

THE POTENTIAL FOR ENSURING FOOD SECURITY IN UKRAINE IN THE CONTEXT OF THE ONGOING MILITARY CONFLICT

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Abstract. The *subject of the research* is the study of Ukraine's food security and the potential for improving it. *Methodology.* The article uses general scientific and specific methods of economic research: the method of content analysis (when processing scientific sources and reviewing the thematic literature, deduction and induction); abstract and logical method (when identifying problematic aspects of ensuring the country's food security, substantiating conclusions and proposals); the method of statistical calculations of regression economics (when substantiating the economic and mathematical model of food security, calculating the indicator of the actual state of self-sufficiency in food security). The *purpose of the study* is to assess the level of food security achieved by Ukraine and to identify the main factors that affect the potential for its possible improvement. *Conclusion.* Ukraine has significant potential to ensure food security at the national and European levels. However, over the past two years, Ukraine has lost its position in the global food security ranking according to the GFSI. The main problematic aspects that led to this are as follows: irrational use of land and labour resources, aging and migration of the rural population; sharp loss of agricultural biodiversity; high level of chemicalisation of agricultural production; loss of the potential for quality reproduction of agricultural land; significant inclusive gaps within rural areas; low level of funding for agricultural science and a predominantly raw material, agrarian orientation. The main reason for the downgrade of Ukraine's GFSI rating in 2022 was the ongoing military operations in the country. Despite the existing problematic aspects, the Ukrainian agricultural sector showed the highest level of sustainable development compared to other types of economic activity. The share of profitable enterprises in the sector was 79%. Ukraine is currently self-sufficient in food security for almost all types of agricultural products. The constructed economic-mathematical model showed a high degree of dependence of food security on such factors as the total value of assets of agricultural formations, the value of fixed assets and the amount of profit. It was determined that the key condition for increasing the potential for ensuring food security in Ukraine, both at the national and European level, should be the social responsibility of agribusiness and raising the level of sustainable development of agriculture and rural areas.

Key words: agricultural business, food security, agricultural companies, food, households, sustainable development.

JEL Classification: Q10

1. Introduction

The active growth of the world's population and the growing attention to equalising the quality of life of people in different countries require a solution to one of the world's most acute and urgent problems – ensuring global food security. The global path towards achieving the goals of sustainable development of society is also primarily based on the issues of sustainable development of agriculture and ensuring

inclusive and equitable access to quality and healthy food for all segments of the population. Among the sustainable development goals that are currently and in the near future a strategic guideline for the development of economic blocs, groups, national economies and regions of individual countries, including Ukraine, is ensuring food security. Directly related: Goal 1 – No Poverty, Goal 2 – Zero Hunger, Goal 3 – Good Health and Well-Being, Goal 10 –

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Reduced Inequalities, Goal 12 – Responsible Consumption and Production, Goal 13 – Climate Action; Goal 15 – Life on Land. The UN has defined the achievement of zero hunger as one of the main goals of sustainable development, which is characterised as inclusive access to quality, adequate and safe food for all categories of the world's population, taking into account opportunities for healthy eating and achieving socio-economic and environmental well-being.

The importance and relevance of this goal is confirmed by the fact that, despite the constant trends in the growth of food production in the world, about 1 billion people still need to be provided with food in adequate quantity, quality and availability (Zero Hunger). This explains the numerous government initiatives around the world, and in particular in the EU, aimed at providing institutional, organisational and financial support for the development of agriculture and rural areas. For the period 2020–2024, the EU has invested more than 18 billion EUR in achieving food security. Approximately 70 countries around the world have received aid (Global food security). At the same time, the problem remains unresolved and requires further steps. Ukraine has huge agricultural potential, which can ensure its significant contribution to solving the global food security problem. Agriculture accounts for about 20% of the country's GDP. In terms of wheat production in 2023, despite the ongoing military conflict, Ukraine is one of the world's top 10 producers. In recent years, Ukraine has been one of the top 5 world exporters of grain products, the leading exporter of oilseeds and products of its food processing. In 2021, Ukraine's total contribution to ensuring global food security was estimated by Ukrainian experts at the equivalent of food for 400 thousand people (Onegina, Antoshchenkova, 2022). The aftermath of the military conflict naturally affected the nature and efficiency of Ukrainian agriculture, but compared to other types of economic activity, agriculture has shown the highest degree of stability and dynamism. This is an undeniable fact about the huge reserves and opportunities for ensuring national food security in Ukraine and its participation in solving this problem at the European and global level.

2. Literature Review

Ensuring food security is a global and vital issue for all parts of the world, regardless of economic development and growth rates.

Özge Can Niyaz (2016) notes that despite the system of measures of pan-European state regulation and the annual increase in the scale of financial support to European agriculture, the desired safe state of food security in the EU has not yet been achieved.

As pointed out by Vatsa & Miljkovic (2022), the main problematic aspects of food security in the EU countries are the low level of interchangeability of certain types of agri-food products and the high degree of dependence on agricultural raw materials, which are a source for food industry enterprises, for example, sunflower seeds, rapeseed. Understanding the complexity of the situation and taking into account the important role of Ukraine as a major importer for the EU, European governments have been taking measures for several years to improve the development of agricultural supply infrastructure and logistics in Ukraine, with the aim of ensuring pan-European food security (Bureau & Swinnen, 2018).

The escalation of geopolitical tensions, the emergence and spread of global pandemics, and the outbreak of military conflict in Ukraine have significantly complicated the task of overcoming hunger and achieving the Sustainable Development Goals related to the need to ensure food security (Carriquiry et al., 2022; Serhiienko, et al., 2023). Hoekman & Mavroidis (2021) argue that the results and consequences of military conflicts, manifested in sanctions, restrictions and bans on the parties to the conflict, are not an effective tool and significantly complicate the task of achieving global and regional food security. This is particularly true in the case of the ongoing military conflict in Ukraine. In recent years, the problem of neutralising the effects of climate change and the desire for climate neutrality have been added to the list of these difficulties, which should also be one of the main strategic guidelines for ensuring global and European food security (Santeramo & Kang, 2022).

The paramount importance of food security for improving the quality of life of society has led to considerable attention being paid to the methodological principles for assessing its level. In defining the nature of food security, the FAO set out the basic principles of its provision: availability, access, utilization and stability (FAO, 2009). When assessing the state of food security, Bawadi et al. (2012) focus on its main components (quantity, quality, food safety, cultural traditions and national preferences), levels of food security (global, national, regional, household, individual) and generally accepted criteria (availability, access, use). Ukrainian scientists distinguish the following principles of food security: self-sufficiency, multifunctionality, social justice, independence, sustainability, balance and rationality (Urba & Kopytko, 2022).

In scientific practice, there are several main methods for assessing the achieved state of food security at different levels of its provision. Bashir & Schilizzi (2012) prefer the food intake method (DIM) and the method based on the scale of measuring the lack of the required level of food security.

Jones Andrew et al. (2013) use a broader set of methods and indicators in their study:

- Global Hunger Index;
- the volume of household consumption and expenditure;
- scale of access to food in households;
- diversity of household diets.

In recent years, scholars have often considered food security through the prism of the concept of sustainable development. Ahn & Norwood (2021) argue that food self-sufficiency and population well-being are determined by the achieved state of sustainability of food value chains, which should ensure a healthy and active lifestyle for people despite external and internal challenges. Antamoshkina and Rogachev (2020) analyse the issues of achieving sustainable food security using the following indicators: food price indices, gradation of the population by income level, share of household expenditure on food, and food import substitution indicator.

Since 2012, the Global Food Security Index (GFSI) has been a widely accepted indicator for assessing the level of food security achieved. Po-Chi Chen et al. (2019) propose to assess the actual state of the country's food security using the H-DEA method to aggregate additional hierarchical indicators and calculate a multidimensional indicator based on expert data. International organisations (FAO, UN, WBCSD) use, in addition to these indicators, a whole range of additional indicators: the level of food consumption and its types, the level of access and its correlation with the level of income, the level of poverty, the level of hunger, the proportion of the population that is undernourished, etc. At the same time, global strategic priorities of exceptional importance for current and future generations, challenges and threats, rather than current geopolitical trends, are driving ongoing research into ensuring and improving food security for all countries and peoples without exception.

The purpose of the study is to assess the current state of food security in Ukraine and identify the main factors that affect the potential for its possible improvement.

In conducting the research, the materials of publications covered in the sources of scientometric databases, including Scopus and Web of Science, materials of own statistical observations, data from the State Statistics Service of Ukraine, the Ministry of Finance of Ukraine, and the European Commission were used. The current state of food security in the country was assessed on the basis of international rating comparisons, the results of own calculations of the indicator of the level of self-sufficiency in food security (as the ratio of the volume of production of certain types of agricultural products to domestic

consumption), independently substantiated factors of the economic and mathematical model of the relationship between the GFSI indicator and factor characteristics. The main methods of research were the method of content analysis (when processing scientific sources and reviewing thematic literature), deduction and induction, the abstract and logical method (when identifying problematic aspects of ensuring food security of the country, substantiating conclusions and proposals), the method of regression economic and statistical calculations (when substantiating the economic and mathematical model of ensuring food security, calculating the indicator of the actual state of self-sufficiency of food security). The economic and statistical calculations were based on the financial statements and performance data of Ukrainian agricultural enterprises (except for large agricultural holdings, which were not included in the statistical sample).

3. Main Research Material

Complex trends in the development of the global and national economies of the world affect the quality of life of the population, the well-being of nations and the global potential of humanity to reproduce and maintain health. At the same time, the quality and accessibility of food is of paramount importance, and in this context, it has become one of the central concerns of governments in all countries. Today, almost without exception, national economies contribute to solving the problem of achieving food security in the global landscape. At the global level, the contribution of national economies to global food security is measured by the Global Food Security Index (GFSI). In the world rankings, Finland, Ireland, Norway, France and the Netherlands were the leading countries in terms of national food security in 2022. Ukraine ranked 71st, dropping 13 places over the year (Figure 1).

The research has identified the main problems of food security in Ukraine, which have lowered Ukraine's place in the overall global ranking according to the GFSI. These include:

- 1) Irrational use of land resources. Ukraine has the highest level of ploughed agricultural land (about 80%), which significantly restricts the potential for restoring its natural fertility through the restoration of humus.
- 2) Considerable rates of biodiversity loss. In particular, over the past twelve years, the number of cattle in Ukrainian agriculture has decreased by 90%. This has virtually eliminated the possibility of restoring the quality properties of Ukrainian soils by applying organic fertilisers of natural origin.
- 3) A significant degree of chemicalisation of agricultural production (the actual share of fertilised

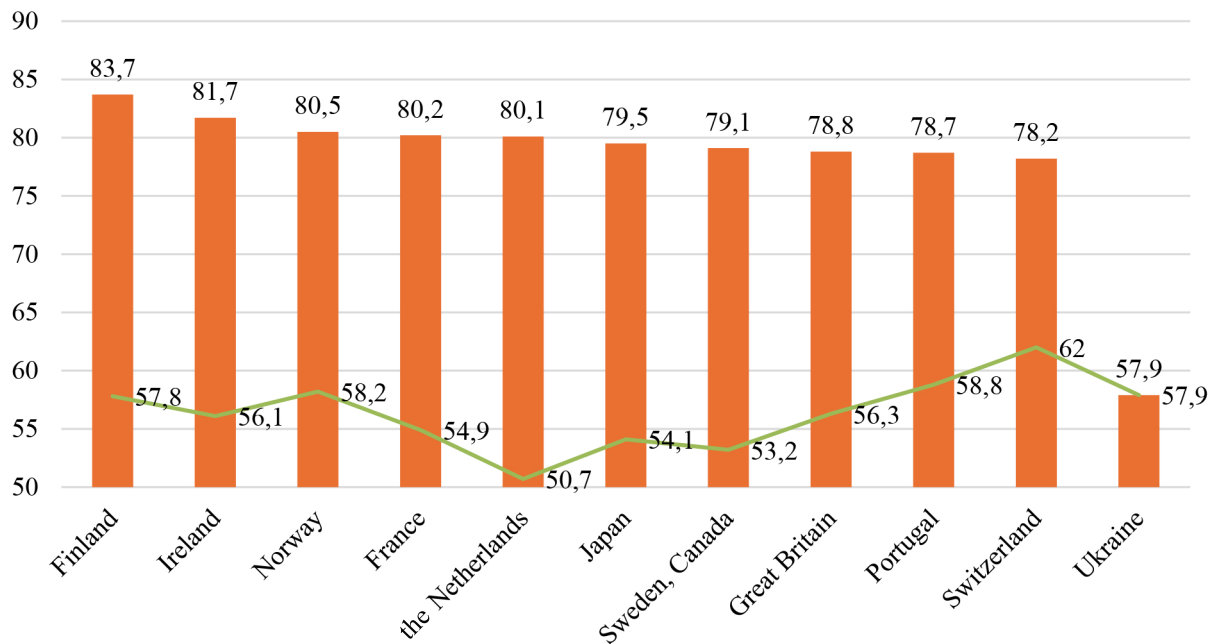


Figure 1. TOP-10 world leaders in food security and Ukraine

Source: The 11th Global Food Security Index shows a deterioration in the global food environment for the third year, threatening food security

areas is 88%; the share of areas treated with pesticides is 89%). The share of the area used for organic production is only 0.6% and has not increased over the past ten years.

4) There are significant inclusive gaps in the quality of life and well-being of the population in rural and urban areas of Ukraine. Traditionally, the wages of employees in agriculture are 20-25% lower than in other types of economic activity. The social infrastructure of rural areas is virtually destroyed, which does not help attract labour resources to agribusiness. According to the World Bank, Ukraine's agricultural productivity is five times lower than the EU average.

5) The level of funding for innovative transformations in the agricultural sector needs to be increased, as well as the limited financial potential of agricultural businesses and the country's budgets, and the low level of funding for the development of agricultural science and education.

6) One of the critical problems of Ukraine's food security is the high share of the raw materials sector in agri-food production. The focus on exports of agricultural raw materials over the past decades has led to a partial loss of the potential of the domestic food industry. This limits the opportunities for increasing value added in agri-food chains.

One of the critical factors constraining agricultural potential and lowering food security ratings is the ongoing military conflict in the country. Active hostilities have created a number of acute problems for both the development of agricultural enterprises and the macroeconomic stability of the country as

a whole. Over the past two years, the price of diesel fuel in Ukraine has increased by 74.5%, the cost of agrochemicals (fertilisers and biological pesticides) by 2.6 times, and the cost of energy resources by three times. The increase in the cost of material and technical resources takes place against a background of general problems in the logistics of agricultural distribution chains and a sharp negative trend in the decline of selling prices. Today, the main export routes for Ukrainian agri-food products remain small hubs on the Danube and railway junctions to Eastern Europe. The loss of sea transport links has severely limited the formation of resource potential and the ability to sell manufactured products, affecting the price attractiveness and profitability of agricultural enterprises.

1. Despite the problematic aspects and existing threats, the agricultural sector of the Ukrainian economy, even during the war, demonstrates the highest level of sustainability and reliability of economic development among all types of economic activity. According to the State Statistics Service of Ukraine, in 2022 the share of profitable enterprises in the country's agricultural sector was 79% (together with the share of loss-making enterprises – about 21%). On average, agricultural business structures received 7.8 thousand USD net profit per 100 ha of agricultural land. The overall level of profitability of agricultural enterprises (excluding extensive agricultural enterprises) was 14%, the ROE index was 17.6%, and the ROA was 9.5% (Agriculture of Ukraine, 2022). Such indicators indicate the existence

Table 1

Level of self-sufficiency in food security in Ukraine, %

Types of food	2010	2015	2017	2018	2019	2020	2021
Cereals and legumes	144,1	238,9	292,9	319,2	341,3	323,3	433,20
Meat and meat products	86,1	106,2	105,1	105,0	110,2	110,1	111
Milk and dairy products	106,4	105,0	107,7	107,5	103,1	99,1	95,20
Eggs	108,5	113,9	119,8	123,9	125,9	125,0	112,40
Potato	97,7	96,3	101,7	101,5	100,0	101,0	101,50
Fruits, berries, and grapes	73,7	92,3	82,9	91,3	78,1	75,9	79,30
Vegetables and gourds	100,0	100,3	102,9	103,4	104,0	104,6	106,10

Source: authors' calculations based on data from (Agriculture of Ukraine, 2022)

of a robust long-term potential for the strength and stability of the agricultural sector of the Ukrainian economy. Such reserve, in turn, creates favourable conditions for ensuring Ukraine's food security and participation in European and global processes of solving the problem of hunger in the world. According to the results of the calculation of the level of food self-sufficiency of the population of Ukraine up to and including 2021, its indicators show a clear upward trend for almost all types of food (except dairy products). At the same time, the actual level of self-sufficiency in food security in the pre-war period was such that there were significant reserves for food exports, given the full supply of food to the population of Ukraine (Table 1).

Along with the dynamics of relatively stable indicators in the last pre-war years and the positive results demonstrated by the country's agricultural sector in 2022, agriculture and rural areas of the country suffered significant losses from the effects of the military conflict. To mitigate them, the Government of Ukraine and European government agencies have introduced a number of projects and support programmes, including: "Grain from Ukraine" (about 220 million USD), share grant programs from the EU (1.73 million USD), the EU Programme "Early Recovery of Ukraine" (150 million EUR), a package of financial assistance for the development of green agriculture (450 million EUR), the EU and FAO financial support project for Ukraine's agricultural sector to strengthen production and supply chains and adapt them to wartime conditions, 50 billion EUR of total EU loan financing over the past two years, and others (Ukraine: EU-FAO partnership to ensure recovery and development of agricultural value chains).

Along with the stable situation in Ukraine's agriculture during the military operations, the potential for food security is characterised by the following strengths:

1. The creation of a free land market is currently being accompanied by measures to find adequate and transparent mechanisms to ensure its functioning.

2. Simplification of a number of legal procedures (cancellation of additional seed certification procedures, simplification of imported feed labelling, simplification of agricultural export licensing, simplification of control over compliance with phytosanitary measures, simplified registration of agricultural machinery and preferential procedures for storage, transportation and use of pesticides and agrochemicals during martial law).

3. Cheap and high-quality workforce in rural areas.

4. The high level of intensification of agricultural production helps to reduce business risks to some extent.

5. Long-term ROA.

6. The traditional predominance of equity capital in the structure of sources of financial support for agricultural enterprises significantly reduces the level of dependence of agricultural producers on the unstable market conditions for credit and financial resources.

7. The lowest level of shadowing of the agricultural economy compared to other types of economic activity (mainly due to the payment of the single tax).

These advantages of the Ukrainian agricultural sector complement the main factor in shaping Ukraine's food security potential – a strong resource base, the quality and quantity of which is crucial for increasing agricultural production. According to the calculations, the actual level of GFSI in Ukraine is closely correlated with the level of assets, fixed assets and financial results of agricultural enterprises. To assess the degree of connection between the GFSI indicator and the main factors of agricultural production, an economic and mathematical model of multiple linear regression with three factors was built:

$$Y_i = b_0 + b_1 x_{1j} + b_2 x_{2j} + b_3 x_{3j}$$

where

x_1 – cost of total capital per 1 ha of agricultural land, thousand UAH;

x_2 – cost of fixed assets per 1 ha of agricultural land, thousand UAH;

x_3 – net profit per 1 ha of agricultural land, UAH;

Y is the actual level of the GFSI indicator in the country.

The mathematical model showed a relatively high level of reliability ($R^2 = 0.85$), which confirmed the close relationship between the selected factors and the practical attribute.

The mathematical model of the actual level of national food security built on the basis of economic and statistical indicators of agricultural enterprises is as follows:

$$Y_i = 57,01 + 0,28x_{1j} + 0,12x_{2j} + 0,1x_{3j}$$

According to the results of the mathematical model, the most significant impact on the actual level of the food security indicator is the degree of provision of agricultural producers with production assets (by all types). Financial results (profit) have a lesser impact, which is explained by the specifics of its use in the current conditions of agricultural business in Ukraine and the minimisation of investment in agricultural production.

Among the components of the GFSI in 2022, Ukraine has the lowest scores in the accessibility component (48.1) and the sustainability and adaptation component (41.5). Despite the high level of chemicalisation of the country's agriculture, agri-food products are characterised by a relatively high level of quality and safety – 71.3. In the context of national importance, a significant problem for Ukraine today is the economic accessibility of the required amount of food for the population of Ukraine. In particular, this problem will be exacerbated in 2022 with the outbreak of the military conflict and a sharp decline in the nominal and real incomes of the population. According to the calculation materials, in 2022 the growth rate of the cost of the consumer food basket (in terms of the cost of a borscht set) was 166.5%, while the average salary of Ukrainians decreased by 16.5% (Figure 2).

Food is the primary expenditure of the Ukrainian population, occupying the largest share in the structure of household expenditure. In 2022,

Ukrainians spent on average about 41.7% of all expenditures on food, 15.5% on housing and utilities, 5.1% on health care, 4.4% on household transport and 3.7% on communication. Traditionally, education, recreation and other non-material needs of Ukrainians have remained and still need to be met. The average household expenditure for all family members was 10,394 UAH, i.e., 259 USD per month and about 8.6 USD per day. According to the World Bank, about 24% of the population in Ukraine today lives below the poverty line, and this figure may soon rise to 55% (How the poverty rate in Ukraine has been changing).

Ukraine has developed a Draft Food Security Strategy for the period until 2030. Its main goal is to ensure access to safe food for all social groups in the country and create conditions for food independence. The strategy defines key priorities, tasks and mechanisms for achieving the strategic goal. The main sources of financial support for the implementation of the strategy are the state and local budgets, as well as funds not prohibited by the legislation of Ukraine. While paying tribute to the full scope and content of the defined food security strategy, it should be noted that the weakest point of any government initiative in Ukraine is their insufficient funding. According to the authors, the strategy pays insufficient attention to the tools for ensuring food security on the basis of sustainable and inclusive development, as well as to the areas of action related to the strategic development of green agriculture and rural areas.

Transformational changes on the basis of sustainable development should become the basis for intensifying the attraction of socially responsible investment flows to the agricultural sector of Ukraine. This transformation is based on the introduction of digital technologies (Kramarenko, 2022). In addition, the existing problems of increasing chemicalisation and degradation of agricultural

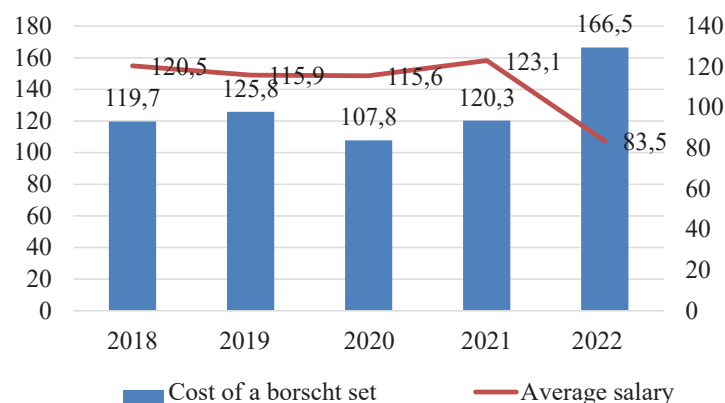


Figure 2. Rate of change in the cost of food and average wages in Ukraine, %

Source: calculated by the authors on the basis of their own statistical research and data (Socio-economic indicators)

land should be solved in the short term by socially responsible agricultural enterprises. It is the source of creation of agricultural and food products, the quality, quantity and availability of which will meet the criteria and indicators of food security of the country. Moreover, it is socially responsible agribusiness that develops on the basis of sustainability and "green" agro-economy, which can create the potential for Ukraine's participation in ensuring the food security of the EU countries and solving the global hunger problem in the world. In the conditions of a military conflict, when the vector of directing the state's financial resources is predominantly non-agricultural, it is responsible agribusiness that should take on the main functions of contributing to ensuring the nation's food security. Modern challenges encourage to increase the role of food security not only for Ukraine, but for the world society as a whole (Irtysheva, 2022; Popadynets, 2021).

At the same time, the state must provide comprehensive systemic institutional support and create conditions for stabilising the investment climate in the agricultural sector and for representing and protecting the investment interests of Ukrainian farmers in the European economic area.

4. Conclusions

Ensuring food security is the most important global challenge of modern times, affecting the life expectancy, health and quality of life of the world's population. Ukraine has a strong agricultural potential and all the conditions to ensure national food security and participate in international processes

to eliminate hunger on a European and global scale. Despite the challenging environment, economic and political instability, and the ongoing military conflict.

Ukraine's agriculture demonstrates relatively high indicators of sustainable development compared to other sectors of the Ukrainian economy. At the same time, the consequences of the hostilities could not but affect the state of food security: in 2022, Ukraine lost 13 positions in the GFSI global ranking. The main problems in ensuring the country's food security were identified:

- Irrational use of land and labour resources, ageing and migration of the rural population;
- sharp loss of biodiversity;
- high level of chemicalisation of agricultural production;
- loss of potential for high-quality reproduction of agricultural land;
- significant inclusive gaps in rural areas;
- low level of funding for agricultural science and the predominantly raw material orientation of the agricultural sector.

Despite these difficulties, Ukraine is now sufficiently self-sufficient in terms of food security (with the exception of dairy products, fruit, berries and grapes). In particular, the self-sufficiency rate for cereal products is 433%, which indicates the potential for ensuring food security at the national and European level. The authors of the article believe that this can be achieved by intensifying the transformation of the Ukrainian agricultural sector towards sustainable development and increasing the level of social responsibility of agricultural enterprises.

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