ОСОБЛИВОСТІ РОЗВИТКУ СВІТОВОГО ГОСПОДАРСТВА ТА МЕВ

УДК 338.439.02
JEL Codes: F01, F52, I32, Q1

RUSSIA'S WAR AGAINST UKRAINE AS A GLOBAL THREAT TO FOOD SECURITY: SHORT-TERM EFFECTS

РОСІЙСЬКА ВІЙНА ПРОТИ УКРАЇНИ ЯК ГЛОБАЛЬНА ЗАГРОЗА ПРОДОВОЛЬЧОЇ БЕЗПЕКИ: КОРОТКОТЕРМІНОВІ ЕФЕКТИ

Pryiatelchuk O. A.
Doctor of Economic Sciences, professor of the Department of International Business Educational and Scientific Institute of International Relations, Taras Shevchenko National University of Kyiv, e-mail: pryyatelchuk@gmail.com, ORCID: 0000-0002-5222-452X

Oleksandra Novak
PhD student, Educational and Scientific Institute of International Relations, Taras Shevchenko National University of Kyiv, e-mail: olexandranovak@gmail.com, ORCID: 0000-0002-5703-7416

Приятельчук О. А.
Доктор економічних наук, професор кафедри міжнародного бізнесу Інституту міжнародних відносин Київського національного університету імені Тараса Шевченка, e-mail: pryyatelchuk@gmail.com

Новак О. Є.
Аспірант освітньо-наукової програми «Міжнародні економічні відносини» Інституту міжнародних відносин Київського національного університету імені Тараса Шевченка, e-mail: olexandranovak@gmail.com

Abstract. *The causal linkage between food security and global threats has not been fully resolved, whereas the relationship between food insecurity and armed conflict has been a key question in both policy and academic circles for recent decades. However, at both the global and national levels, the short-term impacts of such shocks on food security pillars is not well understood. Drawing on latest research and insights, this study attempted to prove that Russia's war against Ukraine is a global threat to food security and investigate the short-term war-induced effects on food security in the world. It overviews the reasons contributing to the current global food crisis, the impact on food security dimensions, as well as the global community responses. According to WFP-FAO report, the consequences of a looming food crisis may be more pronounced and ultimately the number of people facing acute food insecurity worldwide is expected to rise from currently 222 million people regarded food insecure globally. As far as the current food crisis goes on and the war continues it is difficult to assess future outcomes.*

Key words: *food security, threat, vulnerability, shock, armed conflict, war, supply disruptions, food inflation, food crisis.*

Анотація. *Причинно-наслідковий зв'язок між продовольчою безпекою та глобальними загрозами не є достатньо очевидним, тоді як зв'язок між порушенням продовольчої безпеки та збройними конфліктами протягом останніх десятиліть залишається актуальним дискусійним питанням як у політичних, так і в наукових колах. В той же час очікувана в короткостроковій перспективі трансформація концептуальних засад продовольчої безпеки*

потребує моніторингу та прогнозування як на національному, так і глобальному рівнях. Спираючись на останні дослідження та ідеї, авторами даного дослідження аргументовано, що війна росії проти України є глобальною загрозою продовольчій безпеці. Першочерговим завданням є дослідження нагальних короткострокових наслідків війни для продовольчої безпеки у світі. У статті розглядаються причини, що сприяють поточній глобальній продовольчій кризі, вплив загальноутворюючих факторів на параметри продовольчої безпеки, а також реакція світової спільноти на окремі факти їх деформації. Відповідно до звіту WFP-FAO, в найближчій перспективі очікуються вагомі наслідки продовольчої кризи, зокрема значне зростання кількості людей, які стикаються з гострою нестачею продовольства в усьому світі (на сьогодні їх кількість вже перевищує 222 мільйонів людей). Через нагальну тривалість війни та продовольчої кризи автори намагались визначити ключові тенденції формування безпекового середовища та оцінити стан глобальної продовольчої безпеки в найближчій перспективі.

Ключові слова: *продовольча безпека, загроза, вразливість, шок, збройний конфлікт, війна, перебої з постачанням, продовольча інфляція, продовольча криза.*

Introduction.

To begin with, global agrifood sector had already been disrupted and food prices had been elevated due to such global threat as COVID-19 pandemic when Russia invaded Ukraine on February 24, 2022. The invasion has exacerbated the already precarious situation of increased frequency and severity of climate shocks, regional conflicts and the pandemic by further disrupting food production and distribution, and driving up the cost of feeding people and families. In particular, FAO admits the primary responsibility of armed conflicts for the increase in global food insecurity since 2014 (FAO 2020). In November 2022, WFP estimates that up to 349 million people are acutely food insecure, or at risk, across 79 countries where it operates. This is an increase of 200 million people as compared to pre-pandemic levels (WFP 2022). Against this background, this paper analyses to what extent has the Russia's war against Ukraine contributed to the ongoing food crisis.

A food crisis is usually set off by a shock or combination of shocks that affect one or more of the pillars of food security. When a country is food secure, it means that "all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (HLPE 2020). Prior to COVID-19 pandemic the four food security pillars have been defined in the academic literature, namely, availability (sufficient quantity and quality of food), access (economic, social and physical), utilization (nutritional well-being) and stability (food security provision in the event of sudden shocks or cyclical events) (Varaksina 2015; Van & Meijerink 2014). However, a debate has evolved since 2020 on transforming food security definition with a view to global threats by adding to the four-above agency (socio-political government structures enable the achievement of food security) and sustainability (food needs are ensured in line with long-term regeneration of natural, social, and economic systems) pillars (HLPE 2020). In the context of this article we shall focus on availability, access, utilization and stability pillars when accessing the short-term effects of Russia's war against Ukraine on food security in the world.

The purpose of the article is to prove that Russia's war against Ukraine is a global threat to food security and investigate the short-term war-induced effects on food security in the world. This article takes a closer look at the vulnerabilities of countries to shocks in the global agricultural markets, with emphasis on the current example of Russia's invasion of Ukraine. It overviews the reasons contributing to the current global food crisis, the impact on food security dimensions, as well as the global community responses in the short-term period.

Literature review.

Gephart J. et al (2016), Porkka M. et al. (2013), Kummu M. (2020) at al. claim that rapid globalisation has led to increasingly connected food systems. At the same time, Cottrell R. et al. and Woetzel J. et al. state that the frequency and severity of shocks to food systems has increased and this was associated with an increased number of socio-political (armed conflicts), climatic (extreme weather) and economic events (Cottrell 2019; Woetzel 2020). The threats affecting food security fall into 3 categories: 1) systemic threats (affect almost all types of economic activity); 2) threats destabilizing the process of food supply influencing production, import, logistics, market exchange and consumption; 3) threats to food security dimensions (Kurlyak 2018). Moreover, through global trade, food systems all over the world are becoming increasingly interconnected and interdependent, thus, the threats in one place can cause synchronous shocks across other regions and sectors (Buldyrev 2010; D'odorico 2015; Suweis 2015; Gephart 2017).

Food insecurity refers to the lack of secure access to enough safe and nutritious food for normal human growth and development and an active and healthy life (GRFC 2022). IMF experts observe that food insecurity has been rising since 2018. Whereas, a food crisis occurs when rates of acute food insecurity (of a severity that threatens lives, livelihoods or both) and malnutrition rise sharply at local or national levels, raising the need for emergency food assistance.

Main results of the research.

1. Russia's war against Ukraine as a global threat to food security

The launch of Russia's war against Ukraine has revealed the interconnected nature of food systems by undermining availability, access, utilization and stability pillars of food security and subsequently generating the global food crisis. This was channeled through the influence of anthropogenic (armed conflict), economic (rise in global food prices) and natural factors (greater impact of crop failures due to disruption of global food supplies).

First, armed conflict affects food security in a variety of ways, both direct and indirect, from physical disruptions to agricultural production and food availability to disruptions that affect local trade, transport, and physical, social, and economic access to food (Brück & d'Errico 2019). Food availability becomes increasingly limited by reduced imports, and food access is curtailed by higher prices, lack of inputs and the destruction of productive assets and infrastructure. This creates complex humanitarian emergency that require holistic, coordinated responses from the international community.

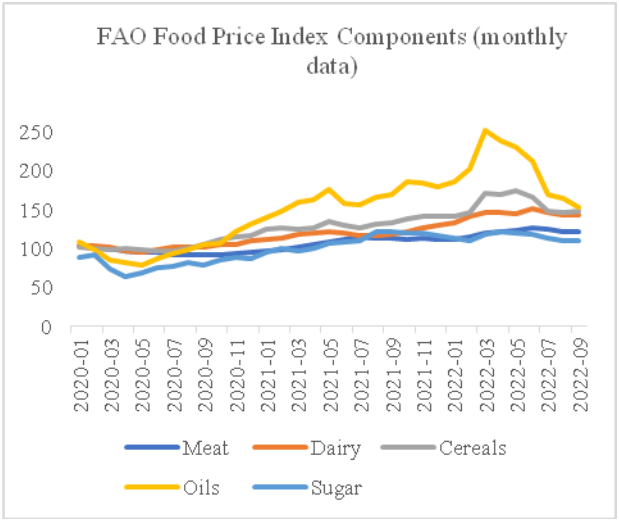
The war undermined food security level in Ukraine in the above mentioned way. To cushion the negative effects, FAO developed USD 115.4 million Rapid Response Plan (RRP) to support the most vulnerable smallholder and medium- sized farming households (979 320 people) through March–December 2022 (FAO 2022). The support included the provision of cash and agricultural inputs (seeds, fertilizers, pesticides, equipment, fuel, and livestock supplies), the maintenance of overall access to critical markets. However, further assistance and investments in Ukrainian agriculture will be needed once the war ends.

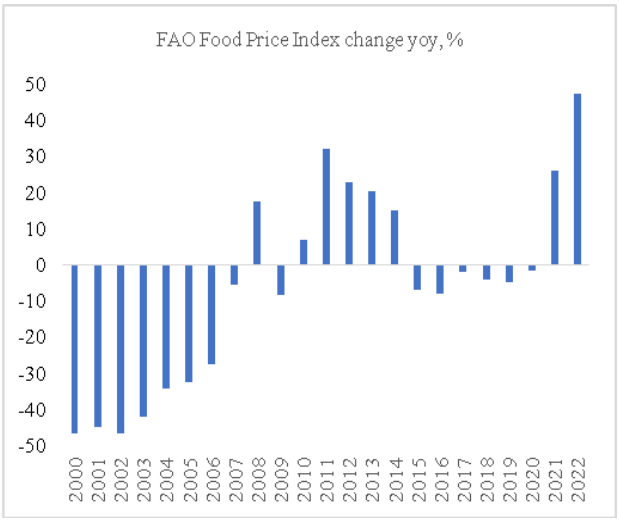
Second, for food import dependent countries even short-lived exaggerated price swings can have sustained effects on food prices. In addition, the opacity and high levels of concentration in supply chains create the real risk that consumer prices will continue at historically high levels, despite further price reduction. All this contributes to growing food inflation processes. As of October 2022, 113 countries have year-on-year food inflation of 10 percent or more, and it exceeds 15 percent in 67 countries, including three countries with triple-digit food inflation rates (WFP 2022).

Therefore, in the short-term period the war contributed to a sharp reduction in the volume of supply on the world food market and a rapid rise in prices of the main crops. The FAO Food Price Index has reached a record high in March 2022 (Monthly Food Price Index=160). As of October 2022 the index slightly decreased to 136 points, while remaining 2 % higher as compared

to 2021 value. For 2022, the Index also demonstrated nearly 50% yearly increase being the largest for the last two decades (See Table 1).

Table 1: FAO Food Price Index (monthly and yearly data)





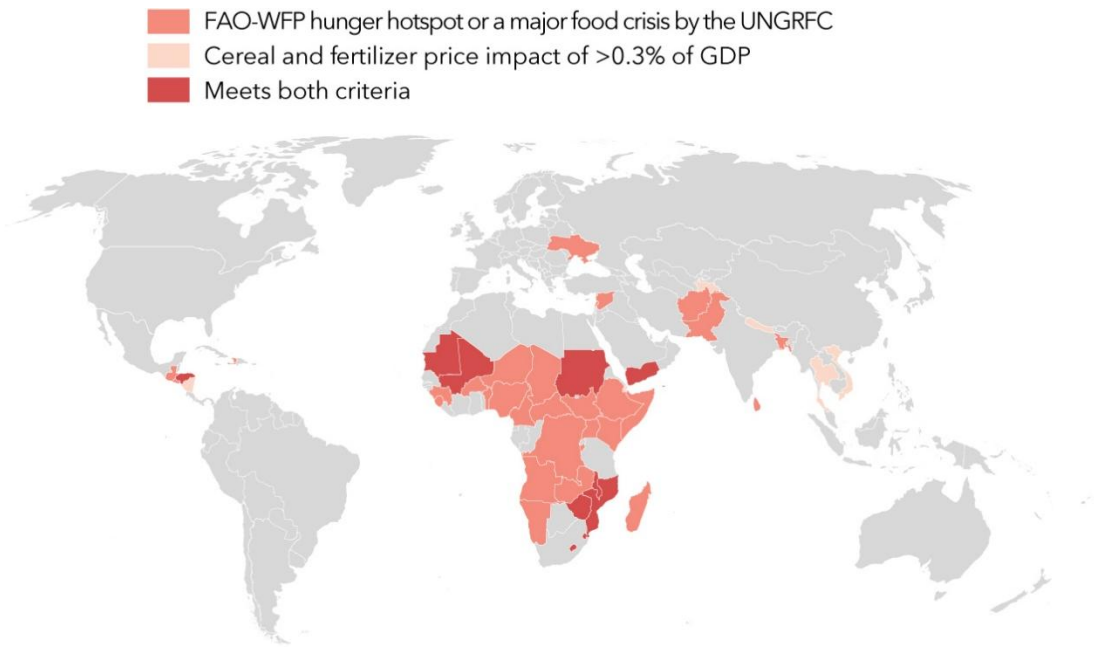
Source: combined by authors based on FAO Food Price Index. Retrieved from https://www.fao.org/worldfoodsituation/foodpricesindex/en/

UNCTAD experts also agree that the war represented a distributional shock (UNCTAD, 2022). Ukrainian agri-products of 2021/22 harvest were in stock, ready to be exported, but the primary export route via the Black Sea was abruptly closed. Initial uncertainty over how long the war would last inevitably sent prices higher. Though the Black Sea Grain Initiative was established in July 2022 enabling partially to resume Ukrainian grain exports, the immediate implications of the supply shock were especially severe for the Middle East and North Africa region that imports most of its grain from Ukraine.

Third, with a view to natural resource constraints and climate challenges food self-suffiency is not possible for all countries. Extreme weather and climate events are becoming more recurrent in many of the most food insecure areas of the globe, with floods, droughts, and hurricanes affecting the same vulnerable areas consecutively. Thus, international trade remains the key enabler of food security by smoothing climate-induced production shocks in individual countries and regions. In a broad term, it alleviates the uneven distribution across countries of land, water, and nutrient resources (Jiayi 2020). Therefore, even short-term food supply disruptions can lead to food emergency in the vulnerable countries.

At the beginning of 2022, according to WFP, weather extremes were the main drivers of acute food insecurity in seven countries leading to 23.5 million people in Crisis levels or worse (IPC/ CH Phase 3 or above). At the same time Russia's war against Ukraine continues to exacerbate food security in the world: a drop in food exports from Ukraine together with knock-on effects could further constrain global food supply. In addition, the war will adversely affect many low-income countries that mostly suffer from climate events and strongly rely on Ukraine as the closest supplier. IMF estimates the highest level of food insecurity to prevail in 48 countries.

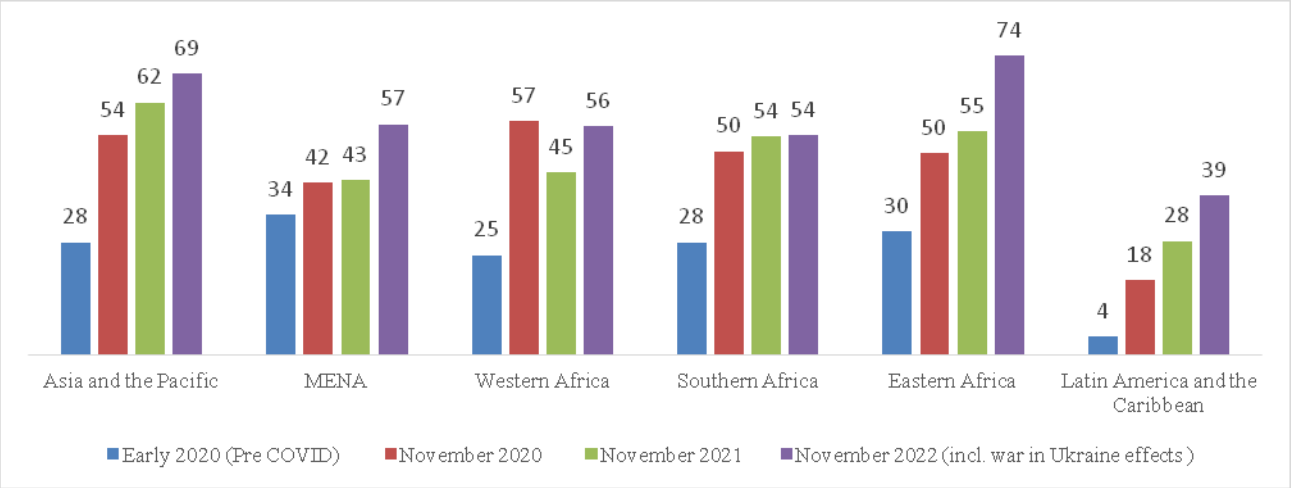
Table 2: Map of 48 countries highly exposed to food insecurity



Source: https://www.imf.org/en/Blogs/Articles/2022/09/30/global-food-crisis-demands-support-for-people-open-trade-bigger-local-harvests

New estimates from the 79 countries where the World Food Programme (WFP) has an operational presence and where data is available show the number of acutely food insecure people will hit a record high of 349 million in 2022. This is an increase of 200 million people compared to pre-pandemic levels. An estimated 49 million people across 49 countries are in Emergency or worse levels of acute food insecurity in 2022 or Integrated Phase Classification (IPC) Phase 4+. As far as the impact of Russia's war against Ukraine is concerned, the largest increase in the number of food insecure people as compared to November 2021 data is observed in the Eastern Africa (+20 mln), MENA (+14 mln) and Western Africa (+11 mln). See Table 3.

Table 3: Number of acutely food insecure people, mln



Source: made by authors on the data sourced from WFP 2022

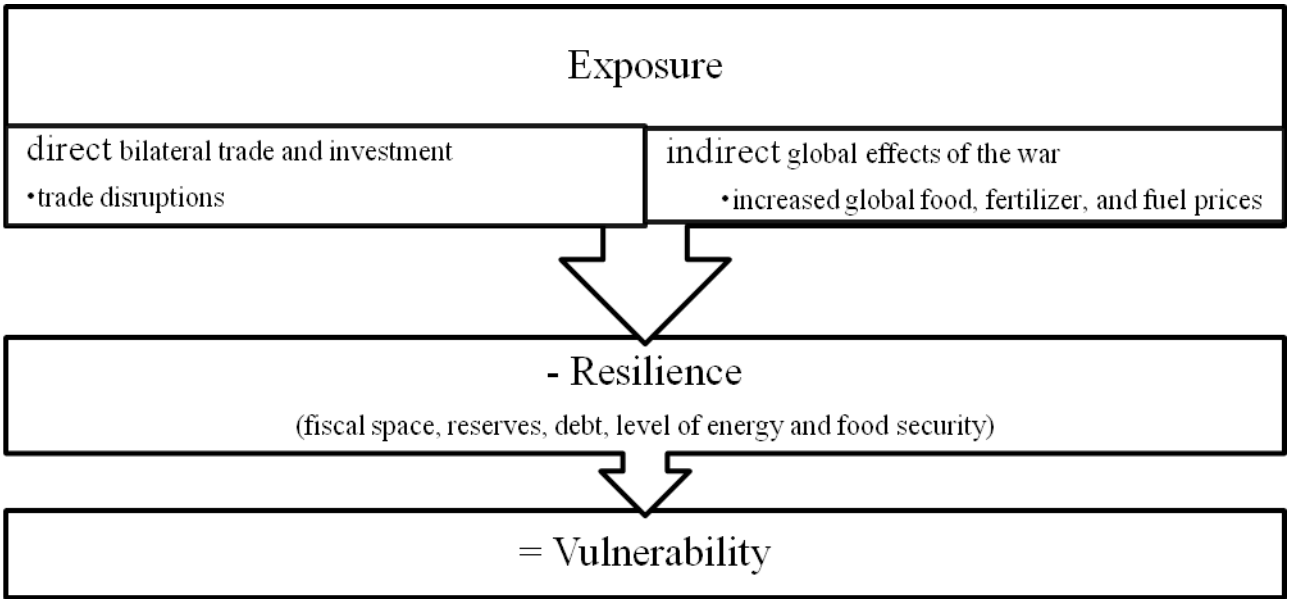
In general, Russia's war against Ukraine comes as a complex threat to food security in the world, as far as it destabilizes the process of global food supplies and endangers certain food security dimensions (availability, access, utilization and stability). As far as the current food crisis goes on and the war continues it is difficult to assess future outcomes. But with a view to the purpose of the article we can define three **key knock-on effects** for food security in the world, namely: 1) increased vulnerability of national food systems; 2) Ukraine's importance for global food security; 3) increased trade policy role for global food prices.

2. Vulnerability of national food systems

First, Russia's war against Ukraine has demonstrated the **vulnerability of national food systems** exposing their structural weaknesses, which have been felt unequally across households, firms and countries. Given the dependence of many countries on agriculture imports from Ukraine and Russia, food **access** has arguably been the most affected by the current cost-of-living crisis resulting in higher food prices**.** Whereas higher food prices together with higher energy prices and rapidly rising inflation have caused further hardship and serious food security risks specifically in low-income countries (OECD 2022).

According to country level economic vulnerability model by S.Raga and L.Pettinotti, vulnerability is measured as the combination of direct economic exposure to Ukraine and Russia (e.g., through bilateral trade and investment) and indirect exposure to the global effects of the war (e.g., through levels of commodity imports, trade and investment openness), minus resilience (e.g., quality of economic governance etc) to manage the negative knock off effects of the war (Raga & Pettinotti 2022).

Table 4: Country level economic vulnerability model



Source: made by authors based on (Raga & Pettinotti 2022)

In the short-term the economic impact of the ongoing war on food security will be felt far and wide mainly through agrifood trade disruptions and increased global food prices though to varying extent. In general, thanks to globalization of agrifood trade, many developed and developing countries are more resilient than previously as local shocks can be compensated by sourcing from areas further away (Gutiérrez-Moya 2021). Some countries, including China, the United States, and EU countries, are relatively well protected. They have high local production, high stock levels, and high purchasing power.

But some least developed and developing countries have slipped into a vulnerable situation. They rely heavily on grain imports, have limited stocks, and have low purchasing power. These countries may be hardest hit by food price increases. As food supplies constrict, these nations will face elevated inflation, which will exacerbate budgetary stress as they attempt to protect their populations from rising food prices.

- **Direct exposure (agrifood trade disruptions)**

The war challenges countries in the face of major threats and shocks resulting in key supply chains disruptions. Disruptions in agricultural exports from Russia and Ukraine, which jointly accounted for 24% of global wheat exports, 57% of sunflower seed oil exports and 14% of maize exports in 2016-20, is putting global food supply chains under strain, driving up food prices and creating a risk of global food crisis (Trade 2022).

According to IPC Technical Guidance Note as published in May 2022, the countries may face acute food insecurity due to the following reasons (IPC 2022):

1.Lower availability and higher price of wheat. This will be felt as exports of wheat from Ukraine (naval blockade of the Black Sea) and Russia (due to logistical and banking challenges) are severely curtailed by the war.

2.**Rising price of vegetable oils.** The war in Ukraine also affects the availability of other key products, such as sunflower and saffron oils. Even though most of these exports from Ukraine are typically not directed at IPC countries, the same ripple effects on prices of other global vegetable oils are being witnessed. As a result, according to IFPRI global vegetable oil prices have increased by around 30% since the start of the war.

3.**Rising price of fuel**, which has increased substantially during the crisis due to many buyers blocking imports from Russia and buying fuel from alternative suppliers, raising global fuel prices.

4.Higher price and lower availability of fertiliser. Russia is one of the largest exporters of fertilisers and fertiliser components. Sanctions affecting banking and transport have led to low

exports and some exporting countries have banned fertiliser exports. Fertiliser prices have increased globally (IFPRI 2022), and the situation is expected to remain problematic.

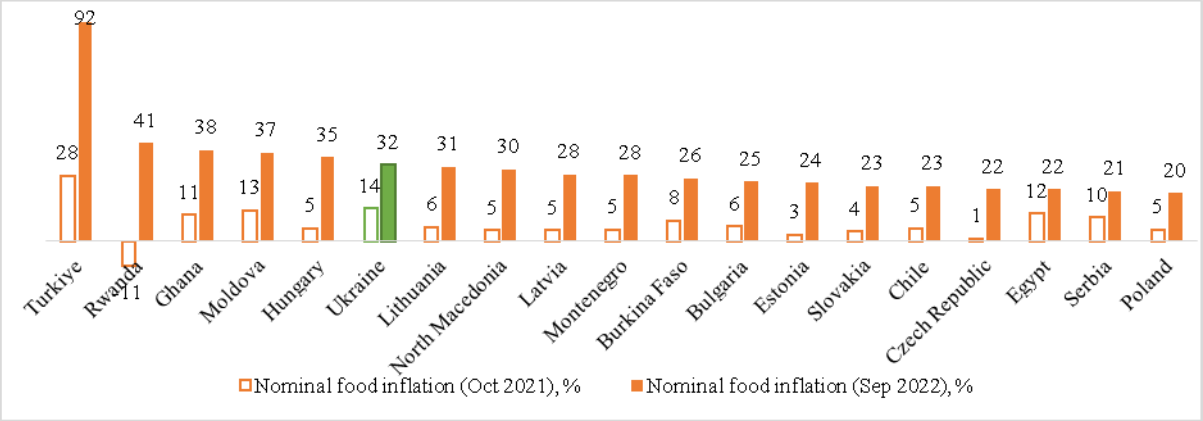
In addition to price effects, the war can also reduce the quantities available on world markets (Hellegers 2022). OECD projects that war-related disruptions are particularly likely for cereals and vegetable oils. Overall, the supply of these agricultural commodities is remarkably concentrated, with the five biggest suppliers covering more than half of the world export market, and almost to 80% in some cases. Such a high degree of concentration limits the scope for substitution to other producers in the short run, making these products particularly vulnerable to shocks.

- **Indirect exposure (increased food prices)**

The shockwaves are spreading through global markets and are putting increasing inflationary pressure on national agricultural industries. This means that, in the absence of government social safety nets, households will have no choice but to dedicate more of their budgets to buying food and this contributes to rising food inflation. Overall, food inflation implies that larger-than-usual share of consumer spending is dedicated to food purchases, and unemployment is high in many countries.

Two years of COVID-19 pandemic made the world economy rather fragile in terms of fiscal space. Today, 60 per cent of workers have lower real incomes than before the pandemic; 60 per cent of the poorest countries are in debt distress or at high risk of it; developing countries miss $1.2 trillion per year to fill the social protection gap (UNCTAD 2022-2). The war in Ukraine and its knock-on effects have also deteriorated the global environment. Therefore, the financial capacity of countries to protect themselves against such global threats as the war in Ukraine remains rather limited, thus, making them highly vulnerable.

Table 5: Nominal food inflation (Oct 2021/Sep 2022), % (yoy)



Source: made by authors based on data sourced from https://thedocs.worldbank.org/en/doc/40ebbf38f5a6b68bfc11e5273e1405d4-0090012022/related/Food-Security-Update-LXXII-October-27-2022.pdf

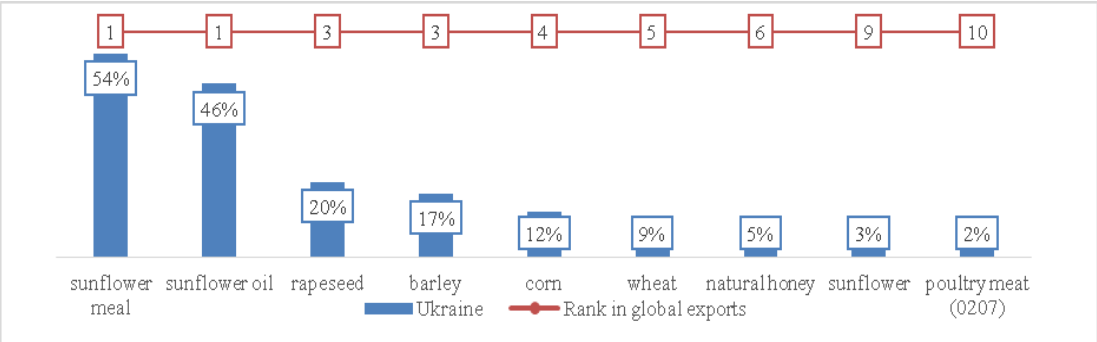
As can be observed from the Table 5, the record double digit food inflation is observed not only in developing countries (Africa, Latin America), but also in developed Europe as compared to 2021 level. In the end, rising prices are more damaging for net food-importing countries that are predominantly low-income economies. As the consumption basket of poorer people is dominated by food, food-price surges hurt the poor everywhere and threaten to push millions into poverty.

3. Ukraine's importance for global food security

Second, Russia's full-scale war against Ukraine has demonstrated **the importance of Ukrainian agricultural sector for global food security**, as far as Ukraine is a leading producer and exporter of agricultural commodities. In 2021, according to USDA, Ukraine was the world's largest producer of sunflower seeds and the largest exporter of sunflower oil, 3rd largest exporter of maize and rapeseed, 4th largest exporter of barley, and 5th largest exporter of wheat (FAS, 2022).

Therefore, the reliance on Ukraine as major global supplier of the above mentioned agrifood products has a significant impact on utilization pillar of food security. For instance, no other large sunflower oil exporter exists to rival Ukraine's global leadership (54% of world exports) and a prolonged conflict threatens the 2023 growing season, crushing facilities operation and overseas supplies (due to logistics problems). In the short-term period, the consumers in the world are already forced to pay exorbitant prices and eventually limit their consumption, whereas specifically European food makers are switching to more available alternatives (rapeseed, linseed, groundnut and palm oil). An unintended consequence of substituting sunflower oil in food products (snacks, prepared foods, pre-fried frozen products) for another vegetable oil is that it could alter their nutritional profile – and not always for the better.

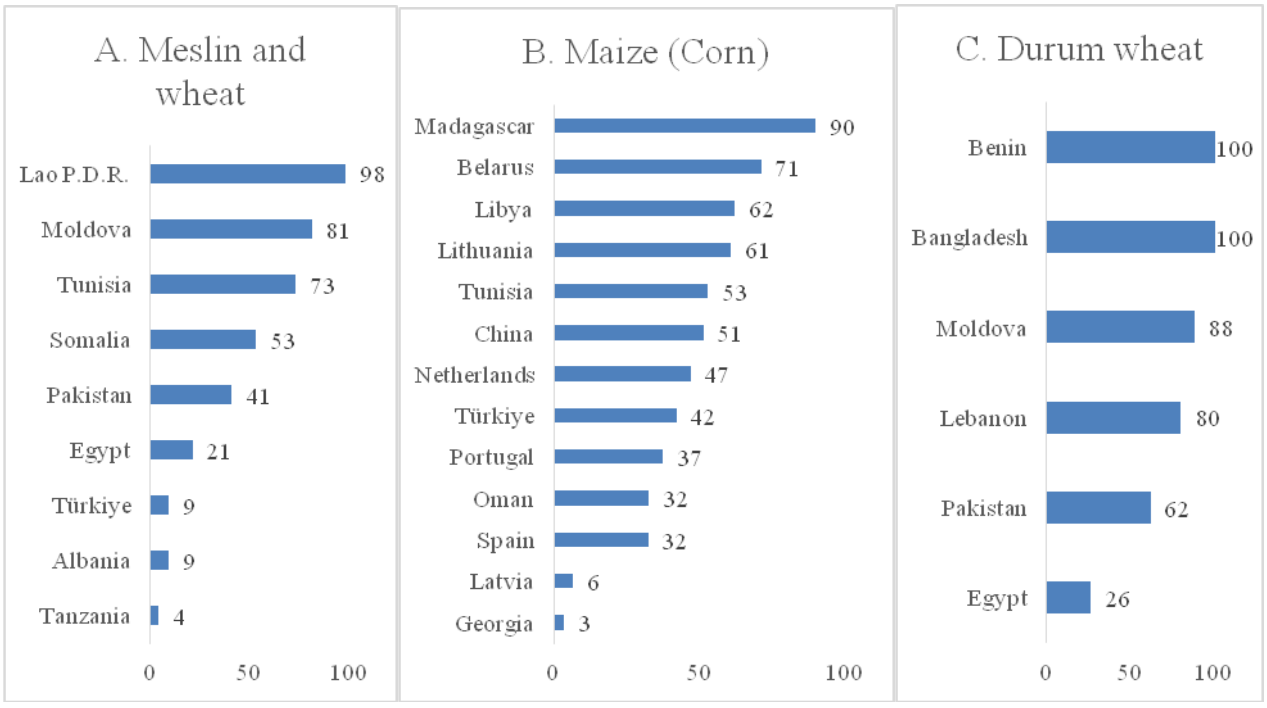
Table 6: Ukraine's agriculture exports position in the world, 2021



Source: made by authors based on data sourced from (USDA 2022)

Moreover, current food system fragilities highlight the importance of **availability** dimension of food security. The countries dependent on Ukraine in terms of agrifood imports, are experiencing short-term supply chains disruptions. Prior to war, as of 2021 Ukraine was primary supplier of commodities to the World Food Program (WFP), feeding 400 million people across the world (WFP Staff Writers 2022). Therefore, the stability of Ukrainian agriculture sector is integral for the agrifood supplies stability in the whole world.

Table 7: Share of Ukraine in total imports, 2020 %

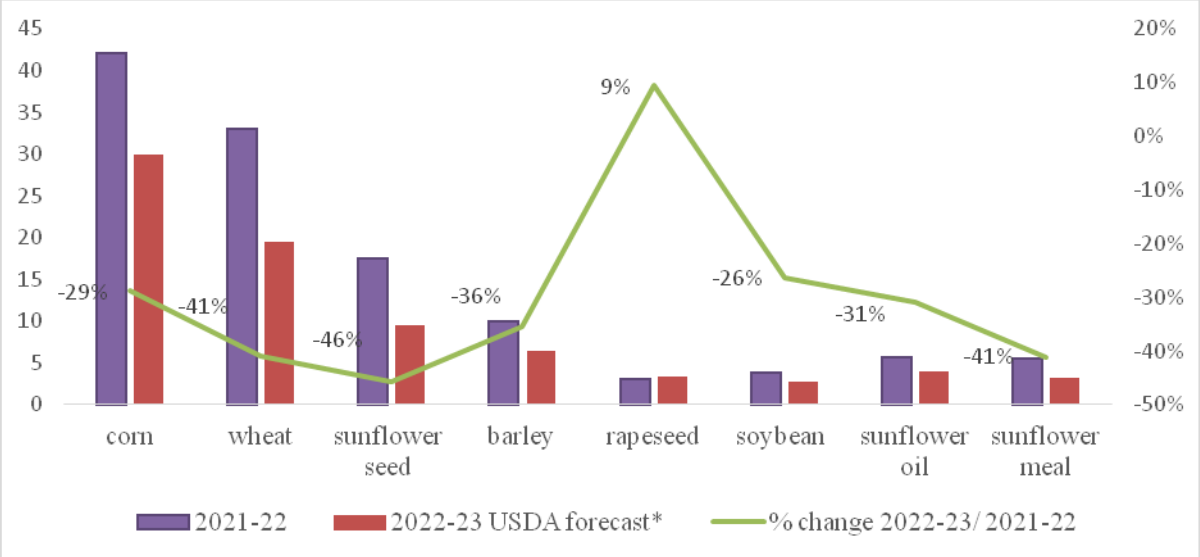


Source: OECD https://stat.link/qecg6r

For instance, the ongoing disruptions to agricultural exports from Ukraine could result in serious shortages in many developing economies, especially in Africa and the Middle East and Central Asia, and exacerbate food price increases that are already weighing on vulnerable social groups. See Table 7.

In general, the Russian aggression against Ukraine is undermining Ukraine's capacity to produce and export crops through (McKinsey 2022): 1)reduced harvest area (ongoing military actions and land mines); 2) farmers' lack of liquidity (inability to ship a large part of last year's harvest); 3) decreased yields (reduced access to fertilizers, disrupted crop production technologies, less advanced plant protection); and 4) ripple effects from increased fuel and fertilizer costs. The WFP estimates that Ukraine's 2022 harvest is expected to be 30 percent lower than in 2021, placing additional pressure on other producers to meet demand (WFP 2022-2). USDA forecast has also downgraded its 2022/23 harvest forecast for Ukraine. See Table 8.

Table 8: Ukraine's agriculture production, mln.t



Source: made by authors sourced from (USDA 2022)

As of September 2022, direct war damages to Ukraine's agricultural sector have reached $6.9 billion. (KSE 2022). Exports have been affected by closures of ports and oilseed crushing operations, rising energy and fertiliser prices are translating into higher production costs. Although the Black Sea Grain Initiative deal signed on July 22 has brought some relative relief to the market, enabling the price of some cereals to return to preinvasion levels. There are still uncertainties whether Russia will follow it in 2023.

4. Trade policy role for global food prices

Third, Russia's war against Ukraine has also highlighted the role of trade policies for global food price stability. To begin with, all countries have been actively using trade policy to respond to domestic needs when faced with potential food shortages since the beginning of the COVID-19 pandemic. But trade policy actions on food and fertilizers have surged significantly since the beginning of the war in Ukraine.

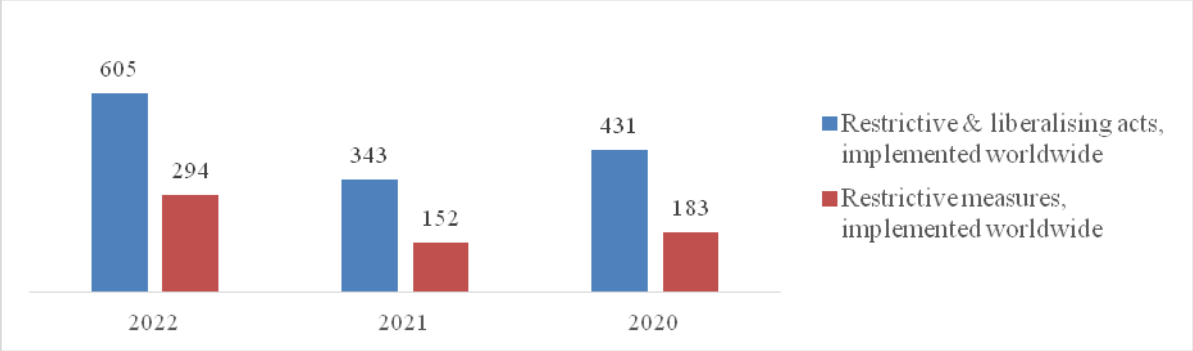
In general, all food crises are distributional in nature. Economic and market disturbances and restrictions illustrate the importance of stability pillar of food security. COVID-19 has initially brought export restrictions and border closures later contributing to uncertainty on markets & inputs access, increased food price volatility and inflation. Rising global food prices have typically induced differential policy responses, as governments try to shield domestic markets from price surges. Some import-dependent countries lower import restrictions, and some food producing countries curb exports. As UNCTAD research shows, trade interventions contributed to an increase in world food prices of 13 percent during the 2008-11 global food crisis—and by 30 percent for wheat (Giordani 2016). Therefore, rising trade-policy interventions risk further disrupting global food markets.

The blockade of Black Sea ports caused by the war severely restricted food supply access. This situation has provoked numerous countries to try to protect their food access by curbing grain exports. As of October 21, 2022, the World Bank reports that twenty countries have implemented 25 food export bans, and eight have implemented 12 export-limiting measures (export taxes, export licensing) (WB 2022).

The scale of restrictions induced by the Russia's war against Ukraine has now surpassed the experience during the food price crisis in 2007/08, which contributed to 40 per cent agricultural prices increase (UNCTAD, 2022). Now export restrictions prevent the trade needed to bring essential food supplies and fertilizers to where they are most required. In one way or another, everyone is exposed to the shock waves of the war.

According to Global Trade Alert, during the first 10 months of 2022 a total of 605 trade policy interventions affecting food and fertiliser products have been recorded, of which G20 members were responsible for implementing 322. The worldwide total is up 79% over the comparable period of 2021 (GTA 2022).

Table 9: Trade policy interventions (time frame 1 January-31 October)



Source: made by authors sourced from (GTA 2022)

However, the current triple F (food, fuel, finance) crisis, induced by the war in Ukraine, is not over, thus, further export restrictions may be imposed. The possible way out of the food crisis is that other large agrifood exporters like the United States, Canada, the European Union, Australia, Argentina, Brazil — which together represent more than 50 percent of global exports of key staples like wheat, barley and corn — should not restrict their exports of staples (Ruta 2022). Thus, the security of these flows would allow markets for critical food products to continue working, helping to preserve the stability of global food markets until the war-induced effects will diminish.

Conclusion

To conclude, the article investigated the causal linkage between food security and such global threat as Russia's war against Ukraine. Overall, the impact has been highly negative for many countries in the world. The war has altered global patterns of trade, production, and consumption of commodities through supply chain disruptions, high and volatile energy, food and fertilizer prices and restrictive trade policies. This has resulted in the global increase of the number of acutely food insecure people.

With a view to the purpose of the article we defined three short-term knock-on effects of Russia's war against Ukraine for food security in the world. First, the vulnerability of national food systems has increased. Second, the importance of Ukraine's agriculture sector for global food security has been proved. Third, the role of trade policy for global food prices has been reiterated.

Overall, Russia's war against Ukraine comes as a complex threat to food security in the world, as far as it destabilizes the process of global food supplies and endangers certain food security dimensions (availability, access, utilization, stability). As far as the current food crisis goes on and the war continues it is difficult to assess future outcomes. Despite the reprieve in global food prices and the resumption of grain exports from the Black Sea, food remains beyond reach for many due to high prices and weather shocks.

References

1. Brück, T., d'Errico, M., 2019, "Food security and violent conflct: Introduction to the special issue". *World Development*, vol. 117, 167–71.
2. Buldyrev, S. V. et al., 2010, "Catastrophic cascade of failures in interdependent networks". *Nature*, №. 7291, 1025-1028.
3. Cottrell, R. S., Nash, K. L., Halpern, B. S., Remenyi, T. A., Corney, S. P., Fleming, A., ... & Blanchard, J. L., 2019, "Food production shocks across land and sea". *Nature Sustainability*, 2(2), 130-137.
4. D'odorico, P. et al., 2014, "Feeding humanity through global food trade". *Earth's Future*, V.2, №.9, 458-469.
5. FAO, 2012, "CFS 39 Final Report". Retrieved from http://www.fao.org/3/MD776E/MD776E.pdf
6. FAO, 2020, "The State of World Fisheries and Aquaculture: Sustainability in Action". Rome, Italy, 244p. Retrieved from https://www.fao.org/documents/card/en/c/ca9229en/
7. FAO, 2022, "Ukraine: Rapid Response Plan – Supporting agricultural production to bolster food availability and access". Rome. Retrieved from https://doi.org/10.4060/cb9457en
8. FAS, 2022, "Ukraine Agricultural Production and Trade". Retrieved from https://www.fas.usda.gov/sites/default/files/2022-06/Ukraine-Factsheet-June2022.pdf
9. Georgieva, K., Sosa, S., Rother, B., 2022, "Global Food Crisis Demands Support for People, Open Trade, Bigger Local Harvests". Retrieved from https://www.imf.org/en/Blogs/Articles/2022/09/30/global-food-crisis-demands-support-for-people-open-trade-bigger-local-harvests
10. Gephart, J. A. et al., 2017, "Shocks to fish production: Identification, trends, and consequences". *Global Environmental Change*, V. 42, 24-32.
11. Gephart, J. A., Rovenskaya, E., Dieckmann, U., Pace, M. L., & Brännström, Å., 2016, "Vulnerability to shocks in the global seafood trade network". Environmental Research Letters, 11(3), 035008.
12. Giordani, P.E., Rocha, N. & Ruta, M., 2016, "Food prices and the multiplier effect of trade policy". *Journal of International Economics*, Vol. 101, 102-122.
13. Global Trade Alert (GTA), 2022, "G20 RESPONSIBLE FOR OVER HALF OF TRADE RESTRICTIONS AFFECTING FOOD & FERTILISER". *Essential Goods Initiative.* Retrieved from https://www.globaltradealert.org/reports/54
14. GRFC, 2022, "FSIN and Global Network Against Food Crises". *GRFC 2022 Mid-Year Update*. Rome. Retrieved from https://www.fsinplatform.org/sites/default/files/resources/files/GRFC%202022%20MYU%20Final_0.pdf
15. Gutiérrez-Moya, E., Adenso-Díaz, B., & Lozano, S., 2021, "Analysis and vulnerability of the international wheat trade network". *Food Security*, 2021(13), 113–128. https://doi. org/10. 1007/s12571-020-01117-9
16. Hellegers, P., 2022, "Food security vulnerability due to trade dependencies on Russia and Ukraine". *Food Security,* 1-8.
17. HLPE, 2020, "Food security and nutrition: building a global narrative towards 2030". A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome. Retrieved from https://www.fao.org/3/ca9731en/ca9731en.pdf
18. IPC, 2022, "Intefrated Food Security Phase Classification". Retrieved from https://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_Technical_Guidance_Note_Ukraine_Analysis.pdf
19. Jiayi, Z., Dellmuth, M. L., Adams, K. M., Neset, T. S., & Von Uexkull, N., 2020, "The Geopolitics of Food Security: Barriers to the Sustainabie Development Goal of Zero Hunger".

20. Kummu, M., Kinnunen, P., Lehikoinen, E., Porkka, M., Queiroz, C., Röös, E., ... & Weil, C., 2020, "Interplay of trade and food system resilience: Gains on supply diversity over time at the cost of trade independency". *Global Food Security*, Volume 24, 2020, ISSN 2211-9124. https://doi.org/10.1016/j.gfs.2020.100360
21. Kurlyak, M.D., 2018, "Formuvannia systemy natcionalnoji prodovolchoji bezpeky Ukrainy" [Formation of the national food security system of Ukraine]: Monograph. *Lviv: Rastr-7*, 232p.
22. KSE, 2022, "Assessment of damages in Ukraine due to Russia's military aggression as of September 1, 2022". KSE Institute. Retrieved from https://kse.ua/wp-content/uploads/2022/10/ENG-Sep22_Working_Sep1_Damages-Report.docx.pdf
23. McKinsey and Company, 2022, "A reflection on global food security challenges amid the war in Ukraine and the early impact of climate change". Retrieved from https://www.mckinsey.com/industries/agriculture/our-insights/a-reflection-on-global-food-security-challenges-amid-the-war-in-ukraine-and-the-early-impact-of-climate-change
24. OECD, 2022, "Editorial: The Price of War". *OECD Economic Outlook*, Vol. 2022/1. https://doi.org/10.1787/f34d0856-en.
25. Porkka, M., Kummu, M., Siebert, S. &Varis, O., 2013, "From Food Insufficiency towards Trade Dependency: A Historical Analysis of Global Food Availability". *PLOS ONE*, 8(12): e82714. https://doi.org/10.1371/journal.pone.0082714
26. Raga, S. & Pettinotti, L., 2022, "Economic vulnerability to the Russia–Ukraine war".
27. Ruta, M., 2022, "The Impact of the War in Ukraine on Global Trade and Investment". The World Bank. Retrieved from https://openknowledge.worldbank.org/handle/10986/37359
28. Suweis, S. et al., 2015. "Resilience and reactivity of global food security". *Proceedings of the National Academy of Sciences*, V.112, №. 22, 6902-6907.
29. Trade, S., 2022, "Aid for Trade at a Glance 2022". Retrieved from https://www.wto.org/english/res_e/booksp_e/a4tatglance2022_e.pdf
30. UNCTAD, 2022, "Development prospects in a fractured world: Global disorder and regional responses". Trade and development report 2022. Retrieved from https://unctad.org/system/files/official-document/tdr2022_en.pdf
31. UNCTAD, 2022 – 2, "Brief NO.2 Global impact of the war in Ukraine: Billions of people face the greatest cost-of-living crisis in a generation". United Nations. Retrieved from https://news.un.org/pages/wp-content/uploads/2022/06/GCRG_2nd-Brief_Jun8_2022_FINAL.pdf
32. USDA, 2022. "Ukraine Agricultural Production and Trade". Retrieved from https://www.fas.usda.gov/sites/default/files/2022-06/Ukraine-Factsheet-June2022.pdf
33. Van, D. M. & Meijerink, G. W., 2014, "A review of global food security scenario and assessment studies: results, gaps and research priorities". *Global Food Security*, Vol. 3, №. 3-4, 227-238.
34. Varaksina, O.V., 2015, "Osnovni aspekty shcho formuyut prodovolchu bezpeku dershavy krainy" [Main aspects and factors shaping the country's food security]. *PUET: Economic Sciences*, № 3 (59). [in Ukrainian]
35. WB, 2022, "Food Security". The World Bank/ Retrieved from https://thedocs.worldbank.org/en/doc/40ebbf38f5a6b68bfc11e5273e1405d4-0090012022/related/Food-Security-Update-LXXII-October-27-2022.pdf
36. WFP, 2022, "Global Operational Response Plan 2022". Retrieved from https://executiveboard.wfp.org/document_download/WFP-0000144406
37. WFP, 2022-2, "WFP Global Operational Response Plan". Retrieved from https://executiveboard.wfp.org/document_download/WFP-0000144406
38. WFP Staff Writers, 2022, "Bulk carrier sets off from Ukraine with grain for WFP in first since start of war". Retrieved from https://www.wfp.org/stories/bulk-carrier-sets-ukraine-grain-wfp-first-start-war

39. Woetzel, J. et al., 2020, "Will the World's Breadbaskets Become Less Reliable": Case Study. *McKinsey Global Institute*. Retrieved from https://www.mckinsey.com/~/media/McKinsey/Business% 20Functions/Sustainability/Our% 20Insights/Will% 20the% 20worlds% 20breadbaskets% 20become% 20less% 20reliable/MGI-Will-the-worldsbreadbaskets-become-less-reliable.pdf