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## CONSEQUENCES OF THE RUSSIAN AGGRESSION: RISKS TO UKRAINIAN FOOD-SECURITY AND GLOBAL FOOD RESILIENCE

**Abstract. The objectives.** *The article examines the main consequences for the food industry development in ensuring food security caused by the Russian invasion of Ukraine. Important factors of acute disturbance affecting the global food supply have been identified, especially in the supply of vegetable oil, grains, corn and oil seeds, miscellaneous grains and fruit. The existing risks of Ukrainian food security has been analyzed for that purpose. Based on the research results, complex directions for supporting the food industry recovery were proposed. This will help prevent a humanitarian catastrophe in order to provide food for the population and make a greater contribution to strengthening the global food system.*

**The results of the research.** *The article presents the main directions for the restoration of normal activity in the food industry, which include coordinated actions of the international community, government agencies, manufacturers and society. To combat the threat of increased hunger and food security, it is necessary to strengthen international cooperation in order to prevent hostilities.*

**Keywords:** *war consequences, global food crisis, food industry, food security, industrial recovery, Russian-Ukrainian war*

**Introduction.** Today the world is confronting new threats to international peace and security. The world is facing a new threatening challenge – war. The unmotivated aggression of one of the world's largest country and the Russia's invasion of Ukraine has tragic consequences not only for Ukrainian people but consequences for the whole world, such as population massacres, inflation, poverty, food crisis and hunger, energy crisis, which could lead to a global recession. Due to Ukrainian unique geographical location, its ability to produce a variety of products, including food not only for its own consumption but also for the needs of other countries and the openness of the Ukrainian economy, Russia's invasion is

a hard blow for global food value chains. Most countries around the world are already concerned about disruption of Ukrainian food supplies, which threaten global food security. The United Nation (UN) has warned that Russia's invasion of Ukraine in a few months could cause a global food crisis that which will take a number of years. The organization's general secretary, Antonio Guterres, said the war had exacerbated the food security situation in the poorest countries due to rising prices. The Russian invasion forced Ukraine to stop shipping huge volumes of oil from its ports, as well as grain: corn and wheat. This has reduced global supply and led to a sharp rise in prices for alternative products. According to the UN, world food prices are now almost 30% higher than at the same time last year<sup>1</sup>. That's why the Ukrainian food industry recovery is an extremely important issue not only to strengthen food security in Ukraine, but also to prevent hunger in other countries. This determines the relevance of the chosen topic.

To determine the extent of how Ukraine will be able to continue to maintain global food security during the war, it is important to identify not only Ukrainian's capacity to export food, but also how Ukraine ensures its own food security. Indeed, according to the Rome Declaration on World Food Security, each country must ensure the human right to complete nutrition, which is the key to the national security<sup>2</sup>.

The purpose of the article is to analyze the Russian invasion impact on food security in Ukraine and its impact on global food chains. This provided to substantiate the recovery toolkit for Ukraine's food industry development to strengthen food safety.

The methodology of the study is derived from the main general scientific and special methods of knowledge of economic phenomena, namely, structural analysis for the study of structural changes as a result of changes in the ratio of activities and structure of the food industry; statistical methods – estimation of loss of potential of food industry in Ukraine; rating method and comparative analysis – to determine the place of Ukrainian industry among other countries; methods of induction and deduction – in substantiation of conceptual basis of formation of effective tools for restoration of possibilities of production of Ukrainian food. The main method of the study is structural-functional and comparative analysis – the study of the factual material that characterizes the capabilities of the food industry in Ukraine in the global system of food security.

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<sup>1</sup> ООН: война в Украине может привести к нехватке еды во всем мире. 19 мая 2022. Русской службы BBC News. Available at: <https://www.bbc.com/russian/news-61506945>

<sup>2</sup> Draft declaration of the world summit on food security. World Summit on Food Security. Rome, 16-18 November 2009. FAO. [https://www.fao.org/fileadmin/templates/wsfs/Summit/Docs/Declaration/WSFS09\\_Draft\\_Declaration.pdf](https://www.fao.org/fileadmin/templates/wsfs/Summit/Docs/Declaration/WSFS09_Draft_Declaration.pdf)

There are numerous assessments of the war impact on global security by domestic and foreign researchers that are appearing in public discussion today. They are reflected in many reports of international organizations, consulting agencies, research centers, and scientific works of foreign and Ukrainian scientists. FAO has predicted price rises for food and animal feed of between 8 and 22% above the already high levels seen at the start of 2022, with other major global suppliers filling only part of the shortfall in supply from Russia and Ukraine<sup>3</sup>. Rising food prices mean rising food insecurity. The Food and Agriculture Organization of the United Nations (FAO) predicts that the number of undernourished people globally will increase by between 7.6 million and 13.1 million as a result of the situation in Ukraine and of the ripple effects on food prices and availability<sup>4</sup>. The World Food Programme (WFP) anticipates significant disruption to its shipments from Odesa destined for West Africa – including to Nigeria, where 8.7 million people are food insecure – for distribution from May<sup>5</sup>. The FAO predicts that due to the war, between 20 and 30 percent of winter crop acreage will not be harvested, and that Ukrainian farmers will reap lower yields from acreage they can harvest. Neither the United States Department of Agriculture (USDA) nor the FAO have yet estimated the impact of the war on global export from Ukraine's next winter crops, set to be planted in 2022 for harvest in 2023. [Welsh, 2022]

Lack of access to an adequate diet, if prolonged, risks leading to an increase in the incidence of chronic malnutrition, which in turn increases morbidity and mortality, constrains cognitive and physical development and reduces both productivity and lifelong earning potential among affected individuals and their children. [Wellesley, L. et al, 2020; Akseer, N. et al., 2022]. If a large percentage of the population is already unable to afford a healthy diet, any increase in food prices has the potential to stoke unrest. Rapid food price inflation in 2011, and its contribution to household economic insecurity, was one factor behind the unrest and protests experienced as part of the Arab Spring in Egypt. A shortfall in wheat exports from Russia and Ukraine was central in driving up prices in that instance.

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<sup>3</sup> Food and Agriculture Organization of the UN (2022), Information Note: The importance of Ukraine and the Russian Federation for global agricultural markets and the risks associated with the current conflict

<sup>4</sup> Food and Agriculture Organization of the UN (2022), Information Note: The importance of Ukraine and the Russian Federation for global agricultural markets and the risks associated with the current conflict.

<sup>5</sup> World Food Programme (WFP) (2022), 'Food security implications of the Ukraine Conflict', WFP, <https://www.wfp.org/publications/food-security-implications-ukraine-conflict>; WFP (2022), 'North Eastern Nigeria emergency', <https://www.wfp.org/emergencies/nigeria-emergency>.

In that context, this war will have multiple implications for global markets and food security, representing a challenge for food security for many countries, and especially for low-income food import dependent countries and vulnerable population groups<sup>6</sup>.

### **1. Food security of Ukraine in the pre-war period**

In order to determine the impact of the military aggression on the state of Ukraine's food system and its ability to fill global food chains, it is important to examine the trends that have enabled Ukraine to meet the challenges of food security in the pre-war period. Indicators of how well the country is addressing its domestic food security problems can be derived from the FAO indices and the methodology approved by the Cabinet of Ministers of Ukraine "Some Issues of Food Security" 05.12.2007. The definition of key food security indicators is based on the following indicators and criteria:

- 1) The daily energy value of a person's diet, defined as the sum of products per unit mass of certain types of products consumed by a person during the day and their energy value. The maximum criterion is 2,500 kcal per day, with 55% of the daily ration provided by animal products;
- 2) The provision of human diets by the main types of products defined as the relationship between the actual consumption of a particular product and its rational rule;
- 3) Adequacy of grain reserves in public resources, defined as the ratio between the amount of food grains in the State reserve and the volume of domestic consumption of bread and bakery products in terms of grain. The limiting criterion for this indicator is its 17% level, which corresponds to 60 days of consumption;
- 4) Economic affordability of food, defined as the share of total food expenditure in total household expenditure. The limit for this indicator is its 60% level;
- 5) Differentiation of food prices by social group, which is tracked over time and is calculated as the ratio between the cost of food for the 20% of households with the highest incomes and the cost of food for the 20% of households with the lowest incomes;
- 6) The capacity of the domestic market for individual products, which is tracked over time and measured in physical terms as a product of consumption of a particular product and the average annual population;

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<sup>6</sup> Impact of the Ukraine-Russia conflict on global food security and related matters under the mandate of the Food and Agriculture Organization of the United Nations (FAO) (CL 169/3)

7) Food independence for a particular product, defined as the ratio between the volume of imports of a specific product in kind and the capacity of the domestic market. The limiting criterion for this indicator is its level of 30%.

Ensuring food security is a strategic task for each country, because it depends on social and economic stability in society, preventing social crises. Food security has a critical impact on the health and well-being of citizens. According to the World Health Organization (WHO) Regional Office for Europe, about 80% of all non-communicable diseases in the world are malnourished. Modern world medical research in the field of nutrition determines new approaches and principles of healthy and balanced nutrition, which are the basis of a healthy lifestyle, and dietary changes are an effective method of preventing diseases, as well as in the treatment of severe chronic diseases. [Сичевський М.П.]

Ensuring food security will strengthen our national security. First and foremost, food security depends on the economic availability of food to the population. A study of the consumption of basic foodstuffs per person in the country shows that the share of consumption of animal products for almost 20 years was below the norm by -55% of the daily ration and varied between 32,2%-53,8% (Table 1). According to the United Nations Food Organization, the average daily caloric intake varies between 3,400 and 3,500 kcal in the EU, 3,900 kcal in the USA and, the share of animal products in the diet of these countries, as well as in Ukraine, is on average 29-30%.

Table 1

**Consumption of food per capita in Ukraine, kg per year**

	The minimum rate	Ratio-nal norm	Consumption of food per capita e, kg per year										
			2000	2005	2010	2013	2014	2015	2016	2017	2018	2019	2020
Meat and meat products	<b>52</b>	<b>80</b>	32,8	39,1	52	56,1	54,1	50,9	51,4	51,7	52,8	53,6	53,8
Milk	<b>341</b>	<b>380</b>	199,1	225,6	206,4	220,9	222,8	209,9	209,5	200,0	197,7	200,5	201,9
Eggs (pieces)	<b>231</b>	<b>290</b>	166	238	290	309	310	280	267	273	275	282	278
Bread	<b>94</b>	<b>101</b>	124,9	123,5	111,3	108,4	108,5	103,2	101,0	100,8	99,5	97,6	96,6
Potato	<b>96</b>	<b>124</b>	135,4	135,6	128,9	135,4	141,0	137,5	139,8	143,4	139,4	135,7	134,0
Vegetables	<b>105</b>	<b>161</b>	101,7	120,2	143,5	163,3	163,2	160,8	163,7	159,7	163,9	164,7	164,0
Fruits, berries and grapes	<b>68</b>	<b>90</b>	29,3	37,1	48	56,3	52,3	50,9	49,7	52,8	57,8	58,7	56,5
Fish and fish products	<b>12</b>	<b>20</b>	8,4	14,4	14,5	14,6	11,1	8,6	9,6	10,8	11,8	12,5	12,4
Sugar	<b>32</b>	<b>38</b>	36,8	38,1	37,1	37,1	36,3	35,7	33,3	30,4	29,8	28,8	27,8
Oil	<b>8</b>	<b>13</b>	9,4	13,5	14,8	13,3	13,1	12,3	11,7	11,7	11,9	12,0	12,3

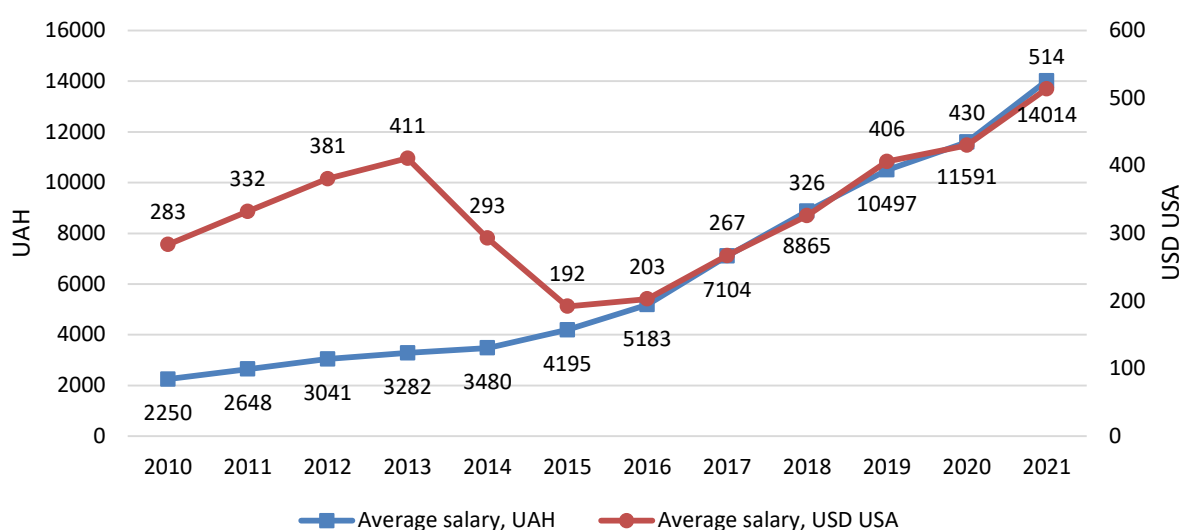
Source: compiled according to the State Statistics Service of Ukraine. Available at: [http://www.ukrstat.gov.ua/druk/publicat/kat\\_u/2021/zb/07/Zb\\_Bsph\\_2020.pdf](http://www.ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/07/Zb_Bsph_2020.pdf)

On the positive side, consumption of animal products has gradually increased from 23.0% (minimum 611 kcal) in 2000 to 29.7% (maximum 800 kcal) in 2019. In 2020, average per capita food consumption improved for almost all food groups, with an annual increase of 0.6 kg in meat consumption (beef and poultry, namely lean meat), 2.3 kg in milk, 0.7 kg in fish, and 7 kg in eggs, Vegetables – 0.8 kg, fruit – 0.9 kg. At the same time, Ukraine does not cover domestic needs in such product groups as sugar (-4,2 from minimal norm in 2022), fruits, berries and grapes (-33,5), fish and fish products (-8,4), which is a negative indicator for healthy nutrition. It should be noted that over the past almost 20 years there has been an increase in the average consumption per capita of foodstuffs important for a healthy diet: fruits – twofold (in relation to 2000), eggs – by 70%, meat – by 63%, vegetables – by 62%. In turn, consumption of bakery products and sugar decreased by 22% respectively<sup>7</sup>. That is, the Ukrainian food market operates under conditions of low demand for almost all types of

<sup>7</sup> The State Statistics Service of Ukraine Available at: <http://www.ukrstat.gov.ua>

food by the majority of the population. In addition, the share of food costs in the structure of household expenditures is large and constantly growing. This is a sign of the low capacity to pay of the majority of the population.

An important indicator of the affordability of food security is the income of the population. The main and main source of income of the able-bodied population is wages. Nominal wages during 2000-2021. has been growing steadily (fig. 2), but the growth rate has not exceeded the inflation rate in Ukraine. In dollar terms, wages declined during the crisis periods: in 1998-1999, 2008-2009 and 2014-2015. Since 2015, the level of wages in USD and UAH increases to 514 US dollars (14014 UAH).



**Figure 1. Dynamics of the average monthly salary of full-time employees in Ukraine in 2010-2021**

Source: compiled by the authors according to the State Statistics Service of Ukraine and the NBU. Available at: <http://www.ukrstat.gov.ua> <https://bank.gov.ua>

According to the following indicator "Adequacy of grain reserves in public resources" (ratio between the amount of food grains in the State food reserve and the volume of domestic consumption of bread and bakery products per grain, the threshold criterion is 17%). Grain production in the country has a steady upward trend. Total grain production in the country in the period 2000-2021 increased more than threefold, due to an increase in yield (2.5 times). At the same time, it should be noted that Ukraine is among the ten largest world producers of wheat, corn, and barley. Thus, in 2021 there were more than 84 million of them. Tons of cereals and pulses, oilseeds – 22.6 million tons were collected. In particular, among cereals: wheat – 32.4 million tons, barley – 10 million tons. tons, buckwheat – 110 thousand tons; legumes: peas – 581.5 thousand tons, millet – 191 thousand tons, corn – 40 million tons.

As well as oilseed crops: sunflower – 16.3 million tons, soy – 3.4 million tons, rape – 2.9 million tons. [Лещенко Р.]

In turn, in almost 20 years, domestic grain consumption has declined by 29% due to reduced consumption of bread and bread products (population reduction of more than 7.4 million people) and utilization for feed (reduction of the number of animals – pigs by 4.5 million head, cattle by 7.5 million head, etc.). In recent years, the level of production of cereals and pulses far exceeds the level of domestic consumption, which testifies to the sustainability of the country's food security.

The affordability indicator, defined as the share of total food expenditure in total household expenditure, shows a negative trend. The limit criterion for this indicator is considered to be its level of 60%, and in Ukraine for 2020, the share of food products in the overall structure of consumer expenditure was 42.2%.

Consequently, the share of food expenditure in Ukraine remains one of the highest in the world. Based on data from the USDA, which regularly monitors food expenditure, in more than 100 countries, this can be seen. The top countries are the United States, Singapore, the United Kingdom, Ireland, Canada, Switzerland, Australia and Austria, whose population spends on food less than 10%. In Germany, the Netherlands, Finland, Qatar, Belgium, South Korea – up to 15%. A number of countries – Poland, Slovakia, Hungary, Bulgaria, Israel, Uruguay, Kuwait, China, Turkey and others – have food costs ranging between 16 and 25%. In Belarus, Georgia, the Russian Federation, Uzbekistan and Jordan, India, Macedonia and Paraguay, the figure is within 30%. This confirms the provision of the Engel Law, according to which, as incomes rise, the share of expenditure on the purchase of essential goods decreases, poor households spend relatively more on the food they need to survive.

At the same time, in absolute terms, food costs are rising. The more developed and wealthy a country is, the less its population spends on food. Ukraine ranks 93rd in the ranking and is ahead of Uganda (share of expenditure on food 44.2%), Kazakhstan (44.9%), Angola (48.6%), Bangladesh (53.5%) and Nigeria (59.0%), which is the last place on the list. Every Ukrainian in 2018 paid an average of 858 US dollars for food and non-alcoholic beverages.

The next indicator – differentiation of the food expenses by social groups – confirms the high level of differentiation of the food expenses by social groups in Ukraine. The coefficient of differentiation of food expenses for social groups was high at 1.67. Animal products (meat, fish and milk) and fruit and berry products (1.7-2.0 times) have been the most differentiated consumption within the upper and lower quintiles for years. Households that are



in the lowest quintile in terms of equivalent income per person are almost at the risk of food insecurity, as their share of food consumption is approaching the threshold.

The foregoing highlights the problem of poverty in Ukraine, where a large proportion of the population is experiencing difficulties, first and foremost in meeting physiological needs. People are poor if the standard of living (income or consumption) is below this limit. The practice of the economically developed countries shows that a family is poor, where the average income per person does not exceed the subsistence level, that is, the subsistence minimum is taken as the poverty line. The problem of poverty in Ukraine, according to the World Bank Report «Poverty and shared prosperity 2020», is very acute today – 25% of the population lives below the poverty line, and the share of poor people in conflict zones reaches more than 50%. That is, the process of impoverishment continues even with the provision of subsidies and other forms of social assistance to the poor. The impoverishment of the population was usually observed until 2014, but today it has gained an accelerated pace due to the military aggression of Russia and the military situation in the country, which requires the introduction of protective measures to prevent genocide of the Ukrainian people. On this basis, it can be considered that Ukraine is a poor country, and poverty is a direct threat to the national security of the country.

The domestic food manufacturing partly consists of a few branches of the real sector of the Ukrainian economy, which had positive dynamics of production. Thus, the volume of production of food products has increased almost threefold: from 187.52 billion UAH in 2010 to 679.66 billion UAH in 2021.

Table 2

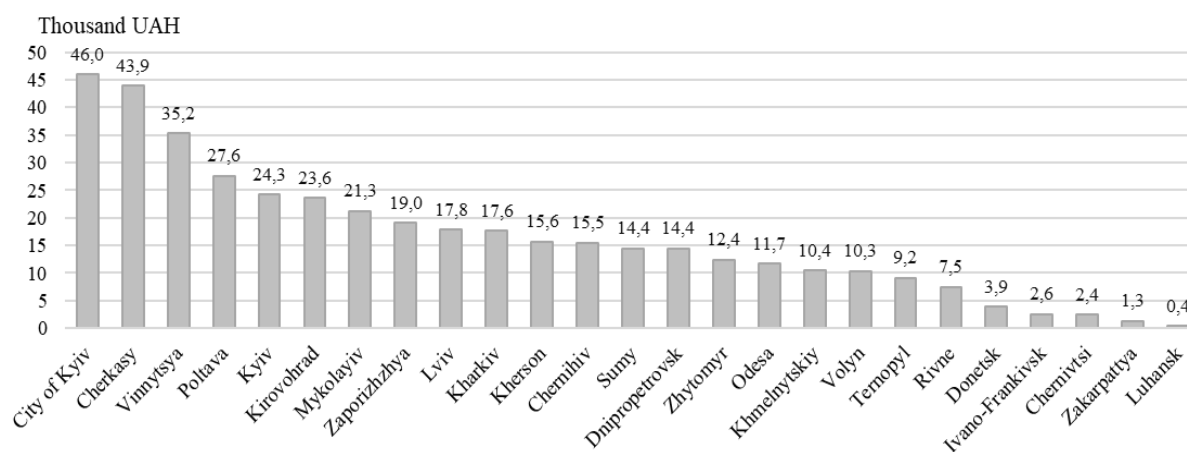
**Structure of Ukrainian Food formation and consumption of the domestic market, %**

Indicator	Formation		Consumption		Export orientation production *	Import dependence production **
	own production	import	internal consumption	export		
2010	88.2	11.8	87.9	12.1	13.7	13.4
2013	89.4	10.6	88.3	11.7	13.1	11.8
2017	89.8	10.2	85.0	15.0	16.7	11.4
2019	89.5	10.5	87.1	12.9	14.4	11.7

*Source: based on authors' calculations*

These data indicate a high level of self-sufficiency of Ukraine in the main types of food from 2010 to 2019. (production for domestic consumption within the country). The share of domestic production in domestic consumption increased during the period under review, including in the production of meat products, vegetable oils, non-alcoholic waters). Consequently, the level of self-sufficiency in Ukraine in 2019: meat and meat products amounted to 110.2%, eggs – 124%, vegetables and melons – 104%, milk and dairy products 103%, 100% for potatoes; 334% for grains for domestic consumption.

Food self-sufficiency means that the basic food needs of the population are met through domestic production, which means that the State is self-sufficient in food in meeting the basic food needs of its citizens. Food security should be addressed not only at the national level but also at the regional level. Satisfaction of the food needs of the population (self-sufficiency level in accordance with the recommended consumption by the Ministry of Health), taking into account the sufficiency index and within its purchasing power. Most of the production comes from own regional production. This is due to the uneven socio-economic development of individual territories of the State, which is the result of significant differences in natural and climatic conditions, Production and economic potential, etc. That is, the level of food supply in different regions of Ukraine is not the same (fig.2).

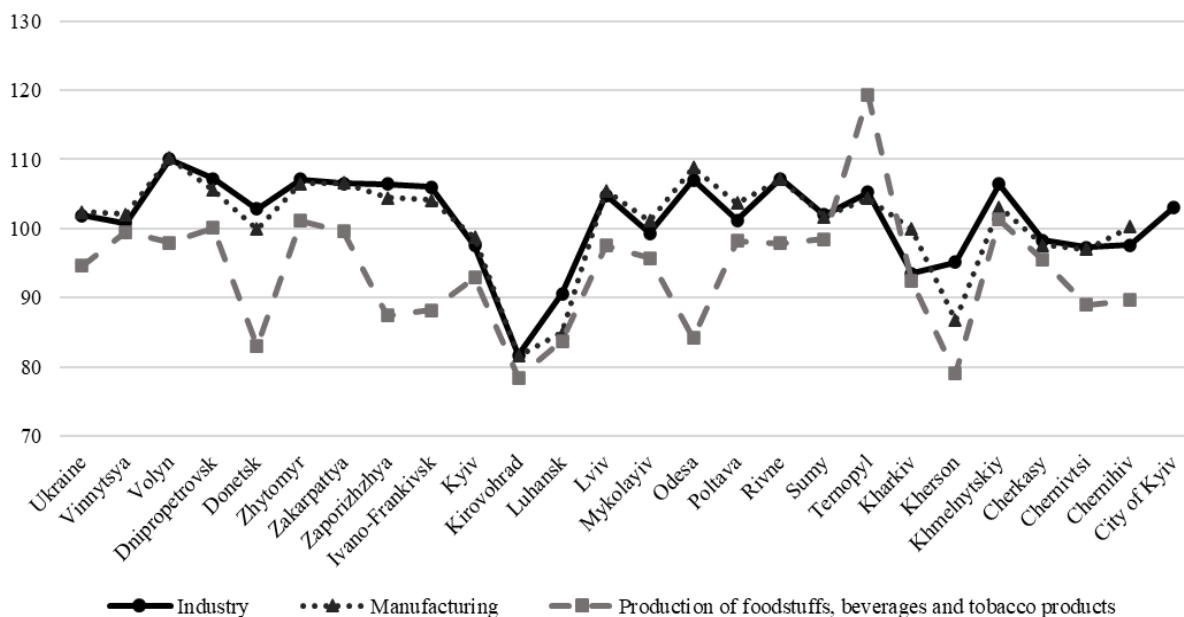


**Figure 2. Distribution of regions of Ukraine by production volumes of food industry per capita for 2021, thousand UAH**

Source: compiled by the author according to the State Statistics Service of Ukraine. Available at: <http://www.ukrstat.gov.ua>

The most self-sufficient regions of food production per capita in 2021 are Kyiv and Cherkasy, Vinnytsya, Poltava, Kirovohrad, Kyiv, Zaporizhzhya, Lviv, Kharkiv, Kherson regions. It should be noted that the importance of the food industry for a large part of the regions, as its

weight in the total sales is more than 35%. Regional differentiation of food industry production, including in its main product groups, is shown in Figure 3.



**Figure 3. Industrial production indices for 2021, % by 2020**

Source: compiled according to the State Statistics Service of Ukraine Available at: <http://www.ukrstat.gov.ua>

The analysis of the development of the food industry in the regions of Ukraine revealed the commonality of the problems that led to the crisis, and the level of their severity in each region determined the peculiarities. These are, first of all, the lack of raw materials, which is due to a significant reduction in agricultural production, and the shortcomings in the country's foreign economic policy, which have strengthened the raw material orientation of the country's food exports; loss of foreign markets due to high production costs and unfavorable customs policy of some importers, intensification of competition in the markets of traditional exports of food industry of Ukraine (sugar, alcohol, confectionery, meat, animal oil); narrowing of domestic markets due to the impoverishment of a large part of the population; availability of obsolete and worn-out equipment; excessive energy and material consumption of products; limited financial resources of food companies; insufficient adaptation of food companies to market conditions. Among the reasons that hinder the further development of the food industry, we should focus on the imperfections of the spatial organization of the food industry, which leads to irrational use of natural resources and raw materials, and reduces the effectiveness of interregional economic ties.

## 2. The importance of the Ukrainian food industry in achieving global food security

Exploring Ukraine's potential as a world food exporter, it is advisable to use the Global Food Security Index (GFSI), which allows you to track the main problems of affordability, physical availability, quality and safety of food in 113 countries.

From the table. 3, which presents the ratings and positions of different countries, we can see that Ukraine lags behind in terms of economic affordability, physical availability and quality of food from reference countries from the nearest neighbors.

Table 3

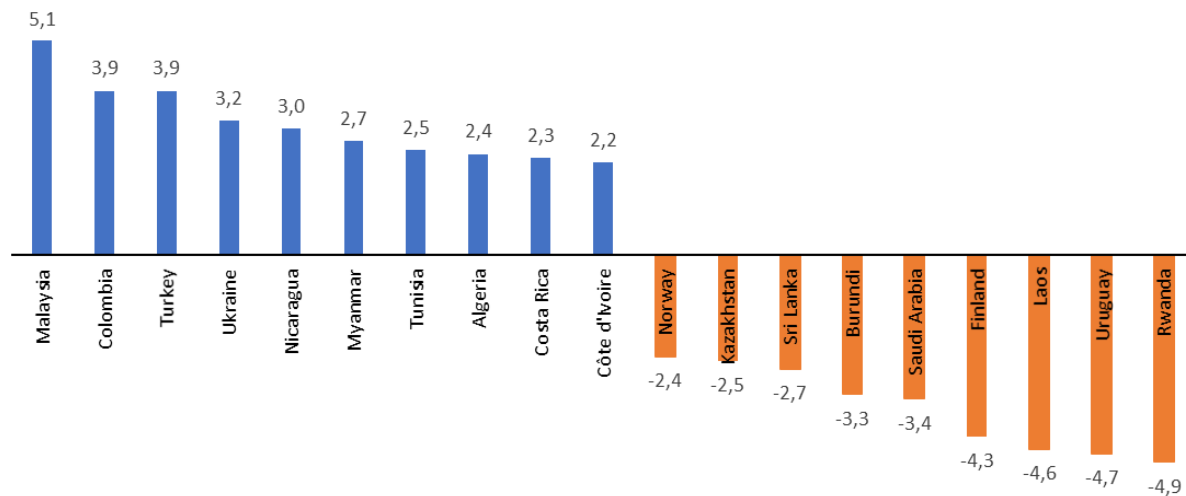
### Country positions in the Global Food Security Index 2021

Global ranking	Country	Overall score	Affordability	Availability	Quality and Safety
22	Poland	74.9	87.0	65.0	80.5
23	Russia	74.8	87.0	65.0	80.5
29	Romania	72.4	81.8	66.6	85.4
31	Hungary	72.1	83.5	66.9	77.4
36	Belarus	70.9	67.6	61.6	82.8
48	Turkey	65.1	65.3	60.9	75.8
58	Ukraine	62.0	73.9	51.8	71.9

Source: compiled according to the Global Food Security Index. Rankings and trends: Available at: <https://impact.economist.com/sustainability/project/food-security-index/Index>

In 2021 Ukraine ranked 58 out of 113 countries, gaining 62 points on the 100-point scale, which is 3.2 points higher than last year. So food security was strengthened. The country Overall food security in Ukraine has improved as a result of the steady improvement of most indicators. With the exception of a decline in the low level of food affordability (GDP per person in Ukraine is below the world average by 10.5%) and access to finance for farmers (below the world average by 12.6%). The weakness in the physical availability of food is due to corruption (37.6% below the world average) and political instability (35% below the world average) inadequate rural infrastructure (17% below world average). At the same time, it should be noted that nutritional levels (kcal/person) are estimated to be 13% higher than the world average and post-harvest food losses are 5.5% lower than the world average. At the same time, Ukraine remains at the end of the ranking among European countries, behind the last place only Serbia with a score of 61.4 points.

The chart shows those countries whose overall scores have increased or declined the most when comparing 2021 to 2020 (Figure 4).



**Figure 4. Biggest changes in overall score between 2020 and 2021**

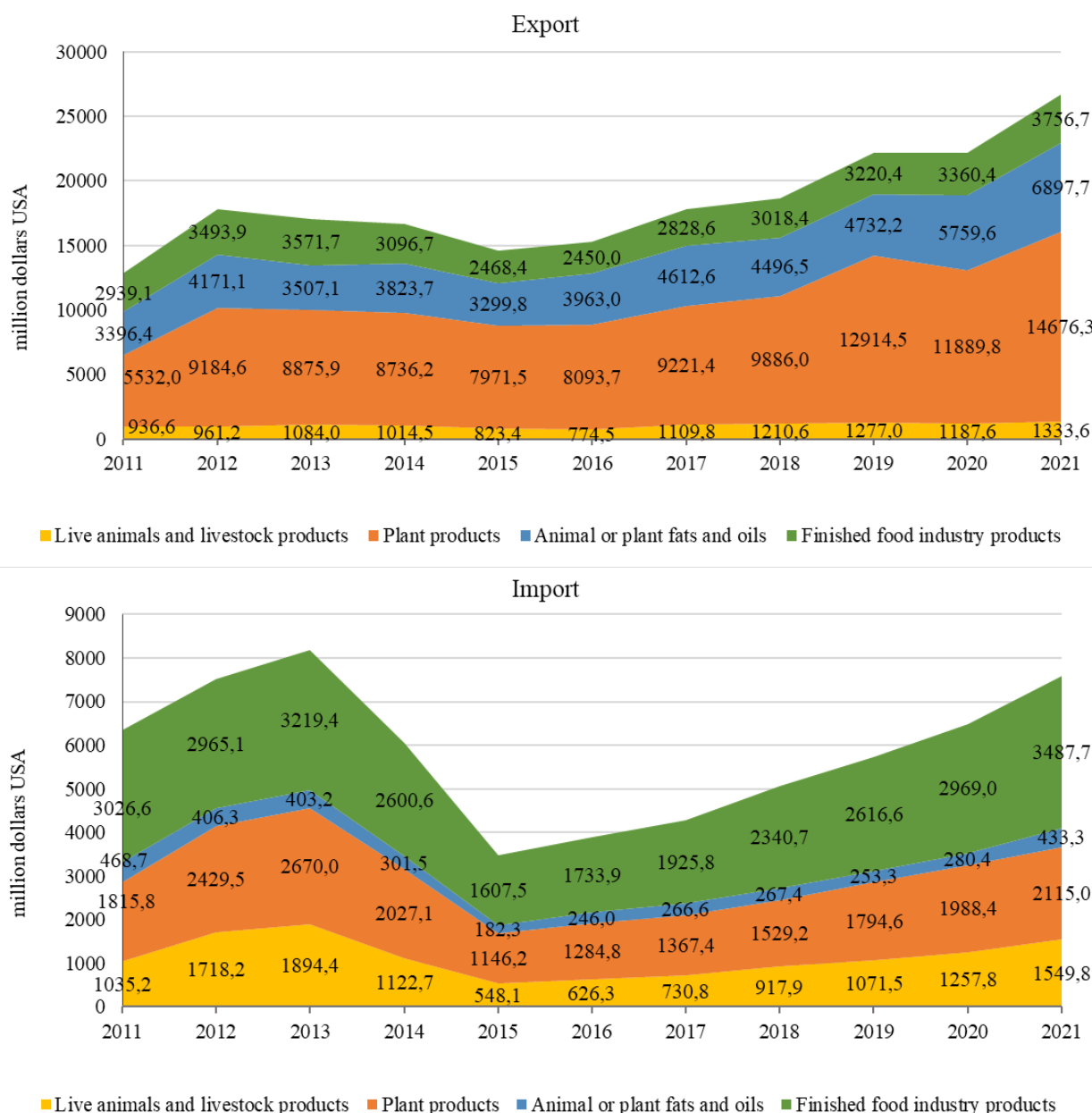
Source: compiled according to the Global Food Security Index Rankings and trends: Available at: <https://impact.economist.com/sustainability/project/food-security-index/Index>

Thus, despite Ukraine's strong capabilities in food production and food security, Ukraine has failed to reach the top of the global food security rankings. European countries show some of the best performance in the world. Thus, the first five steps of the Index were taken by Ireland, Austria, Great Britain, Finland and Switzerland. Of the four categories of the Index, the European region showed the best indicators in terms of availability. Although Ukrainian food has a fairly high level of quality and safety, due to the presence of a developed food complex in Ukraine (almost a quarter above the world average), national dietary recommendations and a high useful composition of Ukrainian food (above the world average by a third). However, the imperfection of nutrition monitoring and supervision (an indicator that measures the state's control over the nutritional status of the population, including the collection of data on malnutrition, eating disorders) has significantly worsened Ukraine's position on this component of food security. And one of the most important factors is poverty and low solvency of the population (the share of food expenditures in the income structure, which is one of the lowest in Europe is 42.2%).

This state of formation of internal food security does not hinder the country's ability to be an active participant in international food trade. Moreover, the prevention of famine in many countries of the world depends on the export of Ukrainian food. According to the Ministry of Agrarian Policy and Food of Ukraine, 20 years ago Ukraine "fed" 40 million

people in the world. In 2021, Ukraine's contribution is equivalent to the food of about 400 million people.

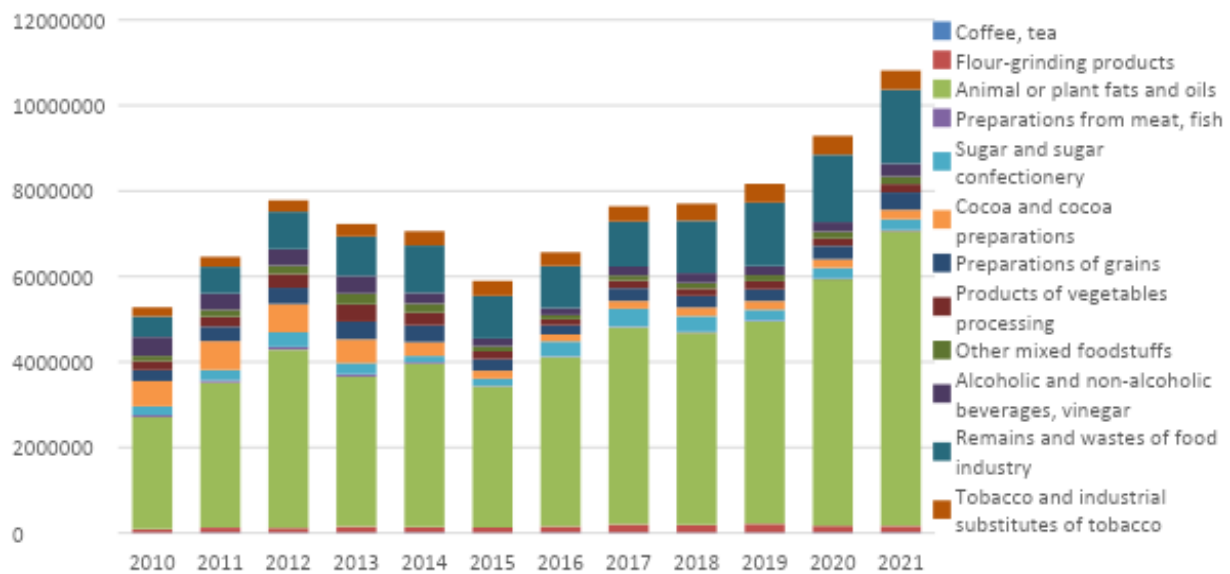
In 2021, Ukraine's food products worth 26.7 billion US dollars were exported (or 40.5% of total exports of goods from Ukraine), which is 33% more than in 2020. (Fig. 5). The most important in food export structure in 2021 were cereals, oil, oilseeds and cakes, solid waste from the extraction of vegetable fats and oils (Fig. 6, 7).



**Figure 5. Dynamics of foreign trade in agri-food products in 2011-2021**

Source: compiled according to the Trade Map: Trade statistics for international business development. Available at: <https://www.trademap.org/>

According to the Relative Comparative Advantage Index (RCA), Ukrainian food products are twice as competitive not only at the world average (2.03), but also ahead of such powerful world exporters as Spain (1.69), Great Britain (1.42), Italy (1.72), the United States (1.03), Germany (0.97) and Belgium (1.88)<sup>8</sup>.



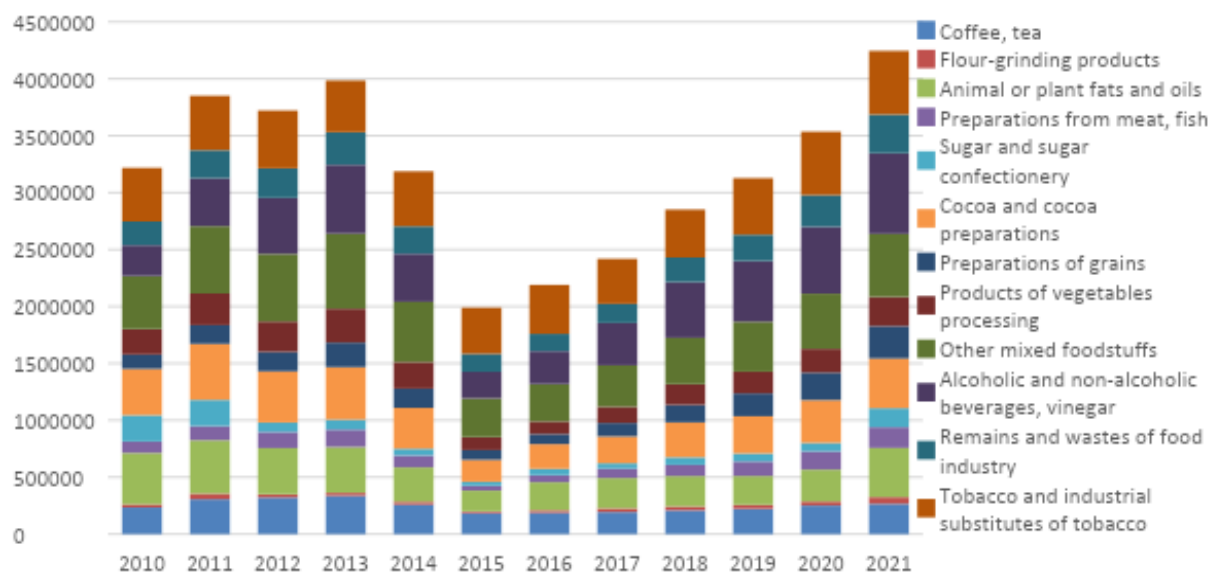
**Figure 6. Dynamics of exported value of food products from Ukraine in 2010-2021, thousand dollars USA**

Source: compiled according to the Trade Map: Trade statistics for international business development. Available at: <https://www.trademap.org/>

Ukraine has exported food products to such countries: China – 15.5% in the structure of food exports, India – 7.1%, the Netherlands – 6.4%, Egypt – 5.8%, Turkey – 5.3%. Ukraine is significant to global food markets, as the largest exporter of sunflower oil, the fourth largest exporter of maize and the fifth largest exporter of wheat<sup>9</sup>.

<sup>8</sup> Ukraine Revealed comparative advantage for Food Products World between 1996 and 2015. Available at: [https://wits.worldbank.org/CountryProfile/en/Country/UKR/StartYear/1996/EndYear/2015/TradeFlow/Export/Indicator/RCA/Partner/WLD/Product/16-24\\_FoodProd](https://wits.worldbank.org/CountryProfile/en/Country/UKR/StartYear/1996/EndYear/2015/TradeFlow/Export/Indicator/RCA/Partner/WLD/Product/16-24_FoodProd)

<sup>9</sup> Chatham House (2020), 'Resource Trade Earth Dashboard', Available at: <https://resourcetrade.earth>



**Figure 7. Dynamics of imported value of food products from Ukraine in 2010-2021, thousand dollars USA**

Source: compiled according to the Trade Map: Trade statistics for international business development. Available at: <https://www.trademap.org/>

Imports of agricultural products and foodstuffs for the period increased by 29% by 2020 and amounted to 7.6 billion US dollars (or 10.8% of total imports of goods to Ukraine). The largest share in the structure of imports of agricultural products and food products were: fish, crustaceans and mollusks; edible fruits and nuts; alcoholic and non-alcoholic beverages; tobacco and industrial tobacco substitutes. In the structure of imports of agricultural products and foodstuffs, the largest share was occupied by: Poland – 10.3%, Italy – 7.2%, Germany – 6.8%, Turkey – 6.5%, Indonesia – 4.2%. Comparing the volumes of exports and imports of the commodity structure of basic food products, it can be concluded that there is a lack of production of finished food products from meat and fish, which could be a potential for import substitution.

According to FAO estimates, 7 million tons of wheat, 14 million tons of corn grain, 3 million tons of sunflower oil and 3 million tons of sunflower meal did not enter the world market due to Russia's blockade of seaports. This has already led to a record rise in world market prices and will inevitably result in a global food crisis and rising inflation. That is why it is fundamentally important to lift the logistical blockade of Ukrainian ports and stop looting by the aggressor country. At the same time, we consider it expedient to implement the priority of developing the export potential of the food industry of Ukraine by increasing the volume of deep processing of food products.



### **3. Russian invasion's impact on the Ukrainian food industry ability to ensure internal and external food security**

Under martial law, it is extremely important for the food industry to fulfill its critical function – to meet the food needs of the population, in particular those who are currently in the temporarily occupied territories, as they are left without domestic food and may be on the brink of starvation. It is also food security in order to prevent famine during military operations, which depends on the self-sufficiency of regions in their own food products, so that in the event of the destruction of logistics chains, the local population does not fall into the trap of humanitarian catastrophe. The most threatening consequences of the war for the food industry and food security of Ukraine are the destruction or partial disruption of food production in the occupied regions and the elimination of stocks of finished products in warehouses and warehouses, in particular, where air strikes took place (Zhytomyr, Kyiv, Kirovohrad, Chernihiv regions). This is especially true in the context of hostilities, when it is impossible to restore the normal operation of most processing plants. In particular, it is Kharkiv, Sumy, Chernihiv, Donetsk, Mykolaiv, Kherson, Kyiv regions, which leads to the death of the population and destruction of industry. Therefore, given the pre-war contribution of food production in the above regions, we can roughly estimate the losses for the food industry as a whole. According to the State Statistics Service for 2021, the volume of sold food products amounted to 679662.2 million UAH in Ukraine. The shares of the food industry in the above-mentioned oblasts, where it is currently impossible or partially lost the opportunity to conduct business, were Kharkiv – 6.91%, Sumy – 1.75%, Chernihiv – 2.92%, Donetsk – 2.22%, Mykolaiv – 3.61%, Kherson – 2.44%, Kyiv region – 7.06%. Thus, today about a quarter (24.69% of the volume of pre-war food products) has been lost, which is about 170 billion UAH. This has resulted in the loss of more than 72,000 jobs.

No less threatening are the disruption of logistics supply chains – the destruction of infrastructure (roads, rail transport), the closure of Ukrainian ports (90% of food exports from Ukraine) and the danger of maritime supplies in the Black Sea. All this leads to the destruction of value chains (cultivation — delivery of raw materials — processing — distribution — utilization of food waste), which results in higher prices for raw materials. Its impact will be felt mainly by companies in the feed industry, the baking industry, brewers and producers of vegetable oils and spreads, as they are more dependent on the supply of cereals and oilseeds. The war showed the need to ensure the smooth operation of the industry and the importance of improving strategic planning for the development of local food production within urban conglomerations and regions for their self-sufficiency in food supply.

#### **4. A set of mechanisms and tools for restoring the food system resilience in Ukraine**

Strengthening Ukraine's internal food security and contributing to global food security depends on resuming logistics flows of food supplies (especially the unblocking of seaports) and creating conditions for the normal operation of the food industry. This will depend on stimulating the innovative renewal of existing capacities and the creation of new innovative factories in accordance with EU requirements and standards (in particular, based on the EU policy of transformation of the food industry Food 2030<sup>10</sup>), as well as promoting access of Ukrainian producers to the latest equipment for food production (leasing programs, special credit programs, portfolio guarantees, etc).

***The priority tasks are:***

- recovery of raw materials for food processing enterprises by creating favorable conditions, in particular by developing a plan for implementation of incentives of the Law Ukraine № 7178, 24.03.2022 "About food security in martial law" in the regions, in particular on simplification procedures for regulating land relations and providing greater opportunities to use available agricultural land for food production;
- achieving a high level of meeting the needs of regions in food products of their own production by creating a favorable business environment for food producers SMEs, namely simplification of regulatory procedures (abolition of inspections, fines, cancellation of registration of tax invoices / calculations); opportunities to switch to a simplified system and voluntary payment of 2% tax, etc;
- opening of new processing facilities with a high share of added value and expansion of existing ones (more favorable conditions for doing business than in neighboring countries) based on public discussion and taking into account the interests of national enterprises producing highly processed products) provided to the Tax Code of Ukraine and other laws on the collection of certain taxes and fees during martial law, state of emergency);
- promoting the innovative renewal of food production through the integration of traditional technologies with modern biotechnology and nanotechnology; introduction of Industry 4.0 technologies for circular technology cycle management, planning and monitoring of resource use by stimulating cluster development in Ukraine, in particular the adoption of the National Cluster Strategy, which will create

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<sup>10</sup> What is Food 2030? *European Commission*. Available at: [https://ec.europa.eu/info/research-and-innovation/research-area/environment/bioeconomy/food-systems/food-2030\\_en](https://ec.europa.eu/info/research-and-innovation/research-area/environment/bioeconomy/food-systems/food-2030_en) (accessed: 30.04.2022).

- the necessary conditions for integration of Ukrainian producers with European clusters within the (European Cluster Collaboration Platform (European Cluster Collaboration Platform<sup>11</sup>)) with the possibility of scientific projects implementing;
- export supply recovery to the EU (establishment of land routes across Ukraine's western borders; simplification of phytosanitary measures and quotas for land transport, which make it difficult to cross EU borders to the final destination) through public discussion and involvement of Ukrainian stakeholders Strategies to promote land exports of Ukrainian food products (Plan to facilitate land exports of Ukraine's stocks of food products<sup>12</sup>);
  - improving the food affordability and territorial accessibility for all segments of the population, in particular in areas of active hostilities, through the using of special payment cards for food security of internally displaced persons and vulnerable groups of the population with basic foodstuffs. This involves the issuance of special cards for the insolvent population, which can be used to pay for the purchase of food products of national production such as Electronic food card programs to help Syrian families adopted by the Turkish government (The Electronic Food Card Programme)<sup>13</sup>;
  - ensuring the European food quality and safety level for reorientation to EU foreign markets and integration into global food supply chains by synchronizing the national market surveillance system with the European Conformity Assessment System and the market surveillance system (EU Market Surveillance Regulation 2019/1020; Decision 768/2008/EC on the general framework for the sale of products; Directive 2001/95/EC on the general conditions of food safety).

***At the next stages, important measures are:***

- stimulating investment processes to modernize the production capacity of existing and create new innovative factories in accordance with EU requirements and standards and promote access to the latest equipment for food production for Ukrainian producers (soft loans, leasing, etc.). In particular, the amendment of the Law of Ukraine "On state support of investment projects with significant investments

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<sup>11</sup> The European online hub for industry clusters. European Union. 2022. Available at: <https://clustercollaboration.eu/>

<sup>12</sup> Europe Plans to Boost Ukraine's Food Exports Using Land Routes. Bloomberg. 10.05.2022. Available at: <https://www.bloomberg.com/news/articles/2022-05-10/europe-plans-to-boost-ukraine-s-food-exports-using-land-routes>

<sup>13</sup> The Electronic Food Card Programme. Operation Overview Updated June 2013. Available at: [https://reliefweb.int/sites/reliefweb.int/files/resources/FoodE-Card\\_JUNE\\_2013\\_English%5B1%5D.pdf](https://reliefweb.int/sites/reliefweb.int/files/resources/FoodE-Card_JUNE_2013_English%5B1%5D.pdf)

- in Ukraine" provisions on insurance mechanisms and state guarantees of foreign investment;
- circular models introduction with deep processing of raw materials, which involves minimal or zero waste (energy efficiency measures: switching to alternative fuels, replacing equipment with more energy efficient; waste processing, deep processing of raw materials in production, etc.) by involving national products) to the European Platform of Circular Economy Stakeholders (European Circular Economy Stakeholder Platform<sup>14</sup>).
  - strategic planning of the development of local food production within urban conglomerations and regions, which will ensure a high level of self-sufficiency of regions in their own food production and will enhance the sustainability of the food system, so that in the event of the collapse of logistics chains, the local population will not be trapped in a humanitarian disaster, the adoption of the Strategy until 2030<sup>15</sup> and its implementation program.

## Conclusion

As a result of Russian military aggression, the Ukrainian food system has suffered enormous losses: air strikes and artillery shelling have damaged the material and technical base of many food industries and farms; the destruction of logistics infrastructure made it impossible to supply raw materials and sell food; the blockade of Ukrainian ports makes it impossible to supply Ukrainian food to Africa, Asia and Latin America. It threatens global food security and raises food prices and hunger for so many people around the world.

The assessment of the population's access to food highlighted the problem of poverty in Ukraine, where a large part of the population has difficulties, primarily in meeting physiological needs. 25% of the population is below the poverty line, and the share of poor people in conflict zones is more than 50%. A study of per capita consumption of basic foodstuffs in the country shows that the share of consumption of animal products for almost twenty years was lower than the established norm by 55% of the daily diet, and ranged from 23.0 to 29.7%. One of the indicators of economic affordability of food security of the population is the prices of basic foodstuffs, which have increased significantly in wartime. The share of food expenditures in Ukraine remains one of the highest in the world (more than

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<sup>14</sup> European Circular Economy Stakeholder Platform. A joint initiative by the European Commission and the European Economic and Social Committee. Available at: <https://circulareconomy.europa.eu/platform/>

<sup>15</sup> В Україні затвердять Стратегію продовольчої безпеки до 2030 року. Держпродспоживслужба. Available at: <https://dpss.gov.ua/news/v-ukrayini-zatverdyat-strategiyu-prodovolchoyi-bezpeki-do-2030-roku>

42%), and military action is causing its further growth, which requires the introduction of protective measures to prevent hunger among the Ukrainian people.

Ensuring food security will contribute to strengthening Ukraine's national security. Trends in the food industry have shown a high level of self-sufficiency of Ukraine in the main types of food in the period 2010 and 2019 (production for domestic use in the country). The share of domestic production in the structure of domestic consumption increased during the analyzed period, in particular in the production of meat products, oil, soft waters). Thus, the level of self-sufficiency of Ukraine in 2019 for meat and meat products is 110.2%; eggs – 124%; vegetables and melons – 104%; milk and dairy products 103%, potatoes – 100%; grain – 334% in the calculation of production to domestic use in the country. In 2021, Ukraine's food products worth \$ 26.7 billion were exported. USA (or 40.5% of total exports of goods from Ukraine), which is 33% more than in 2020. Despite Ukraine's strong capabilities in food production and food security, Ukraine failed to reach the top of the global food security rankings – 58th out of 113 countries in the Global Food Security Index.

In a state of war, it is extremely important for the food industry to fulfill its critical function – to meet the food needs of the population, in particular those who are currently in the temporarily occupied territories, as they are left without domestic food and may be on the brink of starvation. It is also food security in order to prevent famine during military operations, which depends on the self-sufficiency of regions in their own food products, so that in the event of the destruction of logistics chains, the local population does not fall into the trap of humanitarian catastrophe.

An important task to strengthen internal food security is the formation of strategic goals and a number of tasks for the recovery of Ukraine's food industry through the implementation of organizational and economic factors of innovative renewal of material and technical base of production based on the latest digital technologies. This implies achieving a high level of meeting the needs of the regions food products of own production by creating a favorable business environment for food producers of SMEs, namely the simplification of regulatory procedures (cancellation of inspections, fines, cancellation of registration of tax invoices / calculations); realization of the priority of development of export potential of the food industry of Ukraine at the expense of growth of volumes of deep processing of foodstuff; stimulating cluster development of promising sectors of the food industry for their integration with European cluster entities within the European platform of cluster cooperation with the possibility of implementing research projects, as well as the development of new areas of activity – bio- and nanotechnologies.

The growth of Ukraine's capacity to contribute to global food security depends on the resumption of normal operations of the food industry; unblocking of logistics flows of food supplies (unblocking of seaports, establishment of land routes across the western borders of Ukraine; simplification of phytosanitary measures and quotas for land transport, which make it difficult to cross the borders of EU member states to the final destination). All this requires the coordination of joint actions of the world in order to increase the pressure on the aggressor's country to end the war.

Further directions of scientific research in this area are the implementation of the principle of integrated processing and reduction of food waste to strengthen Ukraine's position in the world food system.

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