role in the country's exports, generating cash income, as well as those that can become a basis for the development of the bioeconomy and the transition to sustainable production. Such crops are rapeseed, soybeans, sunflower, and maize (Shynkaruk and Kondratyev 2024, Mirzoieva et al. 2024, Lepetan et al. 2023).

The base year index shows different dynamics during the analyzed period, which vary depending on the year and crop. For example, the cultivation of rye during the beginning of the pandemic and the following year had positive results. However, both the harvested area and production volume experienced a decline since 2022. For most other crops, the index is lower than the base year during 2020-2022, with the beginning of growth since 2023 for various crops, and mainly for the yield indicators.

The CAGR demonstrates that the average annual rates for the selected crops have both positive growth dynamics and declines, depending on the indicator. Thus, for the harvested area, almost all crops experienced a decline in the period from 2019 to 2023. The exceptions are rapeseed and soybeans, which are a positive characteristic of this dynamics, as they have significant potential in the development of the Ukrainian biofuel market. The production volume indicator has the same dynamics, with the exception of these same crops (soybean and rapeseed). On the contrary, the average annual favorable growth rates of crops are demonstrated by the yield indicator. Almost all have a positive result, except sunflower.

Table 3. Dynamics of key indicators of the agri-food sector by main crops, 2020-2023

Crops	2020		2021		2022		2023	
	Nominal difference	YoY change,%	Nominal difference	YoY change,%	Nominal difference	YoY change,%	Nominal difference	YoY change,%
Harvested area of annual and biennial crops, thousand hectares								
cereal and leguminous crops	-9	-0.06	665.5	4.35	-4175.5	-26.18	-937	-7.96
wheat	-257.9	-3.79	535.7	8.17	-1808.7	-25.51	-623.1	-11.80
maize	405.2	8.13	89.7	1.66	-1357.3	-24.76	-149.3	-3.62
barley	-234.7	-9.00	97.6	4.11	-731.9	-29.61	-245.9	-14.13
rye	22.4	19.41	33.8	24.53	-70.1	-40.85	-23.1	-22.76
soybeans	-248.5	-15.41	-41.4	-3.03	204.3	15.44	306.8	20.09
rapeseed (winter and spring)	-166.7	-13.03	-108	-9.71	151.7	15.10	275.4	23.82
sunflower	522	8.76	184.2	2.84	-1427.1	-21.41	-36.4	-0.69
Production volume (gross harvest) of annual and biennial crops, thousand centners								
cereal and leguminous crops	-102098.1	-13.59	210770.5	32.46	-321467	-37.38	59085.1	10.97
wheat	-34504.4	-12.18	72736	29.24	-114218	-35.53	8959.3	4.32
maize	-55897.1	-15.58	118195.1	39.02	-159229	-37.81	48435.1	18.50
barley	-12804.4	-14.36	18006.8	23.58	-38288.5	-40.57	-1009.8	-1.80
rye	1221	36.48	1363.7	29.85	-2791.2	-47.06	-828.5	-26.38
soybeans	-9010.4	-24.36	6955.3	24.86	-494	-1.41	12987.5	37.71
rapeseed (winter and spring)	-7231.2	-22.04	3817.4	14.93	3790.4	12.90	8656.7	26.09
sunflower	-21436.9	-14.05	32819.8	25.03	-50636.7	-30.89	14309.5	12.63
Yield of annual and biennial crops, c/ha								
cereal and leguminous crops	-6.6	-13.44	11.4	26.82	-8.1	-15.03	9.4	20.52
wheat	-3.6	-8.65	7.3	19.21	-6	-13.25	7.1	18.07
maize	-15.7	-21.84	20.6	36.65	-13.3	-17.32	14.6	22.99
barley	-2	-5.85	6	18.63	-6	-15.71	4.7	14.60
rye	4.3	14.88	1.3	3.92	-3.6	-10.43	-1.5	-4.85
soybeans	-2.4	-10.48	5.9	28.78	-3.8	-14.39	3.3	14.60
rapeseed (winter and spring)	-2.6	-10.16	6.3	27.39	-0.6	-2.05	0.5	1.74
sunflower	-5.4	-21.09	4.4	21.78	-3	-12.20	2.9	13.43

Source: calculated by the authors based on statistical data

The acceleration results in a significant slowdown in growth and significant negative indicators for almost all analyzed crops and indicators in 2022. The exceptions again are the results of soybeans and rapeseed for the harvested area indicator. Moreover, the growth rate of these crops in 2022 is notably high (18.48 p.p. and 24.81 p.p., respectively). According to other indicators (production volume and yield), they reflected a decline in 2022. A distinctive characteristic is the return to positive results and acceleration of growth rates for all crops and the analyzed indicators of the development of the agricultural sector. This demonstrates significant potential for the development and restoration of the agricultural sector of Ukraine and is of great importance for ensuring food security in our country.

Table 4. Dynamics of key indicators of the agri-food sector by main crops, 2020-2023

Crops	2020	2021		2022		2023		2019-2023
	Based-year index, %	Based-year index, %	Acceleration, p.p.	Based-year index, %	Acceleration, p.p.	Based-year index, %	Acceleration, p.p.	CAGR, % per year
Harvested area of annual and biennial crops, thousand hectares								
cereal and leguminous crops	99.94	104.29	4.41	76.99	-30.54	70.86	18.22	-8.25%
wheat	96.21	104.08	11.96	77.53	-33.68	68.38	13.71	-9.06%
maize	108.13	109.92	-6.46	82.71	-26.42	79.71	21.14	-5.51%
barley	91.00	94.75	13.11	66.69	-33.72	57.27	15.48	-13.01%
rye	119.41	148.70	5.12	87.95	-65.38	67.94	18.09	-9.21%
soybeans	84.59	82.03	12.37	94.69	18.48	113.72	4.65	3.27%
rapeseed (winter and spring)	86.97	78.53	3.32	90.38	24.81	111.91	8.72	2.85%
sunflower	108.76	111.85	-5.92	87.90	-24.25	87.29	20.72	-3.34%
Production volume (gross harvest) of annual and biennial crops, thousand centners								
cereal and leguminous crops	86.41	114.46	46.05	71.68	-69.83	79.54	48.34	-5.56%
wheat	87.82	113.50	41.42	73.18	-64.76	76.34	39.85	-6.53%
maize	84.42	117.36	54.60	72.98	-76.83	86.48	56.31	-3.57%
barley	85.64	105.83	37.94	62.89	-64.15	61.76	38.77	-11.35%
rye	136.48	177.23	-6.63	93.83	-76.91	69.07	20.67	-8.83%
soybeans	75.64	94.44	49.22	93.11	-26.28	128.22	39.13	6.41%
rapeseed (winter and spring)	77.96	89.59	36.97	101.15	-2.03	127.54	13.19	6.27%
sunflower	85.95	107.46	39.09	74.27	-55.92	83.65	43.52	-4.37%
Yield of annual and biennial crops, c/ha								
cereal and leguminous crops	86.56	109.78	40.27	93.28	-41.85	112.42	35.55	2.97%
wheat	91.35	108.89	27.86	94.47	-32.46	111.54	31.31	2.77%
maize	78.16	106.82	58.49	88.32	-53.97	108.62	40.31	2.09%
barley	94.15	111.70	24.48	94.15	-34.34	107.89	30.30	1.92%
rye	114.88	119.38	-10.96	106.92	-14.35	101.73	5.58	0.43%
soybeans	89.52	115.28	39.26	98.69	-43.17	113.10	29.00	3.13%
rapeseed (winter and spring)	89.84	114.45	37.55	112.11	-29.44	114.06	3.79	3.34%
sunflower	78.91	96.09	42.88	84.38	-33.98	95.70	25.62	-1.09%

Source: calculated by the authors based on statistical data

It is important to note that among the factors that negatively affect crop yields and volume of agricultural crop production in Ukraine were power outages due to attacks on critical infrastructure, disruption of supply chains not only due to shelling and blockades, but also due to fuel shortages. Power outages also pose a threat

due to the inability to store food products that require storage in different conditions (for example, vegetables, fruits, and berries). This is why Ukraine should develop its bioenergy potential and also switch to electric transport, which will reduce such risks, as well as allow quicker integration into the European Community.

Summing up, we have to mention that the selected crops are the bases of Ukraine's food security, which is linked to the balance between export-oriented and import-dependent products. Some of the analyzed crops (wheat, maize, sunflower, barley) constitute the foundations of exports, as they are usually produced in such volumes that exceed domestic needs (Strelbytska et al. 2025, Pokataiev et al. 2023). On the contrary, there are components of food security in Ukraine that are dependent on imports. Namely, fruits, vegetables, meat, etc. This dependence has increased during the wartime period due to some limitations in production capacity. The main reasons for such a situation are the occupation of Ukrainian territories, the shelling of agricultural regions, and migration processes. This import dependence may play a negative role in ensuring food security, which requires the development of an agrarian policy that takes into account this point of view and understands the necessity to ensure domestic availability as a high priority for our state (Misiuk et al. 2023).

To fully disclose the topic, we turn to the analysis of the inclusivity in the agri-food sector, which is essential for achieving food security and balanced development of the economy of Ukraine. One of the criteria of inclusivity is the inclusion of SMEs. In 2022, small enterprises accounted for 18.77% of the total number of enterprises in the agricultural sector. Furthermore, they provided 25.1% of employment. The volume of sales of these enterprises amounted to 33.6% of the total volume. Medium-sized enterprises provided 45.7% of the volume of sales of products. All this indicates a significant contribution of this sector to the country's food security (Kovbasa and Maksychna 2024).

Due to the war, there are no new statistical data on Ukraine related to the topic of inclusivity research, and the data of world organizations are inaccurate and of an expert nature, which is also a consequence of the war. If we characterize women's employment in agriculture, we can present data that at the beginning of 2021, 20.8% of farms were headed by women, and according to 2024, the share of organic farms headed by women was 27% (Deineko and Shor 2024).

Figure 5 presents statistics on the employed female population in Ukraine aged 15-70 by professional group "skilled agriculture, forestry, fishery and fish farming workers" for the period 2010-2021.

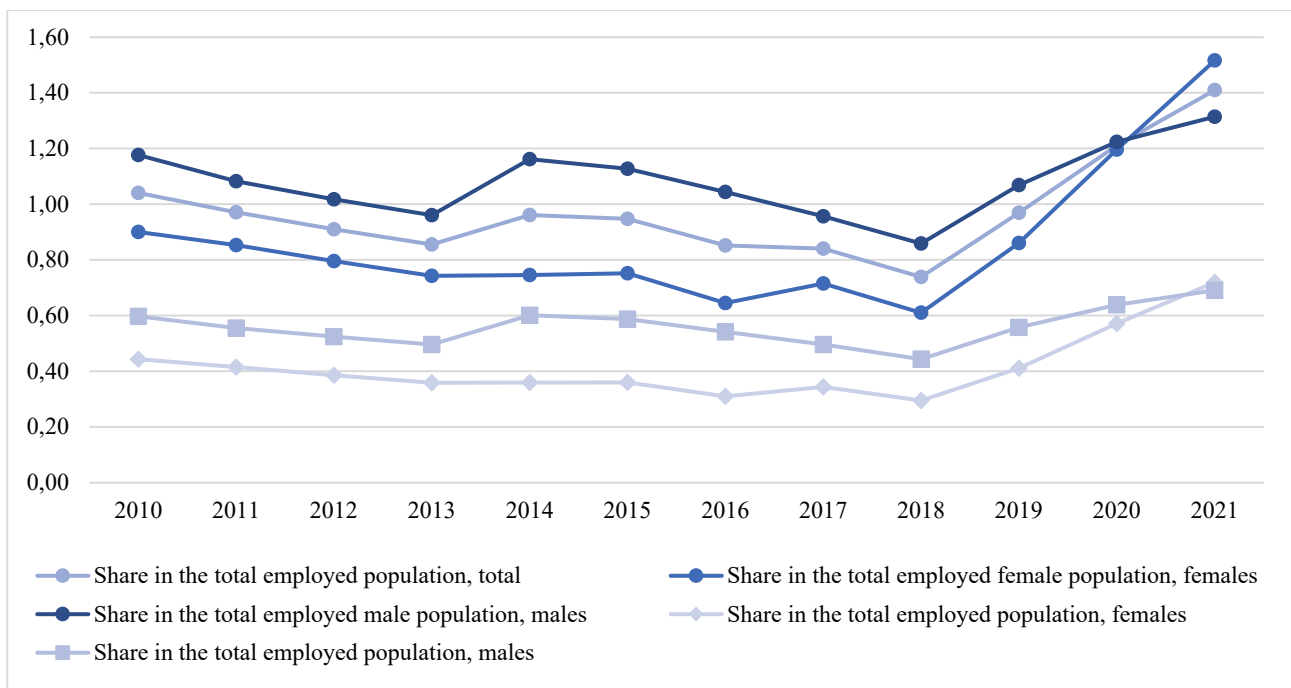


Fig. 5. Share of the population employed in agriculture by gender in Ukraine, 2010-2021

Source: calculated by the authors based on statistical data

This figure illustrates the dynamics of changes in the share of the population employed in agriculture, which the State Statistics Service of Ukraine classifies in the professional group "skilled workers in agriculture and forestry, fish farming and fishing". As can be seen, the dynamics of the share of the female population in agriculture until 2020 were lower than that of the male population. In 2020, the share of the female population employed in agriculture in the employed female population in general changed – it began to exceed the share

of male employment in this professional group. The share of women's employment in agriculture began to exceed that of men in 2021. Currently, in conditions of war and mobilization of the male population, this trend may continue. For this reason, a large number of international donors are now providing grants and various support programs specifically to agricultural enterprises managed by women. It is also based on the fact that from the beginning of the full-scale invasion, there is a loss of agricultural labor. These losses are consequences of various reasons, as internal or external migration, as well as the mobilization of population into the Armed Forces of Ukraine, etc. Statistics represent a decline in the number of officially employed people in the agricultural sector of more than 100 thousand people in the period of 2021-2023 (Gagalyuk 2024). This further substantiates the relevance of an inclusive approach to the development of the agricultural sector in Ukraine due to the need to achieve a socio-economic effect in the form of the development of the agricultural sector and solving the problems of employment of the population. This can be achieved through an increase in women's employment in the agri-food sector.

We must not forget about the need to include internally displaced persons (IDPs) in the development of the agricultural sector of Ukraine, who have significant potential for balancing this sector and restoring its positive trends. Their involvement in the labor market, either through direct employment or by providing them with tools to start their own business, will significantly improve their socio-economic situation. According to official data, as of mid-2024, more than 2 million IDPs were of working age, of whom 128 thousand needed employment and 26.5 thousand people received unemployment benefits (Temporary Special Commission... 2024). This indicates that they need employment, and their inclusion in work in the agricultural sector of Ukraine will have significant potential for solving an acute socio-economic challenge. Firstly, a person becomes integrated in the labor market and gains income, which improves the quality of life. Secondly, more opportunities to grow and produce the necessary crops and goods to ensure food security in society.

We should also not forget about such a category as 'Youth', which remains one of the most vulnerable groups on the labor market at any time. But this group of people has a massive potential for the development of the Ukrainian agrarian sector, as they can contribute creativity and innovation. According to the open data, the share of employed youth (aged 18-35) in 2022 increased slightly compared to the previous year (from 31.2% in 2021 to 31.6% in 2022). This indicator is relatively low and almost half that of the 36-60 age group (Sudakov et al. 2023). This indicates that young people are not fully involved in the economic life of the country, although they have all the opportunities for the development of our economy, including in the agricultural sector. Therefore, it is vital for our state to understand that only on inclusive principles can a balanced economy be built and the agricultural sector, in particular, be developed.

4. Discussion

The conducted research has shown that the full-scale war waged in Ukraine by Russia has a significant negative impact on the development of the agri-food sector and food security in our country, threatening food security in the world. This is explained by multiple factors, including the following: the occupation of territories, active hostilities do not allow sowing and harvesting; the blockade of our ports, as well as restrictions on the borders by certain EU countries, also make it impossible to fulfil contractual obligations; shelling of critical infrastructure significantly complicates the process of working at agricultural enterprises and storing food; migration flows have caused a significant outflow of labour (); enterprises were forced to abandon their facilities and start business in another region, which requires time to develop new types of activity, etc. All this justifies the directions in which the agri-food sector of Ukraine should develop in the future, ensuring the food security of our country. Its development should take place on an inclusive basis, taking into consideration the global orientation towards the Sustainable Development Goals and the European Green Deal, as Ukraine's European integration ambitions should be supported by appropriate actions and policies from the state. To do this, it is necessary to create the maximum possible basis for the development of SMEs, which are key to the development of the economy of any state, providing jobs for the population, solving the problems of self-employment, creating innovations, and supporting the market economy. In this aspect, we cannot but agree with Nehrey and Finger (2024), who identify small and medium-sized businesses as one of the promising directions for strengthening. This is one of the dimensions of an inclusive approach to managing the agri-food sector. To do this, it is necessary to introduce various economic incentives, disseminate information on access to financing, and participation in various programs from international donors. Moreover, Ukraine must harmonise its norms and standards of agricultural production with the EU's ones. That makes it possible to consume all the advantages of Ukraine's accession to the EU. Here we fully share the views of scientists Shubravska et al. (2024) and Popova et al. (2022).

Another important aspect should be the involvement of women in the agri-food sector, which is also a response to today's challenges. Strengthening their role in farm management will allow the restoration of SMEs

that were forced to close due to hostilities, population evacuation, and the mobilization of managers and other male personnel. This will contribute to the restoration of the pace of development of the agri-food sector and ensure food security in Ukraine. As it was noted in modern foreign research by Rudolfson I. with co-authors, food insecurity in Ukraine is exactly driven by the war (Rudolfson et al. 2024). These findings prove our thoughts and conclusions alongside the research of Vesco et al. (2025), Lin et al. (2023), with which we fully and completely agree. Both scholars and we have no differences of opinion regarding the impact of the war on the social and economic consequences in the country, on the growth of exclusion in such conditions, as well as on the increasing risk of food insecurity not only in Ukraine but throughout the world.

The above-described aspects illustrate that an inclusive approach is essential for Ukrainian development and is fully aligned with the Eurointegration path. An inclusive approach should not be limited to supporting only SMEs or gender equality, but also has to consider the interests of other vulnerable groups, among them the active involvement of youth, IDPs, etc. Bringing them together strengthens not only food security but also social resilience.

We fully and completely share the view that the issue of global food security has become more acute during the pandemic, but it has worsened even more with the outbreak of war by Russia against Ukraine (Leal Filho et al. 2023). Therefore, it is essential for the inclusive development of our country, as well as for the world as a whole, to provide maximum stimulation to domestic enterprises of various levels to resume their development.

As well, to ensure national food security, it is vital to maintain a balance between export-oriented and import-dependent products. The necessity of this balance and its prioritizing has become particularly evident during wartime periods. Therefore, agrarian policy should be designed with consideration of national interests and grounded in an inclusive approach (Denysiuk et al. 2022). For a more in-depth analysis of domestic food security and its management by the authorities, it would also be valuable to estimate the population's needs for certain types of products, which can result in the development of an appropriate stimulation policy. But this study focuses on the dynamics of food security indicators and tendencies of the Ukrainian agri-food sector, which makes this estimation beyond its scope. However, the issue represents a direction for future research.

The conducted scientific research reflects the significant potential of the agri-food sector in ensuring its own economic growth, addressing energy security challenges, and obtaining energy independence, which will limit dependence on others. In previous works of our authors, the issue of creating food sovereignty of our state, the production of agri-food sector products with high added value was already raised (Bilan et al. 2017, Shynkaruk et al. 2023). The present study proposes the need for inclusive development of the agri-food sector, taking into account current challenges and the European Green Deal. In particular, attention should be given to the orientation of growing those crops that can be used as biomass and become the basis for the production of biofuels and other alternative sources. The development of this and the orientation of its activities towards the SDGs will allow us to form new markets in Ukraine (for example, the electric vehicle market), develop the bioeconomy, which will ensure the energy independence of our state, improve the quality of life, ensure food security through risk diversification and production using new innovative and energy-saving technologies, etc. All of this is part of an inclusive approach to managing food security and the agri-food sector of Ukraine.

5. Conclusions

Thus, our study shows that the food security of Ukraine is currently under threat due to the war on its territory. If we define food security as the ability of the population to obtain food sufficient for an active and healthy life, then there is currently a problem in this, as evidenced by numerous indicators of food insecurity and indicators of food production. Basically, important indicators that reflect the level of food security in Ukraine significantly declined in 2022, which is explained by the outbreak of the full-scale war. Due to the war, there is a challenge in providing the population with food due to the impossibility of carrying out agricultural work or its difficulty. This causes a shortage of food products and a further increase in prices for them, which has significant socio-economic negative consequences for the population. A study of the development of the agri-food sector during 2019-2023 confirmed that in 2022, key agricultural indicators decreased. There is also evidence of the negative impact of the pandemic on the development of this sector. The positive dynamics of indicators in the post-pandemic 2021 and the year after the start of the full-scale war – 2023 – were noticeable, which indicates the rapid response of our farmers and the restoration of this sector. Furthermore, the study highlights the significant potential of the domestic agri-food sector to ensure inclusive and sustainable production and to foster the development of the bioeconomy. This modern approach aligns with Ukraine's European integration ambitions and falls in line with the European Green Deal. The development of agri-food crops for use as biomass for the purpose of further production of biofuels and other bio-based products can address a significant challenge that Ukraine faced during attacks on critical infrastructure – the energy crisis

and dependence. The development of alternative energy sources will ensure the sustainable development of Ukraine and strengthen its energy independence. The broader use of alternative modes of transport, such as electric vehicles, will also significantly improve the environment, enhance the quality of life, reduce CO₂ emissions, etc. The development of the agri-food sector is also becoming crucial for ensuring food security on an inclusive basis. This requires stimulating the growth of SMEs as a key factor in the development of the labour market and national economy, ensuring the maintenance of the competitiveness of domestic agricultural products. Additionally, an inclusive approach implies greater involvement of women in the labour market, particularly in farm and company management, which will allow us to recover the number of SMEs that were forced to close due to the outbreak of hostilities and forced migration of the population. It is also worth considering the interests of other population groups, such as youth and IDPs, who are particularly vulnerable at the current time. Maximizing the involvement of all population groups in the agri-food sector will increase its efficiency and improve the quality of life of the population of Ukraine. Taking into consideration global trends will provide an opportunity to build a developed country focused on sustainable production and modern, innovative approaches to management.

Statements and Declarations

Acknowledgements

The research is a part of the project's implementation at the National University of Life and Environmental Sciences of Ukraine of Erasmus+ Jean Monnet Module "EU Practices of Social and Economic Inclusion" (Jean Monnet Module 101127466 - EPSEI - ERASMUS-JMO-2023-HEI-TCH-RSCH). The above project has been funded by the European Union. Views and opinions expressed are, however, those of the authors only and do not necessarily reflect those of the European Union or European Education and Culture Executive Agency (EACEA). Neither the European Union nor the granting authority can be held responsible for them.

Disclosure of Interests

The authors have no competing interests to declare that are relevant to the content of this article.

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