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IDENTIFICATION AND LEVELLING OF CRISIS PHENOMENA IN THE WORLD GRAIN MARKET IN THE 2022/23 MARKETING YEAR

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Review Article

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ABSTRACT

The aim of this paper is the detection crisis phenomena in the world grain market in the 2022/23 marketing year (MY), which worsened during the Russia-Ukraine invasion on February 24, 2022. Some countries and international organizations have recently expressed concern that the reduction of grain supply on the world market and the rapid rise in its price. Whether the impact of the destabilizing situation on the world grain market on the exacerbation of hunger is an open question. In order to fill the research gap, the paper tries analysis the global market into grain types between 2008/09 MY to 2021/22 MY and identify on it the shares of Ukraine and Russia. Two methods are used to conduct a comprehensive study of the grain market - fundamental and technical analysis. The analysis of the state and dynamics of the main indicators of the world grain market was carried out with the help of fundamental analysis. The results show that the volume of grain production in the world and the two warring countries are growing. Both countries supply about a quarter of all products in the overall structure of world grain exports. Finally, the result also shows that Ukraine and Russia are key exporters of barley, rye, wheat, and corn to low-income and least developed countries. Grain price forecasting through technical analysis was carried out. Based on the results obtained during the fundamental and technical analysis, three scenarios for the development of the grain market and its impact on the problem of hunger were proposed and given recommendations for levelling of crisis phenomena.

Keywords: *world grain market, population growth, Russian military invasion in Ukraine, hunger and undernourishment.*

1. INTRODUCTION

The idea that history repeats itself is nothing new. Many thinkers of old analyzed and forecasted history, focusing on how it has an inherent repetitive nature of historical events (Čičak, 2021). At the beginning of the First World War, access to Black Sea wheat exports was lost, which led to a reduction in production and an increase in prices. It took place in two periods. The first period lasted from June to October 1914. The volume of wheat production in Europe decreased by 20%, while prices rose by 22%. The second period of the price rise was between October 1914 to February 1915, when the Ottoman Empire had just joined the first world war and blockaded the Bosporus and the Dardanelles Straits (The economist, 2022). It was the only route for Russian wheat to move to European allies, especially Britain and France. This period saw the remaining 45% of the 77% price rise. It is important to define that the loss of access to the Black Sea in October 1914 caused a price increase of 12% above the five-year average while on the eve of the start of Russia's offensive campaign in Ukraine (February 22, 2022), the price of CBOT wheat prices is 49% above the five-

year average (2017-2021). This situation is predictable because from the 1900s to the present day, dependence on Black Sea wheat exports was growing (Voznesenski, 2022).

2. LITERATURE REVIEW

The growth of global grain production since 1960s to present has failed to provide food security for 795 million people and 2 million undernourished people (Roser, Ortiz-Ospina, 2019). Moreover, global population of 7,9 billion in 2022 is projected to increase to 10 billion by 2057 (UN, 2022), with almost all increase occurring in developing countries. Consequently, it is recommended to increase world food production by 60-70% between 2005 and 2050. Global crop production from 1965 to 2015 was triple due to the growth of cropland areas by only 67 million ha (Mha) (Lal, 2016). Thus, today the insidious problem of hunger and undernourishment is more than ever of concern to mankind. Therefore, this issue was given close attention during the review of Agenda 21 (UN, 1992), Millennium Development Goals (UN, 2000), and the Sustainable Development Goals (UN, 2015a, b). However, most initiatives are general recommendations (Horton, 2014) and do not involve the development of a mechanism for solving the problem.

Food producers and exporters have a direct influence on solving the hunger and undernourishment problem, which is primarily related to the realization of their economic interests. The leader among available food is grain. Thirty years ago developing countries consumption nearly 141 kg grain per capita per year, accounting for about 61% of total calories. It now stands at 173 kg per person per year and provides 56% of total calories. There is a diversification of the consumption of grain products. Expected that grain will continue to provide more than 50% of people's food consumed (FAO, 2013).

3. RESEARCH OBJECTIVES

In our research, we will focus on analyzing the situation in the world grain market and the share of Ukraine and Russia in it, which will assess the consequences of partial or complete non-fulfillment by these countries of their trade obligations and its impact on the hunger problem. The main research objectives include:

1) establish the interdependence between the world's population growth rate and the volume of grain production as an affordable food product;

2) analyze the situation in the world grain market and the impact of the war between Ukraine and Russia on it;

3) predict the impact of the war on the grain market and the number of starving and undernourished people, and give recommendations to mitigate the negative consequences of this crisis phenomena.

4. METHODS

To identify the possibility of providing the growing world population with affordable kinds of food (among them was chosen grain), a calculation was being made for the ratio of grain production and population growth rates. A formula to determine this relationship is:

$$\text{ratio}\,\frac{FP}{PG} = \frac{\text{Food grain production}}{\text{Population Growth}} \quad (1)$$

To calculate the ratio FP/PG, it's necessary to find grain production volumes (FP) and population growth (PG). The total grain production (FP) includes different grain types (barley, corn, millet, mixed grain, rice, oats, rye, sorghum, and wheat). Its indicator is calculated by secondary data from

the United States Department of Agriculture (USDA). The following formula was used to calculate population growth rates (PG):

$$PG = \frac{C}{t} \tag{2}$$

where: C – population percentage change, t – time. To find the population change can use the following formula:

$$C = \frac{(\text{final population size} - \text{initial population size})}{\text{initial population size}} * 100 \tag{3}$$

Population change was also calculated using the second data that available on the UN World Population (UN 2022).

Based on the FP/PG ratio, it is possible to conclude the possibility (FP/PG>0 ratio) or impossibility (FP/PG>0 ratio) to provide the world population with grain as one of the available product types. The ability to provide the world's population with grain depends on the state of development of the world grain market.

The main methods that have been used to analyze grain markets by major grains types and forecast its further development under the influence of various factors include (Garner, 2011; Duerfeldt, 2019; Keenan, 2020):

1) Fundamental analysis refers to analyzing the factors that can directly or indirectly impact the supply and demand of commodities. Most of these factors are obvious. But from the 24th of February 2022, the main factor on the supply side is the reduction of grain supply on the world market. This factor is not obvious. It can't forecast or predicted in a supply and demand model. Restoring the balance of markets after the influence of crisis phenomena allows us to continue forecasting.

The fundamental analysis predicts market action with imperfect knowledge, which allows us to make assumptions about different scenarios of the world grain market. During the grain market analysis using the largest statistical database of the grain market, that publishing the United States Department of Agriculture (USDA) and Food and Agriculture Organization of the United Nations (FAO).

2) Technical analysis utilizes current and historical data to forecast how the markets may react. The leading indicator of market reaction is price. This type of analysis help determines where the price is going to move next. The fundamental factors (perfect knowledge) that influence the market are used for forecasting in the technical analysis.

5. EMPIRICAL RESEARCH

5.1 POPULATION GROWTH AND GRAIN PRODUCTION

Despite the development of the world economy and improving the living standards of the population of many countries, only a third of the world's population has enough food. According to the FAO, more than 720 million people in 2020 are facing hunger. In terms of population, taking into consideration the additional statistical uncertainty, it's undernourished almost 10% of the world's population or one in every 10 people (FAO, IFAD, UNICEF, WFP, WHO, 2021).

In general, humanity has already mastered more than 30% of the land surface for agricultural purposes, in particular in Western Europe – 30,8% of the entire territory, in Asia – 20,2%, in North and South America – 14,4%, in Africa – 14,4%, in Australia and Oceania – 4,1%. The main direction of increasing agricultural production will be to increase productivity (Edgerton, 2009).

At the same time, world grain production cannot always meet the needs of a growing population (table. 1).

Table 1. Rate of growth of population and food grain production.

Decade	Population Growth (PG)	Food grain production (FP)	Ratio FP/PG
1961-1971	1,96	2,83	1,44
1971-1981	1,81	1,8	0,99
1981-1991	1,74	3,13	1,79
1991-2001	1,35	1,1	0,81
2001-2011	1,18	1,03	0,87
2011-2021	1,07	3,4	3,17

Source: developed by authors based on information from USDA (2022a), UN (2022).

Table 1. show that the 20-year period of shortage of grain is over. From 2011 to 2021 growth rate of food grain production is higher than the population growth rate. The increase in grain production has reduced the number of undernourished people from 653 million in 2011 to 643,3 million in 2014. But from 2015 to 2020 positive trend changed. The number of undernourished people began to increase again (Roser, Ritchie, 2019). In 2020, between 720 and 811 million people faced undernourished (FAO, IFAD, UNICEF, WFP, WHO 2021). The main reasons for the growing number of undernourished people are the high cost of healthy eating combined with persistently high levels of income inequality. This situation was due to several reasons. Firstly, the growing number of undernourished people is due to the unavailability of food due to the high cost of healthy eating products. This situation is complicated by higher income inequality between people in one country. Secondary, the COVID-19 pandemic exposes weaknesses in food systems (reduction of the production of some types of grain, disruption in grain supply chains, etc.).

5.2. THE GRAIN MARKET ANALYSIS

The future of world grain markets after the pandemic had no chance of recovery, as the war broke out between Ukraine and Russia the biggest grain exporters. The current situation of food security is complicated because both countries account for about a quarter of the world's grain trade (table 2.).

Table 2. Russia, Ukraine and the global grain supply.

Grain	Country	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022
	million tons														
wheat	Russia	18,4	18,6	4,0	21,6	11,3	18,6	22,8	25,6	27,8	41,5	35,9	34,5	39,1	33,0
	Ukraine	13,0	9,3	4,3	5,4	7,2	9,8	11,3	17,4	18,1	17,8	16,0	21,0	16,9	19,0
	Rest of World	144,1	136,8	133,0	157,6	136,2	165,9	164,3	173,0	186,8	185,4	176,2	193,9	202,6	200,1
barley	Russia	3,4	2,7	0,3	3,5	2,2	2,7	5,4	4,2	3,0	5,9	4,7	4,5	6,3	4,5
	Ukraine	6,4	6,2	2,8	2,5	2,1	2,5	4,5	4,4	5,4	4,3	3,6	5,0	4,2	5,8
	Rest of World	20,0	17,1	15,9	20,4	19,6	22,9	29,0	30,8	29,5	29,1	25,6	29,0	35,6	34,7
rye	Russia	0,02	0,01	0,00	0,24	0,13	0,07	0,11	0,05	0,01	0,07	0,28	0,00	0,08	0,08
	Ukraine	0,01	0,06	0,04	0,01	0,02	0,05	0,02	0,02	0,01	0,04	0,09	0,01	0,02	0,02
	Rest of World	0,2	0,3	0,4	0,5	0,5	0,4	0,4	0,4	0,3	0,4	0,7	0,4	0,4	0,6
maize	Russia	1,3	0,4	0,0	2,0	1,9	4,2	3,2	4,7	5,6	5,5	2,8	4,1	4,0	4,5
	Ukraine	5,5	5,1	5,0	15,2	12,7	20,0	19,7	16,6	21,3	18,0	30,3	28,9	23,9	23,0
	Rest of World	83,7	96,6	91,6	117,0	95,4	131,5	142,6	120,8	162,1	149,8	182,6	172,3	182,1	197,0
oats	Russia	0,00	0,00	0,00	0,01	0,01	0,01	0,01	0,02	0,01	0,03	0,01	0,09	0,09	0,15
	Ukraine	0,01	0,02	0,00	0,00	0,00	0,01	0,04	0,04	0,03	0,01	0,01	0,01	0,02	0,02
	Rest of World	2,3	2,1	1,9	2,2	2,1	2,3	2,4	2,1	2,5	2,6	2,4	2,5	2,8	2,4
	change rate, %														
wheat	Russia	12,8	13,6	2,9	13,7	8,3	11,2	13,9	14,8	14,9	22,4	20,4	17,8	19,3	16,5
	Ukraine	9,1	6,8	3,2	3,5	5,3	5,9	6,9	10,1	9,7	9,6	9,1	10,8	8,3	9,5
	Rest of World	78,2	79,6	93,8	82,8	86,4	82,9	79,3	75,2	75,4	68,1	70,6	71,4	72,4	74,0
barley	Russia	17,2	15,5	1,7	17,4	11,4	11,9	18,4	13,8	10,0	20,2	18,2	15,4	17,6	13,0
	Ukraine	31,9	36,4	17,6	12,1	10,9	10,8	15,4	14,3	18,1	14,7	13,9	17,2	11,8	16,7
	Rest of World	50,9	48,1	80,8	70,6	77,7	77,3	66,2	71,9	71,9	65,1	67,9	67,4	70,6	70,3
rye	Russia	7,1	4,1	0,0	48,6	28,8	17,6	27,6	13,6	3,5	17,8	39,4	0,2	19,4	12,0
	Ukraine	2,7	19,1	10,5	2,2	3,7	12,1	5,3	6,0	4,7	9,6	12,3	1,8	4,0	3,7
	Rest of World	90,2	76,8	89,5	49,2	67,5	70,2	67,1	80,5	91,8	72,6	48,3	98,0	76,7	84,4
maize	Russia	1,6	0,4	0,0	1,7	2,0	3,2	2,3	3,9	3,5	3,7	1,5	2,4	2,2	2,3
	Ukraine	6,6	5,3	5,5	13,0	13,3	15,2	13,8	13,7	13,2	12,0	16,6	16,8	13,1	11,7
	Rest of World	91,8	94,3	94,5	85,3	84,7	81,6	84,0	82,4	83,4	84,3	81,9	80,8	84,7	86,0
oats	Russia	0,1	0,1	0,1	0,6	0,4	0,3	0,4	0,9	0,5	1,1	0,5	3,4	3,1	6,3
	Ukraine	0,3	0,8	0,2	0,1	0,1	0,3	1,7	2,0	1,1	0,4	0,3	0,4	0,7	0,6
	Rest of World	99,7	99,1	99,7	99,3	99,5	99,5	98,0	97,1	98,3	98,6	99,1	96,2	96,2	93,1

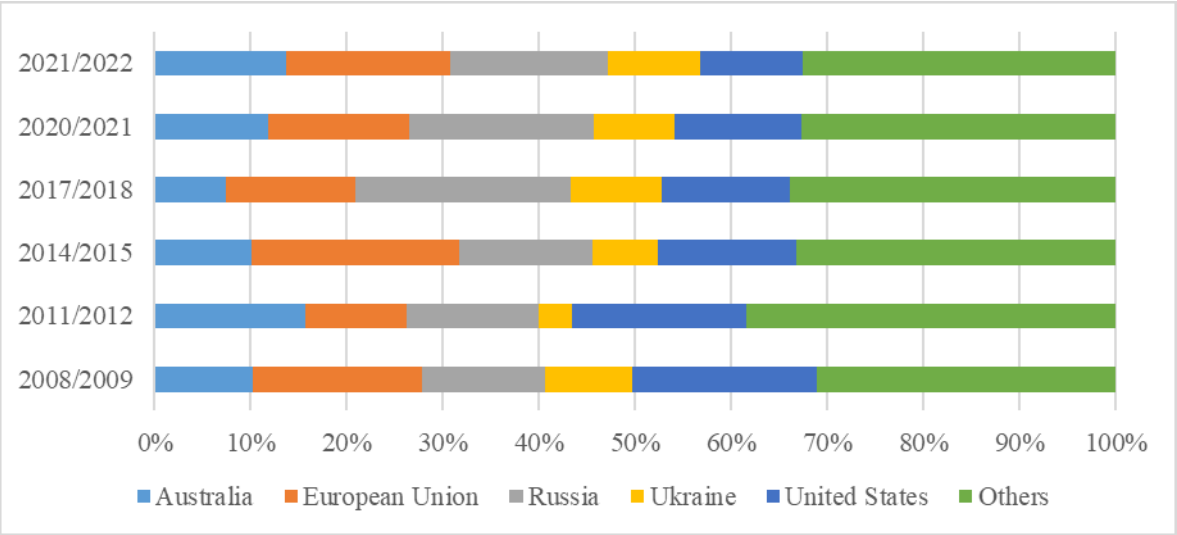
Source: complications and calculation by authors based on information from USDA (2022b).

Table 2 shows that Ukraine and Russia are the most important producers of grain in the world. In 2021/22 MY countries separately or together ranked amongst the top position in different sectors of global market.

In the wheat sector, in 2021/22 MY, Russia stands out as the top 2 global wheat exporter after European Union (EU), trading a total of 33 million tons, or the equivalent of 16,5% of world export. Ukraine stood as the 5th largest wheat exporter in 2021/22 MY, exporting 19 million tons and with a 9,5% global market share (fig.1).

The most of wheat exports from Ukraine are shipped in the first few months of the marketing year, but the closure of most ports restricts additional exports. Russian exporters also rushed to sell grain before the introduction of the 11,0-million-ton export quota, from February 15 to June 30, 2022, of which wheat will account for 8,0 million tons. This quantitative restriction does not apply to the neighboring Eurasian Economic Union (EAEU) countries and maintains access to ships out of the Caspian Sea (USDA, 2022d).

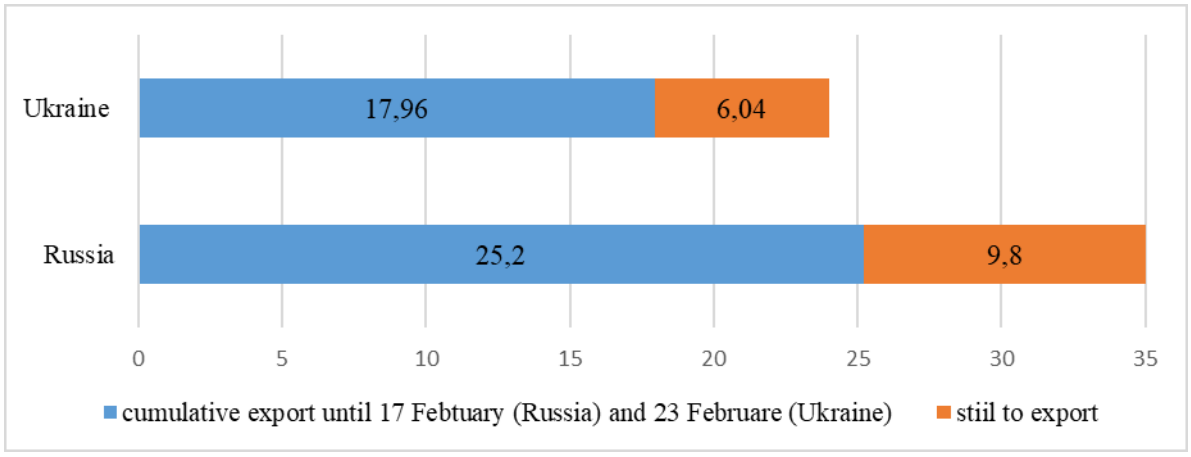
Figure 1. Share of top-5 wheat exporters in the world market in 2008/09 – 2021/22 MY, %.



Source: (USDA, 2022c).

Since the introduction of the restriction, Russia has not supplied 9,8 metric tons of wheat to the world market (fig.2).

Figure 2. Ukraine and Russia still have a sizeable amount of grains from 2021/22 to export (m tonnes).



Source: (Patterson, 2022).

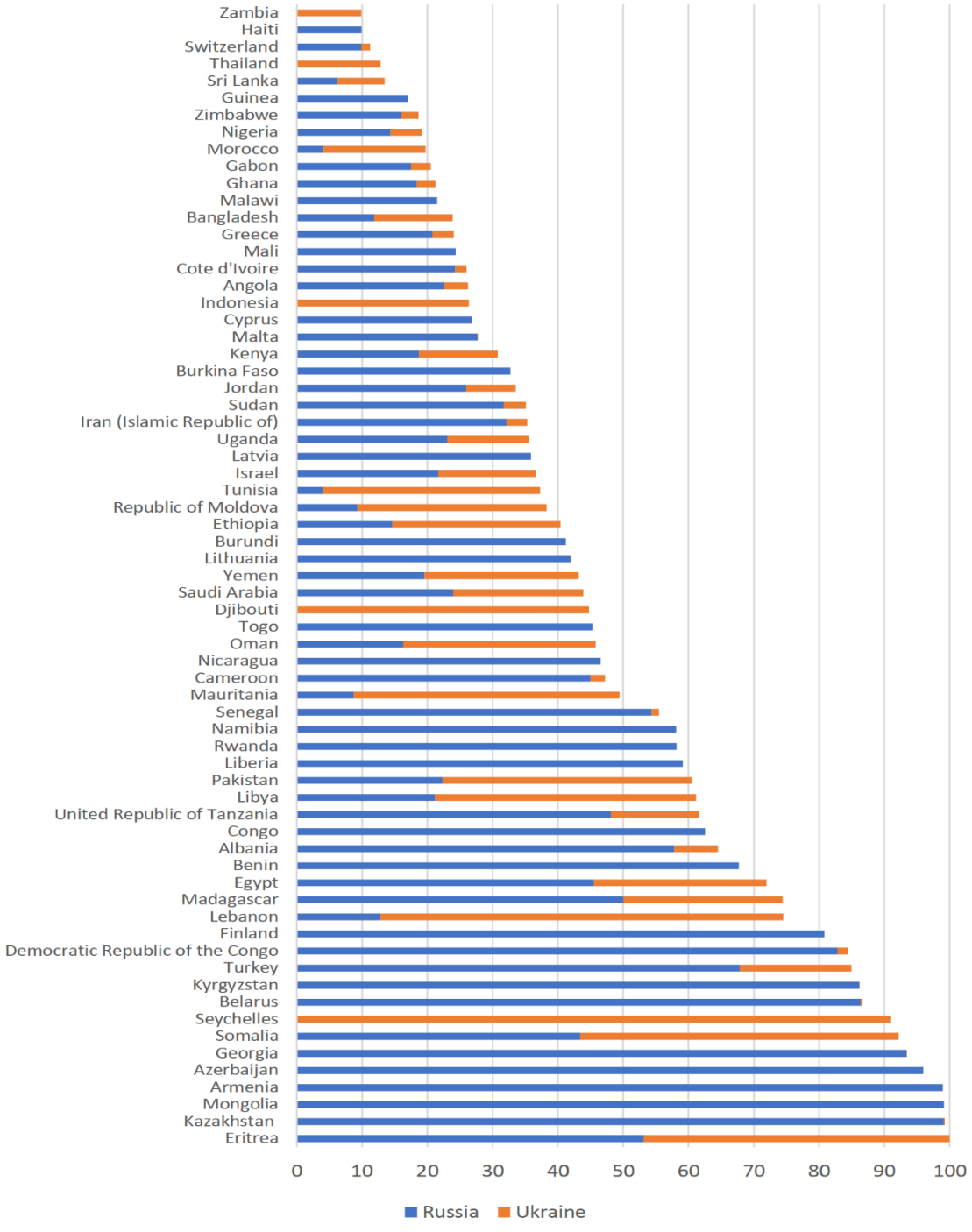
The position of Ukraine and Russia in the other types of grain sectors is also noteworthy:

- barley sector – placement both countries in the top 5 of leading exporters during 2008/09 - 2021/22 MY. Their share in the barley sector increased from 19,3% in 2008/09 MY to 29,7% 2021/22 MY;
- maize sector – Ukrainian stands on top-5 and Russia on top-10 main exporters from 2008/09 till 2021/22 MY. The total growth of the two countries in the maize sector for the study period is from 8,2 to 14%;
- oats sector – Russia takes a leading position during 2008/09 - 2021/22 MY. It rose from 8th to 3rd position of larger exporters, increasing exports from 2 to 150 thousand tons. Ukraine decreased from 6 to 11 positions in the top-15 exporters during the same period (944 to 478 thousand tons);

- rye sectors – both countries during 2008/09 - 2021/22 MY don't change their position in the top-5 larges exporters: Russia stands on 2nd and Ukraine stands on 4th position. Total production in both countries declined. The production of rye in Russia is decreased by 62% (from 4.51 to 1.72 million tons), and in Ukraine - by 43% (from 1.05 to 0.6 million tons).

Analysis of the total exports of the two warring countries indicates their significant share in various sectors of the world grain market. The situation is especially threatening for importing countries, whose share of Ukrainian and Russian grain in the import exceeds 30%. For example, more than 2/3 of importers are critically dependent on supplies of warring countries (fig. 3).

Figure 3. Wheat import dependency, net importers only, 2021 (%).



Source: (FAO, 2022).

Figure 3 shows that the leading importers of wheat from Russia and Ukraine were the countries of North Africa and Western and Central Asia. Most of the countries exporting countries belong to low-income and food-deficit countries, but also there are representatives of the least developed countries among it.

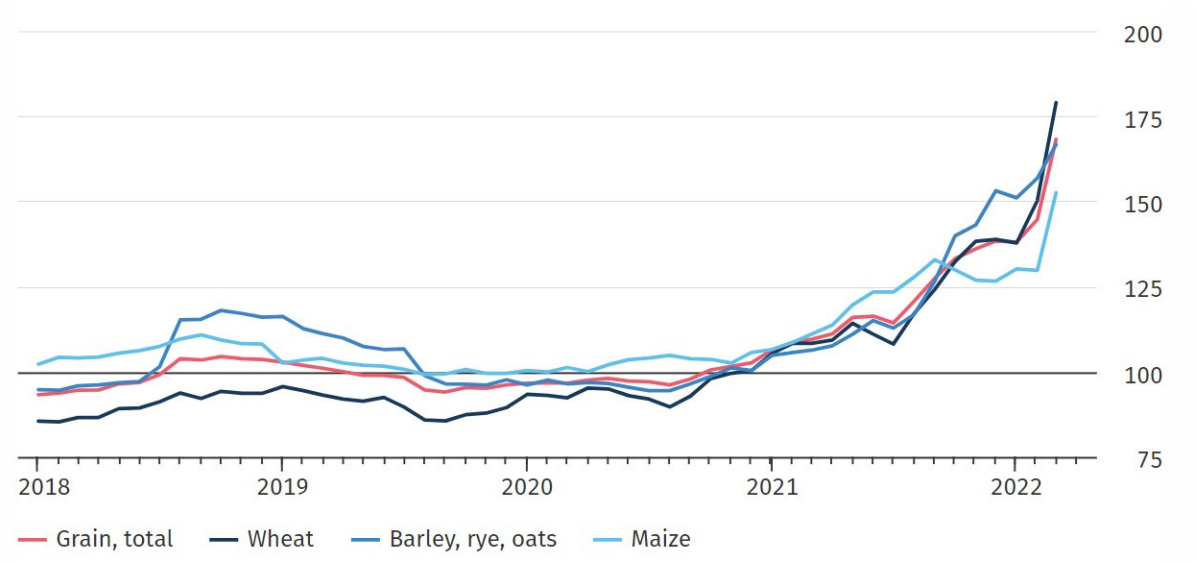
Both countries have imposed a trade embargo on grain supplies. Russia has completely banned the export of grain (wheat, mixtures of wheat and rye (meslin), rye, barley, and maize) until June 30, 2022 (Decree No. 362, 2022). At the same time, Ukraine imposed a partial ban on grain exports. Unlike the aggressor country, Ukraine is trying to fulfill its obligations to partner countries during the war. The country's leadership understands the need to prevent the aggravation of the food crisis in the world, which may arise through no fault of Ukraine. But at the concurrent to protecting food safety for the citizens of their country. Therefore, oats, millet, buckwheat, and rye export are prohibited. Other types of grain can be exported. The company needs to take free export licensing (Decree No. 207,2022).

Legislative restrictions on grain supplies by Ukraine and Russia to the world market coincided with the physical impossibility of supplies. From one side, about 90% of the grain from Ukraine was exported through ports located in Odesa and Mykolayiv regions. Russian warships have blocked Ukrainian ports, leaving the country with a functioning railway and three ports on the Danube: Izmail, Reni, and Ust-Dunaisky (Odesa region). About 10% of the grain was transported through ports on the Danube. The main route for the export of Ukrainian grain by rail - is 11 railway border crossings on the borders of Poland, Slovakia, Hungary, Romania, and Moldova. Before the war, only one of them is Izovi, who worked 100%, the rest - 50-80%. Despite the congestion of these border crossings, about 11% of grain exports were usually transported through them (Ulyanytsky, Krytska, 2022).

Reducing the supply of grain to the world market by the two main exporters, disrupting supply chains, and panic among importing countries whose imports share from Ukraine and Russia exceeds 30% are factors that have contributed to rising grain prices.

The reduction of grain supply on the world market by Ukraine and Russia has led to an increase in their grain prices on the world market (fig. 4).

Figure 4. Import price of selected types of grain, index 2015=100.



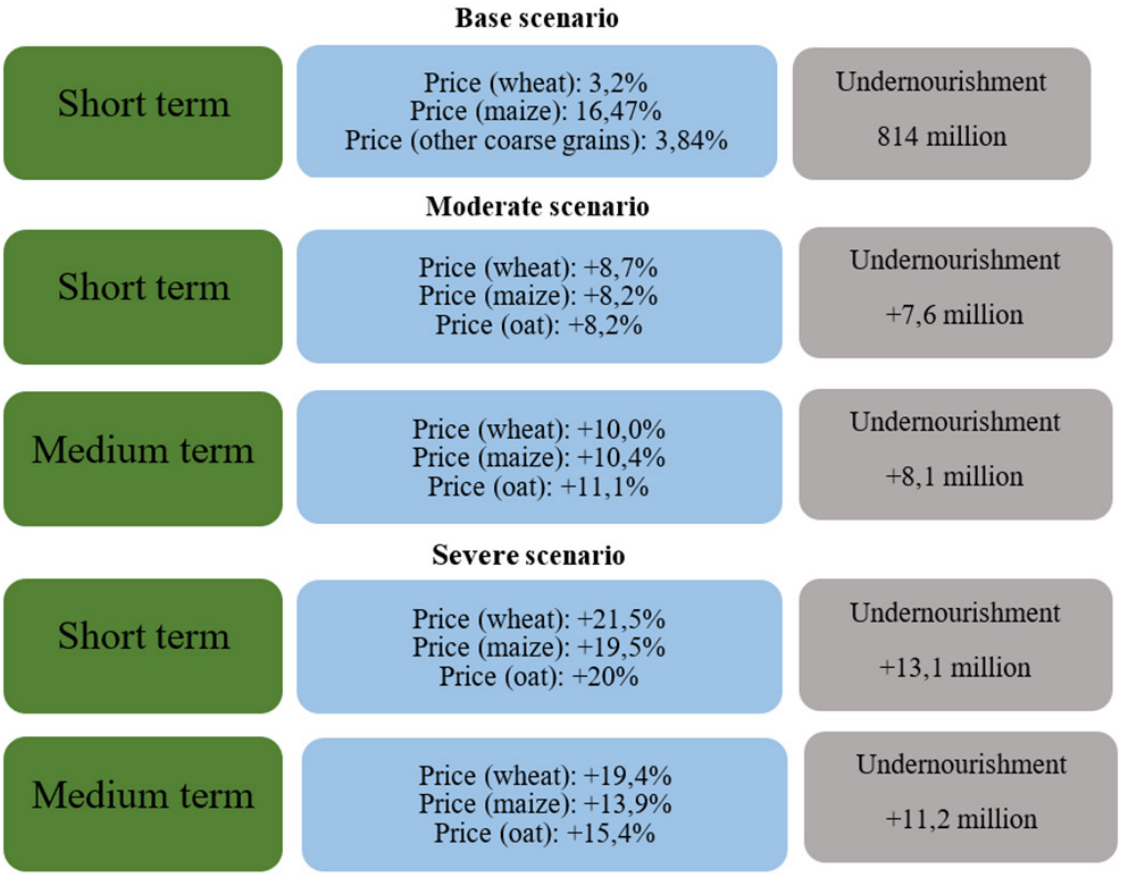
Source: (Destatis, 2022).

In March 2022, import prices for grain increased by 53,6% compared to the same period last year. The price increase affected all types of grain. Prices for wheat in March increased by 65,3% compared to the previous year, prices of barley, rye, and oats also increased by 65,3%, and maize - by 37,4%. The monthly rate of change for the same month the previous year has always been two-digit since January 2021 (Destatis, 2022). On 28 February 2022, the price of wheat increased to $12,09 per bushel, and it was the highest since 1960. The rise in the price of maize was not so rapid. During the war in Ukraine, the corn price approached a 10-year high, and on 25 April 2022, it was $8,14 per bushel (Macrotrends, 2022).

5.3. SCENARIOS OF DEVELOPMENT OF WORLD GRAIN MARKET

Further development of the world grain market during or after Russia's war in Ukraine will be one of three possible scenarios: base, moderate and severe (fig. 5).

Figure 5. Impact on world market prices and undernourishment for three scenario.

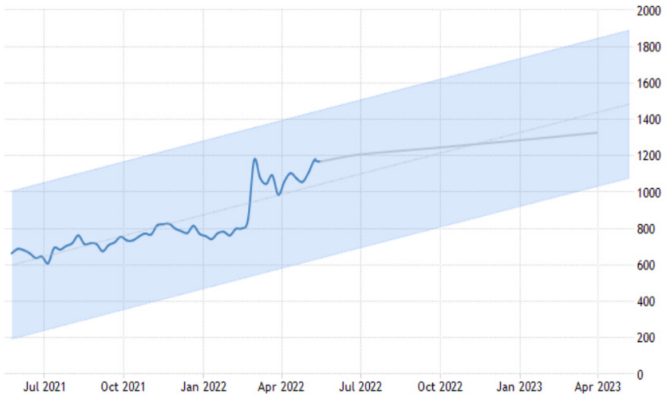


Source: developed by authors based on information FAO (2022) and own calculation.

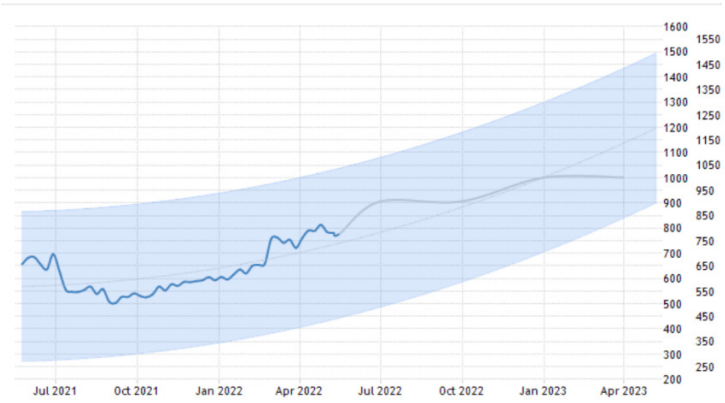
Base scenario. Russia invasion of Ukraine has already influenced rising grain prices and the reduction of its supplies to the world market. At the same time, changes in the grain market are affecting many countries whose populations may be on the verge of starvation. Factors complicating the forecasting of Ukraine and Russia grain exports are the reduction of sown areas in Ukraine (more than 30% are not suitable for sowing grain) (Trompiz, Sharafedin, 2022), the use of insufficient fertilizers provided with fertilizers by 84%), reduced yields (use of insufficient fertilizers, weather conditions, etc.), the danger of care and harvesting grain, disruption of grain supply chains distribution through the Black Sea, the possibility of extending the ban on grain exports to Ukraine and Russia.

The duration of the baseline scenario is the end of the second quarter of 2022. Short-term period is due to the complexity and smoothness of the relationship between the grain market and related industries and the state of infrastructure development (agriculture, logistics, etc.).
The grain prices forecasting has been made in Trading Economics Excel Addin. The construction of the price trend has based on secondary grain price data (Trading Economics, 2022). Based on the forecast from May 20 to June 31, 2022 the increase in wheat prices will be 3,2% (1206,27 USd/BU), maize – 16,47% (905,69 USd/BU), oat - 3,84% (633,18 USd/BU) (Fig. 6).

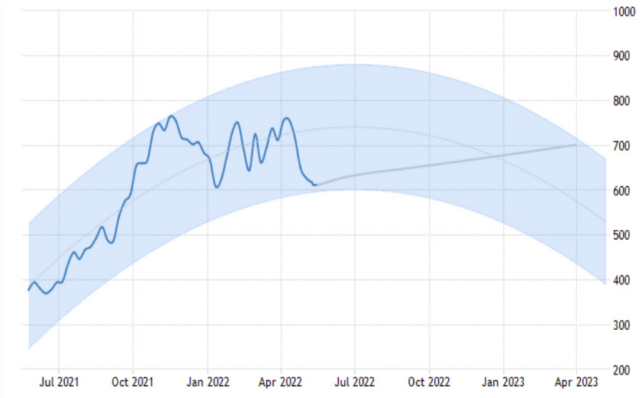
Figure 6. Forecast market price on wheat, maize and oats, USd/BU.



a) Wheat price, USd/BU



b) Maize price, USd/BU



c) Oat price, USd/BU

Source: developed by authors based on (Trading Economics, 2022).

Resumption of grain supply chains on the world market is possible only after the resumption of port control on the Black Sea (Child, Rasheed, & Hatuqa, 2022). The approximate duration of demining ports is 2-3 months.
According to the FAO baseline scenario, quantity hungry people will be 814 million.

Moderate scenario. In the scenario of moderate shock, grain prices will continue to rise. Medium-term forecasting increase wheat price on 10% (1325 USd/BU), maize – 10,4% (1000 USd/BU), oat – 11,1% (700 USd/BU) (fig. 6). This growth will be expected by the end of April 2023 (completion of 2022/23 MY and beginning of 2023/24 MY). This period is accompanied by even more accompanying factors that complicate the forecasting of the state of market development. On the one hand, in 2022/23 MY harvesting is at risk. And on the other hand, the harvest will mean the opportunity to start new sowing in 2023/24 MY. According to the FAO forecast, a reduction in the export of wheat and corn from Ukraine and Russia together will decrease by 10 million tons and the export of other grains - by 2,5 million tons. The reduction in exports will be attended by the price increase.
The process of restoring pre-war production and exports, especially for Ukraine, will take 2-3 years. During this period, Black Sea grain consumers will diversify their suppliers and the foods they consume. The return of Ukraine and Russia to the grain market will be viewed positively, as the number of hungry and undernourishment will increase from 7,6 to 8,1 million people.

The severe scenario provides the total export reduction of wheat by 13 million tons, maize - by 12 million tons, and coarse grain - by 5 million tons. Alternative grain supplies by other producers will be partially satisfied. An increase in grain prices will be inevitable, but their increase level will depend on the elasticity of supply of alternative suppliers and the relative elasticity of demand for goods.
The impact on the market also will be felt in related sectors. For example, supply reductions in feed wheat and corn will increase the price of feed products. All these factors together will drive up livestock prices. The high prices are most affected by the food-intensive poultry and pork sectors. Ukraine's position in the world grain market under the severe scenario will depend on its ability to continue producing grain and its partial export, which will depend not only on the volume of production but also on access to the logistics chain. Transport infrastructure facilities are in the high-risk zone.
According to FAO forecasts, the severe scenario will last until 2026/2027 MY, which will cause first an increase in undernourishment by 13,1 million, and then their gradual reduction - by 1,9 million.
Forecast scenarios for the world grain market appear to remain uncertain. The grain market has many interrelated sectors (by type of grain) and industries. The main ways to level the negative phenomena in the world grain market are:

- promote free trade in the grain market. It is necessary to reduce trade barriers to imports or exports, stimulate increased production and exports, keeping supply chains moving;
- find new and more diverse food suppliers. Countries dependent on Ukrainian and Russian exports should rationally use existing food stocks and look for alternative suppliers of grain and other food products;
- state and/or international support for vulnerable groups, which will save people from starvation;
- the availability of information on the state of development of the grain market will enable governments to make informed decisions. At the initiative of the G-20, the Agricultural Market Information System (AMIS) have created, where anyone can find objective information about the state of the market.

Solving the problem on the world grain market and mitigating the consequences for interconnected markets is possible only if the war ends and the warring parties return to the market. It's hard to replace grain exports from Ukraine and Russia in the short and medium term. Their products are the chief constituent of global supply and processing chains, and their absence inevitably triggers a chain reaction with unpredictable consequences.

6. DISCUSSION

The research result substantiates the possibility of providing a growing population with available food - grain. The development of the world grain market and the position on it of key exporters that fully or partially stopped the supply of grain to the world market were studied. The study emphasizes that war is an uncertain factor and therefore not fully predictable and controllable. The share of recommendations that will help mitigate the levelling of the crisis in the grain market and reduce the number of starving and undernourished depends on the length of the period of non-fulfillment of trade obligations between Ukraine and Russia.

7. CONCLUSION

In 2022/23 MY world grain market characterized several crisis phenomes that occurred against the background of the Russian invasion of Ukraine on February 24, 2022. Among the main factors that should mentioned: 1) the grain market share of Ukraine and Russia is close to 25 percent; 2) the critical dependency of 2/3 of importing countries on the Ukrainian-Russian grain; 3) most importing countries belong to low-income and food-deficit countries.

War is having a domino effect at different levels. On the one hand, there is a possibility of food security in warring countries, which are already struggling to feed their populations by limiting exports or imposing a total ban on grain exports. On the other hand, its exacerbation of the hunger problem in the world.

Three Forecast scenarios for the development of the world grain market has proposed. Attention has focused on two aspects: 1) the duration of hostilities on the territory of Ukraine and, accordingly, the continuation of sanctions for Russia; 2) implications for the global grain market and its impact on the number of hungry people in the world. Mitigation of the negative effects on the world grain market can be achieved through compliance with the principles of free trade and reduction of trade barriers in the grain market can help mitigate the effects of the crisis on the world grain market; diversification of grain suppliers; search for alternative foods that can meet people's needs; support vulnerable groups both in Ukraine and the major importers of Ukrainian and Russian grain; allow the possibility of free access to objective information about the state of the world grain market, which will allow making balanced decisions in conditions of instability in the markets.

The recommendations provided relate to the possibility of levelling the consequences of the crisis phenomena, but they cannot fully solve the problem. The only possible way to stabilize the situation on the grain market directly and in related industries is to end the war.

REFERENCES

Child, D., Rasheed, Z., & Hatuqa, D. (2022). Ukraine latest updates: UN rights body to hold session on Ukraine. Aljazzera, 9 May. Retrieved from: https://www.aljazeera.com/news/2022/5/9/russia-ukraine-live-news-japan-to-ban-russian-energy-imports-liveblog [Online Resource]

Čičak, Z. (2021). The history repeats itself. Horizons. *Journal of International Relations and Sustainable Development*, 18, 126-140.

Destatis (2022). Increase in grain prices larger than ever since 2011. Statistischen Bundesamt, Press release № 027. Retrieved from: https://www.destatis.de/EN/Press/2022/05/PE22_N027_61.html. [Online Resource]

Decree No. 362 (2022). O vvedenii vremennogo zapreta na vyvoz zernovykh kul'tur za predely territorii Rossiyskoy Federatsii [Title in English: On the introduction of a temporary ban on the export of grain crops outside the territory of the Russian Federation], 14 March 2022, Pravitel'stvo Rossiyskoy Federatsii. Retrieved from: http://publication.pravo.gov.ru/Document/View/0001202203150001 [Online Resource]

Decree No. 207 (2022). Pro vnesennya zmin do dodatkiv 1 i 5 do postanovy Kabinetu Ministriv Ukrayiny vid 29 hrudnya 2021, № 1424 [Title in English: On Amendments to Annexes 1 and 5 to the Resolution of the Cabinet of Ministers of Ukraine of December 29, 2021 № 1424], 5 March 2022, Ofitsiynyy visnyk Ukrayiny, № 4, st. 217.

Duerfeldt, A. (2019). Charting Commodities: Technical vs Fundamental Analysis. CropWatch. Retrieved from: https://cropwatch.unl.edu/2019/charting-commodities-technical-vs-fundamental-analysis [Online Resource]

Edgerton, M.D. (2009). Increasing Crop Productivity to Meet Global Needs for Feed, Food, and Fuel. *Plant Physiology*, 149(1), 7–13. https://doi.org/10.1104/pp.108.130195

FAO, IFAD, UNICEF, WFP & WHO (2021). Transforming food systems for food security, improved nutrition and affordable healthy diets for all. The State of Food Security and Nutrition in the World 2021, FAO, Rome. Retrieved from: https://www.fao.org/state-of-food-security-nutrition [Online Resource]

FAO (2022). The importance of Ukraine and the Russian Federation for global agricultural markets and the risks associated with the current conflict, Information Note, FAO, Rome. Retrieved from: https://www.fao.org/3/cb9236en/cb9236en.pdf [Online Resource]

FAO (2003). Agriculture, food and water, Contribution to the World Water. Development Report. Retrieved from: https://www.fao.org/3/y4683e/y4683e.pdf [Online Resource]

Garner, C. (2011). Commodity Market Fundamentals. Upper Saddle River, N.J.FTPress Delivers, New Jersey. ISBN: 9780132491914

Horton, R. (2014). Why the sustainable development goals will fail. *The Lancet, 383 (9936), 2196.* https://doi.org/10.1016/S0140-6736(14)61046-1

Keenan, M.J.S. (2020). Advanced Positioning, Flow, and Sentiment Analysis in Commodity Markets: Bridging Fundamental and Technical Analysis. 2nd Edition. John Wiley & Sons Ltd. Chichester, West Sussex, Great Britain. ISBN:9781119603825

Lal, R. (2016). Feeding 11 billion on 0.5 billion hectare of area under cereal crops. *Food and Energy Security*, 5(4), 239–251.

Macrotrends (2022). The Premier Research Platform for Long Term Investors. Retrieved from: https://www.macrotrends.net/charts/commodities [Online Resource]

Patterson, W. (2022). Russia-Ukraine conflict: What it means for grain and oilseed markets. ING

THINK: Economic and Financial Analysis, 7 March. Retrieved from: https://think.ing.com/articles/russia-ukraine-conflict-what-it-means-for-grain-markets/ [Online Resource]

Roser, M., Ritchie, H. (2019). Hunger and Undernourishment. Published online at OurWorldInData.org. Retrieved from: https://ourworldindata.org/hunger-and-undernourishment [Online Resource]

Roser, M., Ritchie, H., & Ortiz-Ospina, E. (2019). World Population Growth. Published online at OurWorldInData.org. Retrieved from: https://ourworldindata.org/world-population-growth [Online Resource]

The economist (2022). War in Ukraine will cripple global food markets. The economist, 12 March. Retrieved from: https://www.economist.com/finance-and-economics/2022/03/12/war-in-ukraine-will-cripple-global-food-markets [Online Resource]

Trompiz, G., & Sharafedin, B. (2022) Ukraine's embattled farmers running on empty as world faces food crisis. Reuters. Retrieved from: https://www.reuters.com/markets/commodities/ukraines-embattled-farmers-running-empty-world-faces-food-crisis-2022-05-25/ [Online Resource]

Trading Economics (2022). Trading Database. Retrieved from: https://tradingeconomics.com [Online Resource]

Ulyanytsky, D., & Krytska, I. (2022). Viyna vidrizala Ukrayinu vid morya, a metalurhiv i ahrariyiv mayzhe vid vs' oho eksportu. Yak teper vyvozyty tovar za kordon [Title in English: The war cut off Ukraine from the sea, and metallurgists and farmers from almost all exports. How to now export goods]. Forbs, 30 March, Retrieved from: https://forbes.ua/inside/blokada-portov-stoit-agrariyam-15-mlrd-v-mesyats-na-chem-teryayut-eksportery-i-kak-na-voyne-vezti-tovar-za-granitsu-29032022-5109 [Online Resource]

U.N (1992). Agenda 21. U.N. Conference on Environment and Development (3-14 June 1992), Rio de Janeiro, Brazil.

U.N (2000). Millennium development goals and beyond 2015. U.N. Department of Public Affairs, New York, NY.

U.N (2015a). Transforming our world: The 2030 agenda for sustainable development. A/RES/70/1. U.N., New York, NY.

U.N (2015b). World population prospects: key findings and advance table. 2015 revision, 59. United Nations, New York, NY.

U.N. (2022). Total population. Statistic Datebase. Retrieved from: https://population.un.org/wpp/Download/Standard/Population/ [Online Resource]

USDA (2022a). *World graine production. United States Department of Agriculture.* Retrieved from: https://apps.fas.usda.gov/psdonline/app/index.html#/app/advQuery [Online Resource]

USDA (2022b). Graine export. *United States Department of Agriculture.* Retrieved from: https://apps.fas.usda.gov/psdonline/app/index.html#/app/advQuery [Online Resource]

USDA (2022c). TOP-5 largest wheat exporters in the world. *United States Department of Agriculture.* Retrieved from: https://apps.fas.usda.gov/psdonline/app/index.html#/app/advQuery [Online Resource]

USDA (2022d). Grain: World Markets and Trade. World Agricultural Outlook Board. *United States Department of Agriculture*, January 2022. Retrieved from: https://downloads.usda.library.cornell.edu/usda-esmis/files/zs25x844t/qb98nh234/6t054j511/grain.pdf [Online Resource]

Voznesenski, D. (2022). When Black Sea Wheat Is Caught in Conflict. RaboResearch, Rabobank. Retrieved from: https://research.rabobank.com/far/en/documents/183433_Rabobank_When-Black-Sea-Wheat-Is-Caught-in-Conflict_Voznesenski_Feb2022.pdf [Online Resource]