Relações Internacionais do Mundo Atual – unicuritiba
19/04/2024
Submetido em: 19/04/2024
Aprovado em: 18/07/2024
Avaliação: Double Blind Review
ISSN: **2316-2880**

IMPACT OF THE COVID-19 PANDEMIC AND THE RUSSIAN-UKRAINIAN WAR ON THE EUROPEAN UNION'S WHEAT SUPPLY

IMPACTO DA PANDEMIA DA COVID-19 E DA GUERRA RUSSO-UCRANIANA NO FORNECIMENTO DE TRIGO DA UNIÃO EUROPEIA

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ABSTRACT

Objective: This study aims to analyze how the COVID-19 pandemic and the Russian-Ukrainian war have impacted the wheat supply in the European Union (EU), focusing on changes in wheat availability, consumption, and pricing.

Methods: The research employs a quantitative approach, utilizing secondary data from official European and international statistical databases. The study analyzes wheat stock levels, consumption rates, and price fluctuations within the EU during the specified periods of the pandemic and the conflict.

Results: Findings indicate a significant reduction in wheat stocks and consumption within the EU during the COVID-19 pandemic, with prices remaining stable globally. The Russian-Ukrainian war, while not drastically affecting wheat quantities within the EU, led to a sharp increase in global wheat prices, particularly in the initial months following the outbreak of the conflict.

Conclusion: Both the COVID-19 pandemic and the Russian-Ukrainian war have had detrimental impacts on the EU's wheat supply, albeit in different respects. The pandemic affected internal supply dynamics, whereas the war influenced global pricing structures, underlining the vulnerability of global food supply chains to geopolitical events.

Keywords: COVID-19; Russian-Ukrainian War; Food Supply Chain; European Union; Impact Analysis

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RESUMO

Objetivo: Este estudo visa analisar como a pandemia de COVID-19 e a guerra russo-ucraniana impactaram o fornecimento de trigo na União Europeia (UE), focando nas mudanças na disponibilidade, consumo e precificação do trigo.

Métodos: A pesquisa utiliza uma abordagem quantitativa, empregando dados secundários de bases de dados estatísticas oficiais europeias e internacionais. O estudo analisa os níveis de estoque de trigo, taxas de consumo e flutuações de preço dentro da UE durante os períodos especificados da pandemia e do conflito.

Resultados: Os resultados indicam uma redução significativa nos estoques e consumo de trigo dentro da UE durante a pandemia de COVID-19, com preços permanecendo estáveis globalmente. A guerra russo-ucraniana, embora não afetando drasticamente as quantidades de trigo dentro da UE, levou a um aumento acentuado nos preços globais do trigo, particularmente nos meses iniciais após o início do conflito.

Conclusão: Tanto a pandemia de COVID-19 quanto a guerra russo-ucraniana tiveram impactos prejudiciais no fornecimento de trigo da UE, embora de maneiras diferentes. A pandemia afetou as dinâmicas de suprimento internas, enquanto a guerra influenciou as estruturas de preços globais, sublinhando a vulnerabilidade das cadeias de suprimento alimentar globais a eventos geopolíticos.

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1. INTRODUCTION

The COVID-19 pandemic and the Russian-Ukrainian war have substantially disrupted global food supply chains, significantly impacting the European Union's wheat supply. Wheat, a staple food worldwide, ensures food security and market stability. The European Union (hereinafter: EU), one of the largest producers and consumers of wheat, has been directly influenced by these crises, prompting a need to understand their specific impacts on wheat supply within the region. The complexity of these events necessitates a thorough examination to grasp how such significant disruptions can ripple through global supply chains and affect regional stability.

The COVID-19 pandemic, declared in early 2020, resulted in widespread lockdowns, labour shortages, and logistical challenges, severely disrupting agricultural production and food supply chains worldwide. These disruptions affected wheat production, distribution, and consumption patterns, highlighting the fragility of global food systems in the face of unprecedented public health crises. Similarly, the ongoing conflict between Russia and Ukraine began in February 2022 and exacerbated these issues. Both countries are major wheat exporters, and the conflict has led to significant reductions in wheat exports, further straining global supply chains.

Wheat is a critical component of the global food market, forming the basis of many diets and agricultural economies. The stability of wheat supply chains is vital for direct consumption, livestock feed, and industrial uses. The EU's interconnectedness with global markets and reliance on stable wheat supplies make it particularly vulnerable to disruptions caused by significant global events. The importance of wheat to the EU's agricultural sector and its broader economic implications underscores the necessity of studying how crises like pandemics and wars impact this essential commodity. Understanding these dynamics can provide insights into broader food security issues and help develop strategies to mitigate adverse effects.

1.1 Problem definition, purpose, objectives and research questions

Wheat is one of the staple food crops grown in many parts of the world, including some regions of the EU (Tadesse et al., 2016). Wheat products are likely

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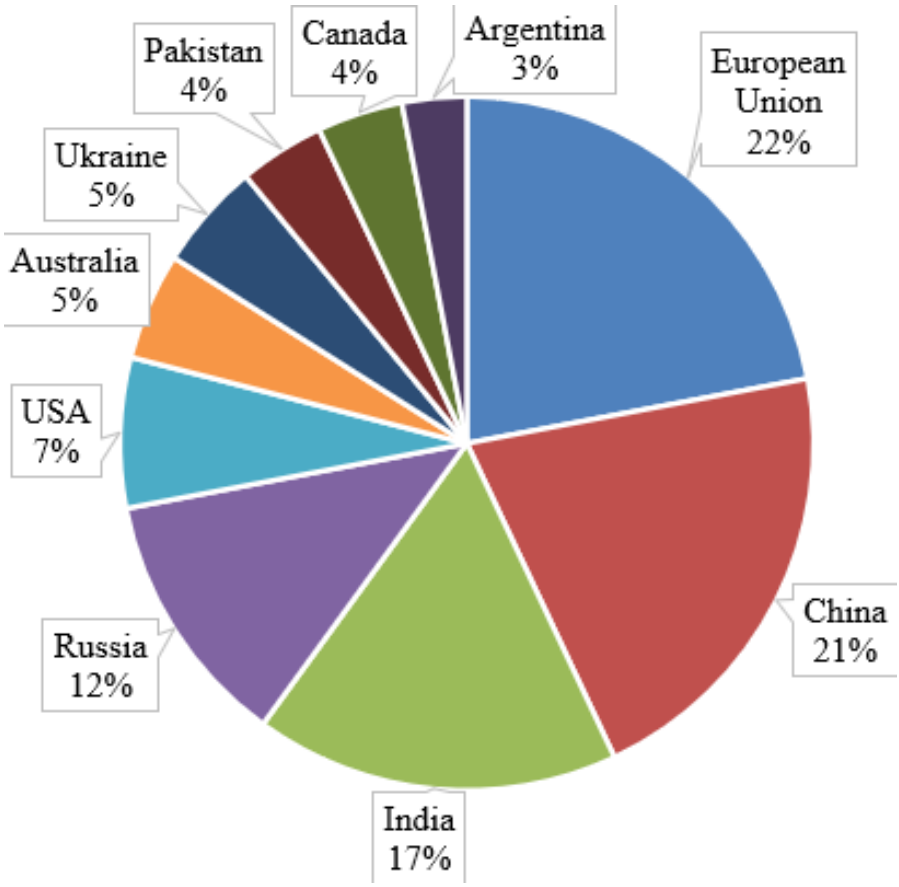
the primary source of calories, carbohydrates and dietary fibre for people of all ages and income levels. The importance of wheat is also demonstrated by the fact that in the EU, wheat is the most extensively produced crop, with an average annual production of more than 130 million tons (Eurostat, 2024) and that the EU is the world's largest producer of wheat (Kramar, 2022) (see Graph 1).

Graph 1. The world's largest country in terms of wheat production



Source. (World Population Review, 2022)

The COVID-19 pandemic and the Russian-Ukrainian war have had a significant impact on the supply of wheat and wheat products in the EU, with the pandemic causing various disruptions in global supply chains and transport networks, which has had the effect of increasing the prices of wheat and wheat products. However, The Russian-Ukrainian war only increased these problems because, despite the quantitatively significant wheat production, the EU still imports many of the latter from Ukraine, a large producer and exporter of wheat and wheat products.

More concretely, the pandemic caused disruptions in agricultural production, as workers could not access fields and farms due to the measures in some cases.

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The transport of wheat and wheat products was also restricted as shipping containers and trucks were diverted to other sectors, such as the healthcare industry. However, ironically, the pandemic also caused an increased demand for wheat and wheat products because during quarantine periods, in panic and uncertainty, people began accumulating stocks of durable food, including wheat products. This increase in demand has consequently put additional pressure on supply chains and raised wheat prices on the market.

The current state of war between Ukraine and Russia is no less favourable, as both are large exporters of wheat and wheat products, and the war has led to restrictions on wheat export. This restriction has increased the prices of wheat and wheat products worldwide and exacerbated food insecurity in many countries inside and outside the EU. As with the pandemic, the war has also caused disruptions in the transportation of wheat and wheat products, as ships cannot safely navigate some parts of the Black Sea, the main shipping route for transporting Ukrainian grain.

The purpose of this research is to investigate the specific impacts of the COVID-19 pandemic and the Russian-Ukrainian war on the EU's wheat supply. By examining these crises through the lens of price and quantity indicators, the research aims to provide a detailed understanding of how these global events have influenced wheat production, consumption, availability, prices, and export dynamics within the EU.

Objectives of this research are:

- to analyse the effects of the COVID-19 pandemic on wheat production, consumption, availability and prices in the EU;
- to assess the impact of the Russian-Ukrainian war on Ukraine's wheat export volumes and world wheat prices;
- to compare the relative impacts of the pandemic and the war on the EU's wheat supply.

Through this comprehensive analysis, the research seeks to contribute valuable insights into the resilience of the EU's wheat supply chain and inform policy decisions to enhance food security in the face of global disruptions.

The research will delve into two research questions:

- How has the COVID-19 pandemic affected wheat production, consumption, availability, and price in the EU?
- How did the Russian-Ukrainian war affect the dynamics of wheat exports in Ukraine and world wheat prices, and how did these changes affect wheat

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supply in the EU?

1.2 Theoretical background

1.2.1 Wheat, wheat products and their importance

Wheat is a widespread crop whose seed is used worldwide to produce staple foods. Among the thousands of known varieties of wheat, the most important are common wheat (Triticum aestivum), durum wheat (T. durum) and spike wheat (T. compactum). About 95% of the wheat produced worldwide is bread wheat, and most of the remaining 5% is durum wheat (Igrejas & Branlard, 2020). The latter is better adapted to the dry Mediterranean climate than bread wheat and is often called pasta wheat. Despite its relatively new origin, bread wheat is exceptionally genetically diverse, with over 25,000 different species, enabling it to adapt to various environmental types (Shewry, 2009).

The significant advantages of wheat are its good yield per unit area, it grows well in a temperate climate with a moderately short growing season, and it produces versatile and high-quality flour (Igrejas & Branlard, 2020; World Population Review, 2022). Most wheat flour produces bread, pasta, cereal, cakes, biscuits, tortillas, and more. However, wheat (and wheat products) is also essential for humans and humanity, as food products have a high nutritional value (Shewry & Hey, 2015; Tadesse et al., 2016). Although the relatively low protein content is present in wheat products compared to, e.g. dairy products, wheat has a very favourable ratio of amino acids, which are the building blocks of proteins, and thus contribute more to the quality of food products than quantity (Shewry & Hey, 2015). Otherwise, more than its protein content, wheat is known for its content of vitamins and minerals and dietary fibres, which contribute to better digestion, take care of the health of the human intestine and can even help reduce the risk of cardiovascular diseases (Anderson et al., 2009). After all, wheat (mainly of lower quality) is also often used in various feed forms for livestock farming needs (Igrejas & Branlard, 2020).

The amount of world wheat production and the production of wheat products has increased more or less constantly throughout history (see Graph 2) (FAOSTAT, 2024). This was supported by various changes in the use of pesticides, fertilisation methods, planting, irrigation improvement and the use of genetically better types of wheat for cultivation (Tadesse et al., 2016). At the same time, it is necessary to point out that wheat production increased much faster than the area in which it grew, which

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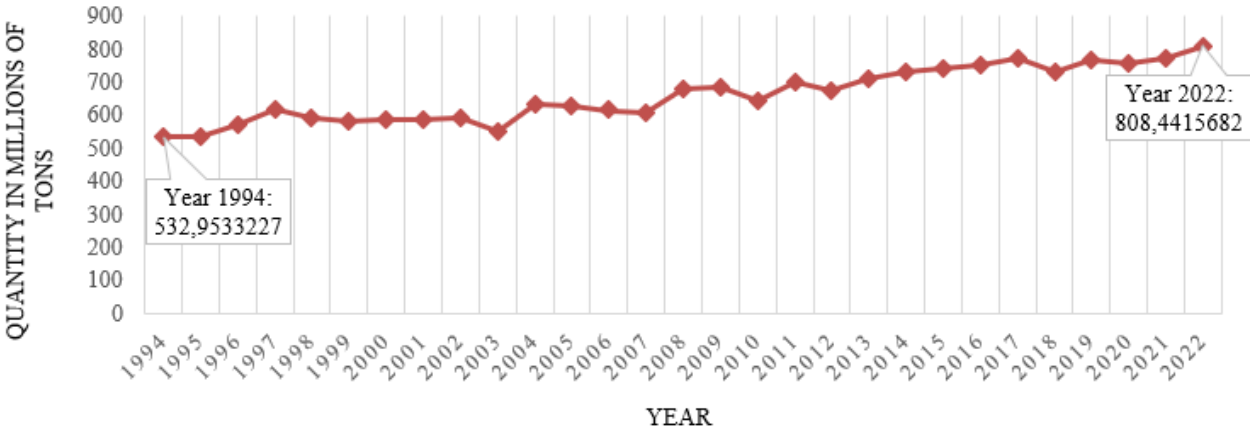
confirms that better approaches are used for production today, and farmers approach it systematically. For example, in 1960, the yield of wheat production was 1.2 t/ha, while in 2009, it was measured at 3.1 t/ha (Tadesse et al., 2016).

Graph 2. World wheat production in millions of tons



Source. (FAOSTAT, 2024)

1.2.2 The COVID-19 pandemic

By definition, pandemics are disease outbreaks that often spread between people. In the past, during the course of human development, we faced various forms of pandemics, such as Spanish flu, Ebola, Zika, and others. Each of those mentioned achieved some key common characteristics by which pandemics are recognised and distinguished worldwide. These are (Qiu et al., 2017):

- geographical dispersion;
- the severity of the infection;
- infectiousness and contagiousness;
- minimum population immunity;
- movement of the disease;
- novelty.

However, in addition to the negative impact on health, pandemics often impact the economy, society, and national and global security, and last but not least, they also cause some political and social disturbances (Qiu et al., 2017). The COVID-19 pandemic, which was declared a pandemic on the 11th of March 2020 and was officially closed by the World Health Organization (hereinafter: WHO) on the 5th of May 2023, when sufficient high population immune threshold (Ioannidis, 2022), had similar consequences (World Health Organization, 2023).

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The COVID-19 pandemic represented a global outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2), which began to spread at the end of 2019 in China and gradually covered the entire world (da Silva et al., 2022; World Health Organization, 2023). During the pandemic, more than two million people died in the European region. The number could have been even higher if the countries of the mentioned region had not used various restrictions to limit the spread of the virus. The restrictions that were most used during the pandemic can be divided into (Han et al., 2020; Dzúrová & Květoň, 2021; Heller et al., 2023):

- restrictions on the movement of people, which varied in scope and duration, from the complete closure of countries to restrictions on movement between regions or municipalities;
- maintaining a safe distance between people when only they could be in physical contact;
- closure of public institutions, such as schools, kindergartens, cultural centres, sports facilities, restaurants, clubs, etc.;
- mandatory use of masks in public spaces or even outdoors;
- mandatory vaccination or testing when people wanted or had to travel, move more freely, be present in specific public spaces, etc.

Government restrictions not only interfered with people's free time but also significantly impacted the operation of companies and entrepreneurs, which made it difficult to carry out certain activities or made activities practically impossible to carry out during the time of government restrictions. However, sectors were affected differently (Delardas et al., 2022). During the first wave of the pandemic, the agricultural industry in the EU was one of the least affected, as it had only a 1.4% reduced volume of work (Montanari et al., 2021). The transport sector was much more affected, directly impacting the 20% drop in the industry's production. In the second half of the year, road freight transport in the EU recorded a decline of 24%, while in the same period, the capacity of transported air cargo in Europe decreased by as much as 80% (Delardas et al., 2022). During the pandemic, a high reduction in energy consumption could be observed due to the reduced functioning of the economy. Also, during the mentioned period, there was less pollution on Earth, and the level of digitalisation and use of various online platforms increased. However, the pandemic had a significant negative impact on energy inequality increase and a decrease in investments in renewable energy sources. (Zakeri et al., 2022)

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In addition to various restrictions, vaccines against COVID-19 were also developed with great urgency during the pandemic, which probably represented a crucial factor in ending the pandemic and returning people's lives to a normal state without restrictions. According to official WHO data, more than 67% of people in the European area were vaccinated with at least one vaccine against COVID-19, and more than 60% with two doses (see Graph 3). However, even according to the recommendations during the pandemic, two doses represented a sufficient share of immunity and protection against significant complications in case of infection with the virus (World Health Organization, 2024).

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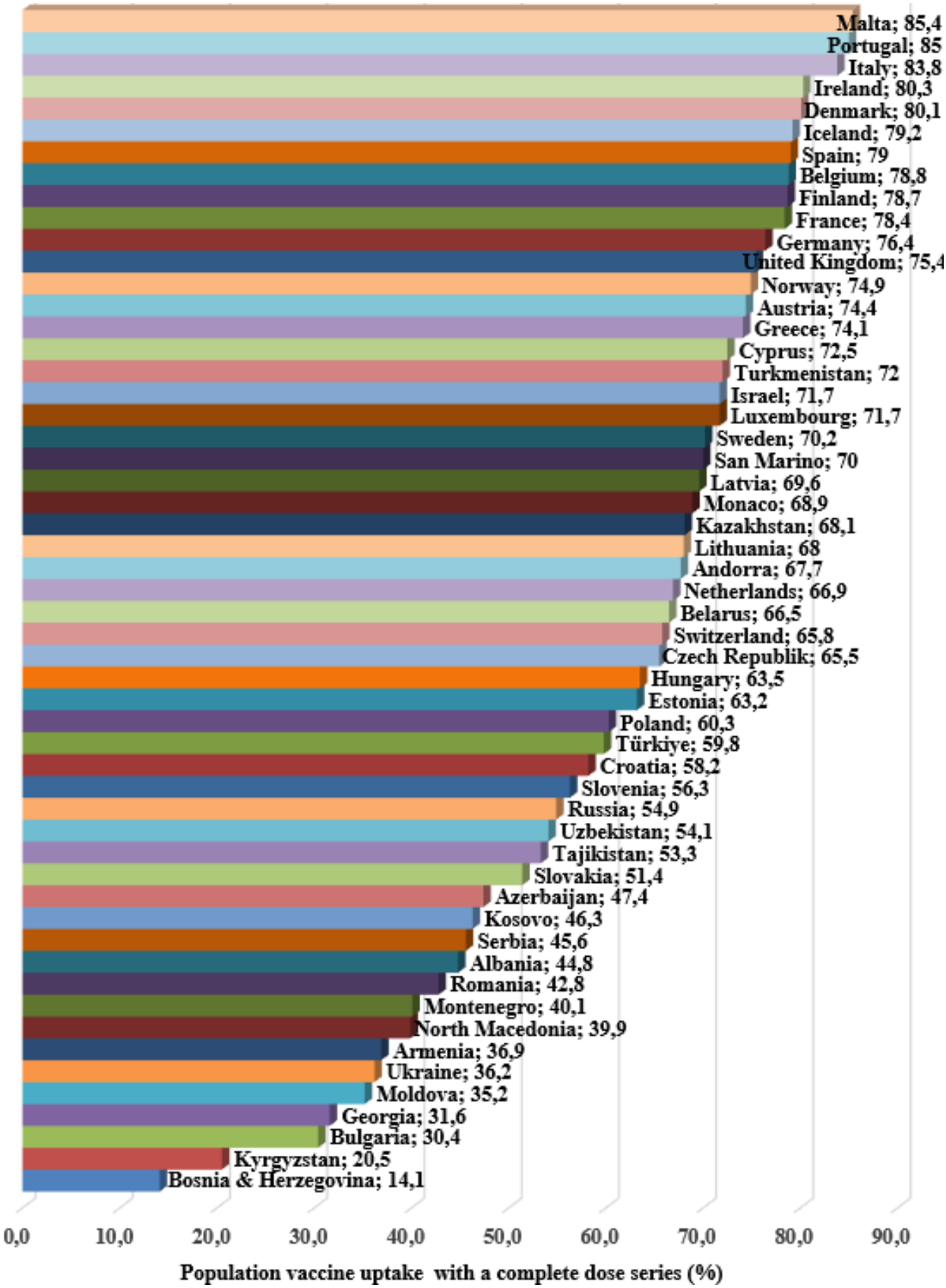
Graph 3. Vaccination of the European population with a complete dose series of the COVID-19 vaccine



Source. (World Health Organization, 2024)

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1.2.3 Russian-Ukrainian war

At the end of February 2022, after almost ten years of intense conflicts and disagreements, Russia attacked the neighbouring country of Ukraine. In the following period, the latter allied with NATO, further tightening the situation with Russia. Otherwise, the lobbying of Ukraine and its president Zelensky for Ukraine's accession to NATO, even before the start of the war, is said to be the main reason that Russia started the war in the first place. There was a threat that NATO could bring its military forces to Russia's border (Jakupec & Kelly, 2023). NATO Secretary General Jens Stoltenberg has never ruled out the possibility of Ukraine joining the alliance. However, in recent answers to questions related to Ukraine's membership, he persistently emphasised that Ukraine is welcome to apply for membership. However, all 30 member states must agree to such an approach. Ukraine thus landed in a situation where it is directly dependent on military aid from the NATO alliance, while it does not receive the alliance's other credits (Olson, 2022). Likewise, during the war, it is not to be expected that Ukraine would join the alliance since, based on its founding acts, all NATO countries would be at war with Russia (Jakupec & Kelly, 2023).

Table 1. Breakthrough events and reports in connection with the Russian-Ukrainian war

EVENT / REPORT	DATE	DESCRIPTION
Forecast of Russian military operation	24.2.2022	The Russian president announced that Russian forces will carry out a "special military operation" in Ukraine. Ukraine's president declared martial law and closed Ukrainian airspace.
Swift payment system sanctions	26.2.2022	The United States of America (hereinafter: USA), Canada and key European countries agreed to remove selected Russian banks from the Swift payment system.
Missile attacks on Kharkiv and attack on Kiev	28.2.2022	Russian forces launched missile attacks on the city of Kharkiv and, at the same time, an attack on the capital, Kyiv. The president of Ukraine signed an official request for Ukraine's immediate entry into the EU through a particular procedure.
Call to Western countries to enforce "no-fly zone"	1.3.2022	The Ukrainian president called on Western countries to enforce a "no-fly zone" over Ukraine.
United Kingdom government sanctions against Russia	1.3.2022	The United Kingdom (hereinafter: UK) government announced sanctions against Russia, including a ban on Russian ships entering British ports and additional economic measures.
United Nations report that people fleed from Ukraine	2.3.2022	The commissioner of the United Nations organisation (hereafter: UN) said that more than a million people

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		have fled Ukraine within a week since Russian forces invaded the country.
NATO rejects request for "no-fly zone".	4.3.2022	NATO Secretary General rejects "no-fly zone" over Ukraine.
UK government sanctions against Russia	10.3.2022	The UK announced sanctions against seven Russian businessmen, froze assets, and banned the travel of 386 members of the Russian Duma.
Economic damage assessment in Ukraine	28.3.2022	Ukraine suffered $564.9 billion in infrastructure damage, lost economic growth and others since Russia began its military action.
New USA, UK and EU sanctions	6.4.2022	US sanctions targeted Russian banks. The UK froze the assets of Russia's biggest bank, sanctioned eight more oligarchs and froze oil and coal imports until next year. The EU announced a comprehensive package of sanctions, including bans on coal imports and bank transactions.
EU is ready to give 9 billion € for Ukraine's recovery	30.5.2022	The European Council was ready to give Ukraine 9 billion € to help its post-war reconstruction.
European leaders support Ukraine	16.6.2022	The leaders of France, Germany, Italy and Romania visited Kyiv and pledged to support Ukraine's bid to join the EU. The day after that, the Prime Minister of the UK arrived in Ukraine.
EU approved candidate status to Ukraine	23.6.2022	The EU approved Ukraine's application for candidate status.
UN reports on new refugees from Ukraine	9.8.2022	The UN refugee agency revealed that more than 10.5 million people crossed the border from Ukraine since the Russian invasion began on February 24, which represented a quarter of Ukraine's population.
EVENT / REPORT	DATE	DESCRIPTION
UN warns of global food emergency	16.9.2022	The UN food chief said the world is facing a "global crisis of extraordinary proportions" as the war put 345 million people at risk of starvation and pushed 70 million closer to starvation.
Russian president signs the treaty of accession (annexation)	30.9.2022	The Russian president signed the treaty of accession, formalising Russia's illegal annexation of four occupied regions in Ukraine. A few hours later, the Ukrainian president announced that Ukraine had officially applied for NATO membership.
Russian president formalises connection of Ukrainian regions	5.10.2022	The Russian president signed laws on the official annexation of four Ukrainian regions to Russia.
Impact of UK sanctions on Russia revealed	10.11.2022	New data revealed the impact of UK sanctions on Russia. 18.39 billion pounds of Russian assets were sanctioned.
EU provides weapons and equipment to Ukraine	14.11.2022	The EU and its member states have provided Ukraine with arms and military equipment worth at least 8 billion €.
Russian president admits possible long-term war	8.12.2022	Russian president admitted that the war in Ukraine could turn into a "prolonged process".
EU agrees to €2 billion additional aid to Ukraine	12.12.2022	The EU agreed to an additional two billion euros in support for a fund used to supply Ukraine with weapons.

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USA president visits Kyiv	14.2.2023	The USA president visited the Ukrainian capital, Kyiv, to meet with the president of Ukraine.
Diplomatic meeting between China and Russia	22.2.2023	The top Chinese diplomat met with the Russian president in Moscow to discuss strengthening bilateral cooperation.
State visit of Chinese president to Russia	20.3.2023	Chinese President went to visit Russia.
Finland joins NATO	4.4.2023	Finland became the 31st member of NATO.
NATO secretary general visits Ukraine	20.4.2023	NATO Secretary General visited Ukraine for the first time since the Russian invasion.
"Peace mission" of African leaders in Ukraine and Russia	16.6.2023	The leaders of seven African countries visited Ukraine and Russia on a so-called "peace mission".
EU highlights progress in Ukraine's membership	22.6.2023	Senior EU officials said Ukraine had completed two of the seven steps outlined by Kyiv to gain candidate status for EU membership.
A meeting between North Korean politician and Russian president	12.9.2023	North Korean politician and the Russian president had a meeting in Russia where they discussed the potential supply of North Korean weapons for the war in Ukraine.
Ukrainian president addresses the UN general assembly	20.9.2023	The Ukrainian president addressed the UN General Assembly in person for the first time since Russia invaded Ukraine in February 2022.

Source. (Gioe & Manganello, 2023; Walker, 2024)

Table 1 shows the main breaking events, reports or essential information about the state of war between Ukraine and Russia. Ukraine had much help from NATO countries. The UK was the fastest to side with Ukraine and was keen to end the dispute between the two countries in Ukraine's favour. On the other hand, North Korea and China are Russia's most prominent allies, but the latter of the mentioned two allies still tries to remain fairly neutral (Gioe & Manganello, 2023). Also, Ukraine‘s tendency and desire to join the EU gives the impression of a kind of “plan b” after it failed in its lobbying to join NATO. During the war, many sanctions were adopted by the EU, the USA and the UK aimed at Russia. At the same time, the latter retaliated with similar measures and sanctions aimed at the entities listed above. At least for now, there is no indication of any truce between Ukraine and Russia, although both are increasingly showing the consequences of the war and asking for help from their allies on each side. During the war, however, Russia already acquired some parts of Ukraine under its military control (see Figure 1), but the aforementioned situation is constantly changing and unstable (Walker, 2024).

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Figure 1. Comparison between the map of Ukraine before the war and in December 2023

Source. (Bailey et al., 2024)

The EU adopted many different sanctions against Russia and Belarus during the war. The European Council divided the measures against the mentioned countries as (European Council, 2024):

- sanctions against individuals – encompassing movement or travel restrictions and asset freezing for individuals outside their countries;
- sanctions against the economy:
  - o financial sanctions;
  - o sanctions related to transport;
  - o sanctions related to energy;
  - o sanctions related to import and export;
  - o sanctions related to services;
  - o media sanctions;
  - o diplomatic sanctions;
  - o sanctions on the visa payment system.

2. METHODS

The methodology used to create the paper focused on reviewing existing

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research and other secondary data sources, which served as a solid foundation for researching the impact of the COVID-19 pandemic and the Russian-Ukrainian war on wheat supply in the EU area. A systematic search and analysis of the relevant literature (accessible until December 2023) in bibliographic databases (Web of Science, Cobiss and Google Scholar) was conducted to extract the key observed parameters and indicators demonstrating wheat supply in the EU. Freely available statistical data from the official European statistical database Eurostat was also reviewed, along with other statistical databases (Statista and United Nations statistical databases). In further steps, the synthesis of information and categorisation of essential supply indicators with wheat products were made based on secondary data obtained in the existing literature. The price of wheat on the market and its quantity in the EU were chosen as the main indicators for the analysis. At the same time, some results were meaningfully supported and presented with the help of various graphic displays.

3. RESULTS AND ANALYSIS

Data show a certain degree of influence on the EU's supply of wheat and wheat products during the pandemic and the current Russian-Ukrainian war. Different timings of certain restrictions during the COVID-19 pandemic are highlighted as having a significant impact on general disruptions in the food supply and supply chains in general. The problem was said to consist of two parts, with the first part primarily being the problem of the inconsistency of restrictions between different countries. (Moosavi et al., 2022) Supply chain designers were thus forced to use various strategies and approaches for other geographical areas. Another part of the problem was the impossibility of predicting the restrictions' length, changing them, or tightening or reducing them, which brought a lot of ambiguity and instability in the world of supply chains. (Moosavi et al., 2022)

Unlike the pandemic, however, the impacts of the Russian invasion of Ukraine and their impact on global food security were immediate and obvious, leading to one of the most volatile periods in global food security in decades. This invasion not only affected the prices and quantities of agricultural commodities exported from the Black Sea (Nichols & Faulconbridge, 2023) but also raised the prices of various other foodstuffs, leading to an increase in malnutrition, particularly among the world's poor (Caprile & Pichon, 2022). In addition, the Russian invasion of Ukraine and the

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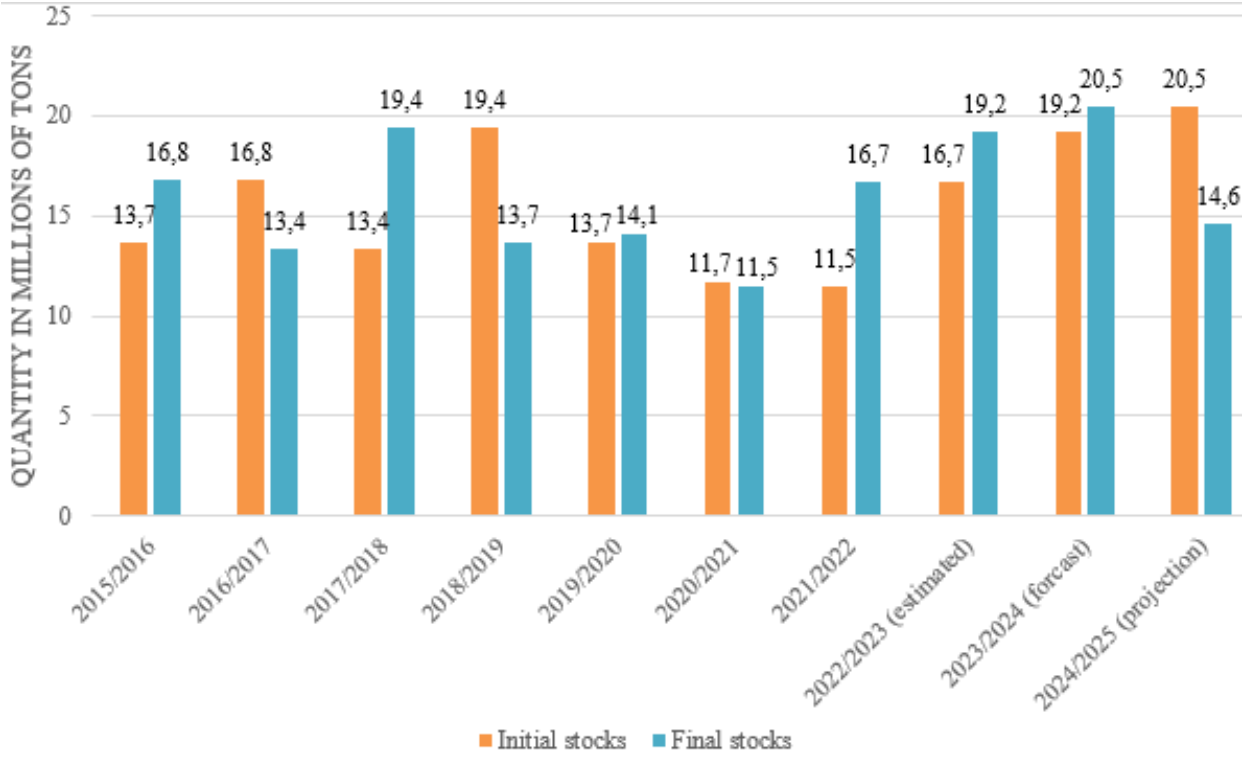
COVID-19 pandemic between 2019 and 2022 resulted in a 39% increase in food procurement costs (Welsh et al., 2023).

3.1 The impact of the COVID-19 pandemic and the Russian-Ukrainian war on the EU's wheat quantity

At the end of 2019, a virus broke out in China, which later followed and changed people's lives worldwide for almost two years. During this time, the COVID-19 pandemic affected events worldwide in various ways. Some studies presented generally adverse effects of the pandemic, including its impact on the food market (Zakeri et al., 2022), where the Russian-Ukrainian war also harms the mentioned market (Leal Filho et al., 2023). Graph 4 shows the quantities of wheat stocks at the beginning and end of each observed year (from 2015 to 2024). The graph shows a drop in wheat stocks at the beginning of 2020 and a constant lower number of stocks at the beginning and end of the year during the COVID-19 pandemic. However, at the end of 2022, the number of stocks in EU countries increased drastically and returned to pre-pandemic levels. In the period when there was a high increase in stocks, Russia's invasion of Ukraine was just beginning and continues to this day.

Graph 4. Total initial and final wheat stocks of EU countries from 2015 to 2024



Source. (International Grains Council, 2023)

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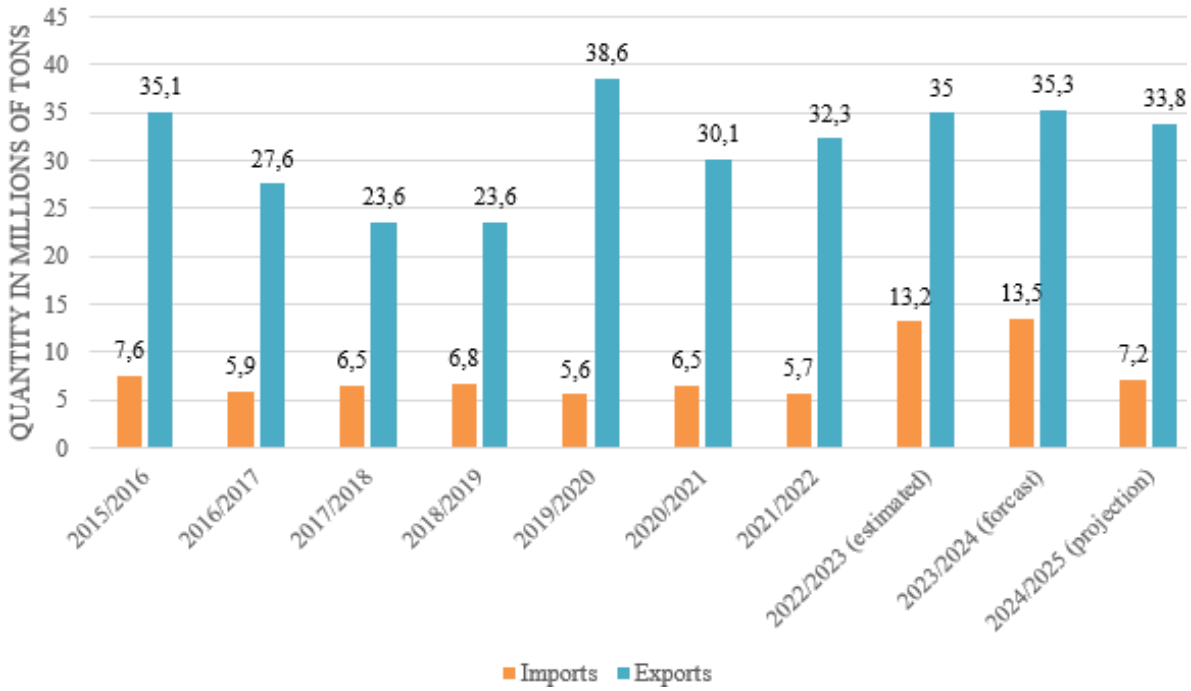
Graph 5 shows that when the global pandemic was declared in 2020, the wheat export quantity from EU countries grew while imports remained practically the same or decreased minimally. Despite the slight decline in wheat exports in 2021, it is noticeable that wheat exports are slightly positive after the pandemic, even during the war. In 2023, however, the amount of wheat imported into the EU was doubled compared to the previous year.

Graph 5. Total wheat imports and exports of EU countries from 2015 to 2024



Source. (International Grains Council, 2023)

The trend of increasing imports from the EU area already started in the second half of 2022 (Ministry of Agrarian Policy and Food of Ukraine, 2024). However, at the annual level in 2022, a smaller decline in wheat imports can still be detected, which is very likely the result of restrictions on wheat imports from the territory of Ukraine in the initial months of the war (see Graph 6 and Table 2). Russian military vessels blocked Ukrainian ports in the Black Sea for more than four months. After the four months mentioned, the UN, Turkey, and Russia agreed to re-enable exports through the safe maritime humanitarian corridor in the Black Sea, established between July 2022 and July 2023. During the initiative's implementation, from three Ukrainian ports (Chernomorsk, Odesa and Juzhni/Pivdeni), more than 1,000 ships full of grain and other foodstuffs left Ukraine. After a year, on the 17th of July, 2023, Russia announced that it would abandon the Black Sea grain initiative, which it did (European Council, n.d.; Nichols & Faulconbridge, 2023). According to (Polityuk, 2023), the

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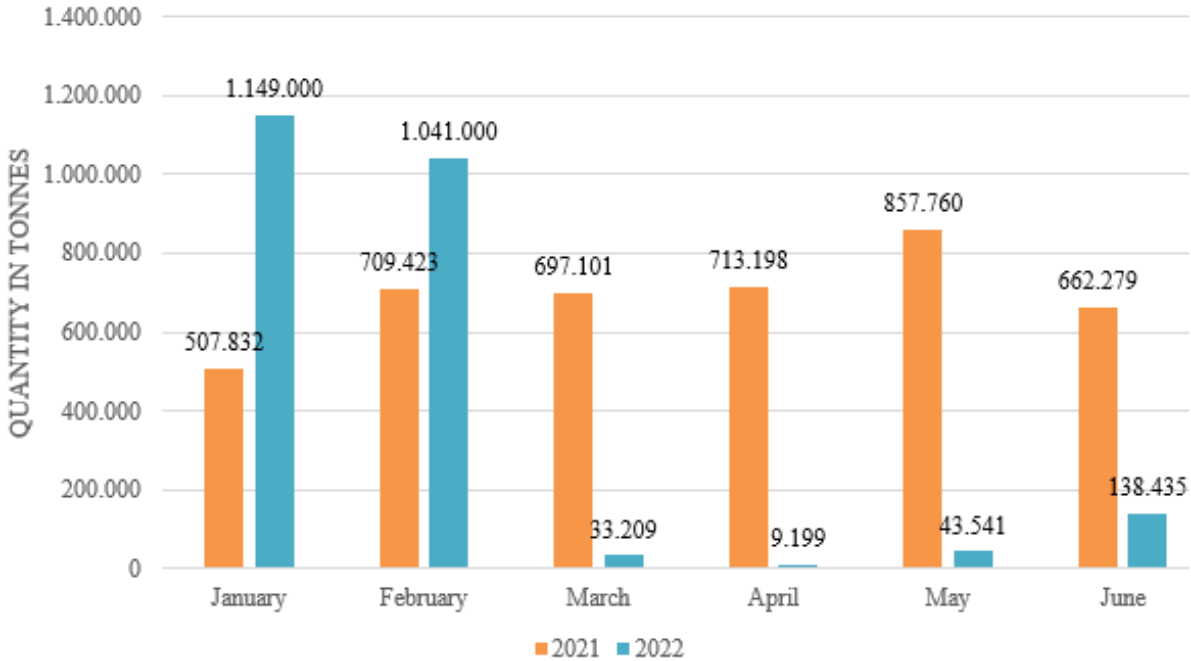
consequences of abandoning the initiative are already showing, as the export volume of wheat in October 2023 is expected to decrease by almost 50% compared to the year before when Russia still took the initiative into account. Thus, Ukraine is forced to export very limited quantities of its grain production capacity to the EU through the Danube River channels on its western border.

A comparison between the amount of wheat exports from Ukraine in the first half of 2021 and the same period a year later (see Graph 6) clearly shows the consequences of limiting wheat exports from the mentioned country. The total amount of exports in the first four months of the war was less than in any independent month until December 2023. The Black Sea initiative, therefore, once again enabled Ukraine to export grain more efficiently and, simultaneously, the opportunity to find alternatives for the period after the Panchen initiative (from July 2023). After the initiative's end, exports fell again, but this drop in volume was significantly smaller than at the start of the war.

Graph 6: Ukraine's wheat exports in the first four months of the war



Source. (European Council, n.d.)

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Table 2. The amount of wheat exported since the beginning of Russian-Ukrainian war
YEAR MONTH

YEAR	MONTH	WHEAT EXPORTS [TONS]	EXPORT RESTRICTIONS
2022	March	33.209	Restriction of exports by Russia
	April	9.199	
	May	43.541	
	June	138.435	
	July	411.755	Black Sea Grain Initiative
	August	899.627	
	September	1.906.493	
	October	1.979.534	
	November	1.581.392	
	December	1.554.649	
2023	January	1.328.623	
	February	1.496.912	
	March	1.786.966	
	April	1.537.772	
	May	1.090.123	
	June	1.271.566	
	July	841.480	Termination of initiative
	August	1.224.404	
	September	1.272.959	
	October	1.341.132	
	November	1.130.590	
	December	1.844.404	

Source. (Ministry of Agrarian Policy and Food of Ukraine, 2024)

The annual wheat production of all EU countries during the COVID-19 pandemic and the war, according to the trend from the past, has not significantly changed. In 2020, production increased slightly compared to 2019, but the amount was practically identical to previous years (see Graph 7). However, the volume of wheat production, its consumption and availability decreased the year after that, i.e. 2021. Since the reduction in the mentioned quantities, a slightly positive upward trend has been observed in all three parameters. Still, the quantities have not yet returned to the pre-pandemic level. From the beginning of the war until today, no significant changes have been observed in wheat production, consumption, and availability. This makes sense since the war does not occur directly in EU territory.

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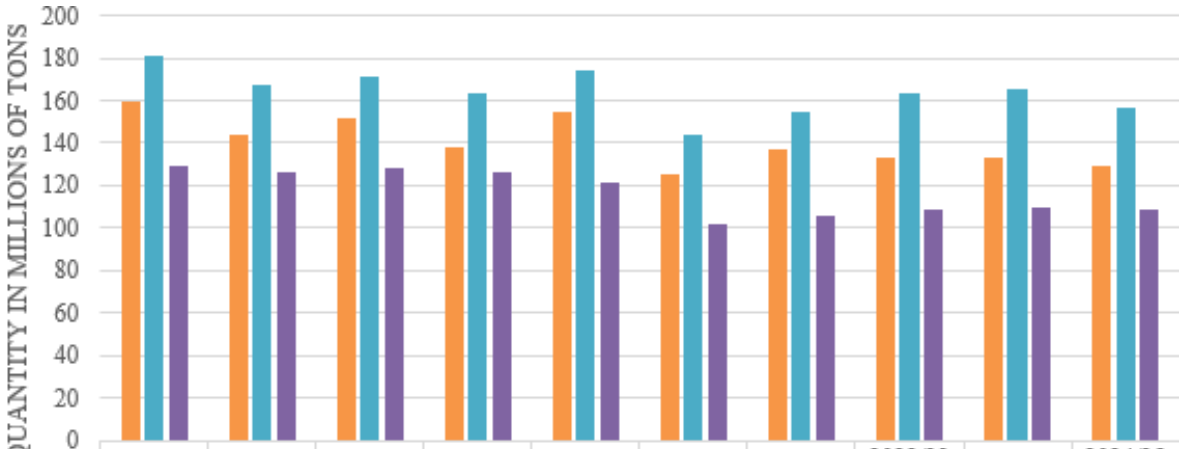
Graph 7. Total wheat production, consumption and availability in EU countries from 2015 to 2024



	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23 (estimated)	2023/24 (forcast)	2024/25 (projection)
Production	159,6	144,2	151,4	137,7	155	125,7	137,5	133,3	133,1	129,3
Availability	180,9	166,9	171,3	163,9	174,3	143,9	154,7	163,2	165,8	156,9
Consumption	129,1	125,9	128,2	126,6	121,6	102,3	105,6	109	110	108,5

Source. (International Grains Council, 2023)

3.2 The impact of the COVID-19 pandemic and the Russian-Ukrainian war on EU's wheat prices

Russia's invasion of Ukraine has added to the pandemic's pressure on global food supply chains. Both countries involved in the war are large exporters of wheat (together, they represent almost 30% of world wheat exports) and, at the same time, play a vital role in the global supply of fertilisers as an essential commodity for the production of wheat and other crops (Ben Hassen & El Bilali, 2022). Russia, for example, is one of the leading suppliers of nitrogen, an essential nutrient for almost all plants, including wheat. In 2020, it was, among other things, the world's largest exporter of fertilisers, with estimated exports worth US$7.6 billion. In addition, Russia is a major natural gas supplier and the primary raw material for nitrogen fertilisers. Thus, despite the successful domestic production of nitrogen fertiliser, the EU depends on Russia's natural gas supply (Levi & Molnar, 2022). Thus, in reality, EU countries are faced with three scenarios:

- they can import natural gas for the production of fertilisers needed to grow wheat;
- they can import fertilisers;
- they can directly import wheat and wheat-related products.

However, the countries are undeniably in all three scenarios very likely to be market-linked either with Russia, with whom they have been in conflict since the beginning of the war, or with Ukraine, which has limited supplies of everything due to

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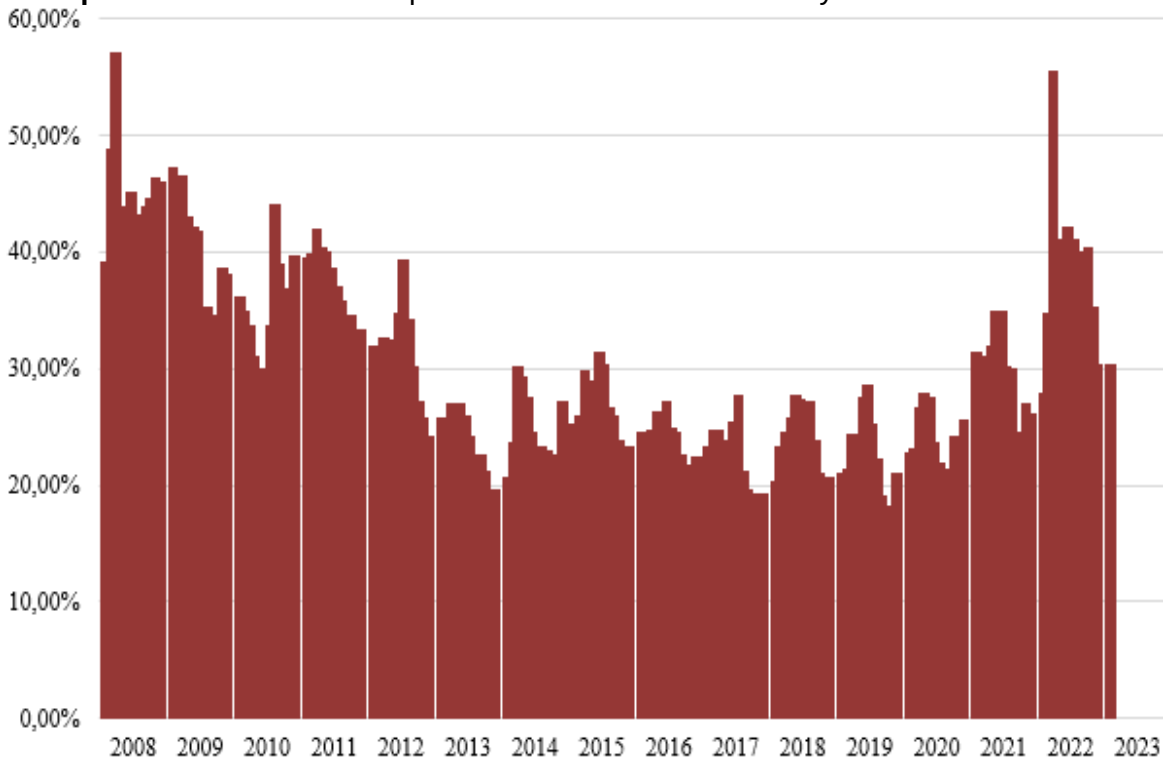
the war.

Graph 8 shows the course of changes in the wheat share price, which was fairly constant after the end of 2012 and the recession from the previous period until the start of the war in Ukraine. Thus, according to (Glauber, 2023), the wheat share price did not suffer a significant change during the pandemic, which changed shortly after the start of the war between Russia and Ukraine.

Graph 8. World wheat share price between 2008 and January 2023



Source. (Glauber, 2023)

The Russian blockade of the Black Sea ports at the beginning of the war not only affected the export volumes of wheat and other raw materials from Ukraine (Ministry of Agrarian Policy and Food of Ukraine, 2024) but also exponentially increased wheat prices on the market (see Graph 9). Compared to March 2021, wheat prices in May 2022 were 58% higher. The graph then shows the steep drop in the grain price index after May 2022, when various solidarity corridors were established. Since the launch of the Black Sea Grain Initiative in July 2022, prices have fallen further. According to the European Council (2023), grain prices started to rise again in September and October 2022 due to uncertainty about the future of the Black Sea grain initiative but fell in November and December 2022. However, when Russia announced in July 2023 that it was withdrawing from the Black Sea grain initiative, prices rose minimally again.

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Graph 9. Grain and oilseed price index and wheat price sub-index between 2021 and 2023

Source. (International Grains Council, n.d.)

The research results related to the amount of wheat show that the COVID-19 pandemic and the war in Ukraine have left inevitable consequences in the EU. In its initial stages, the pandemic had the most significant impact on the number of grain stocks in EU member states, which fell visibly in the years when the virus was most present in the EU. On the other hand, it is interesting that grain imports into the EU significantly increased during the same period. From this point of view, a smaller drop in the volume of wheat production in the EU in 2021 is a reasonably expected result. The availability and consumption of grain in the EU is still lower than before the pandemic since the start of the pandemic (International Grains Council, 2023). Meanwhile, Ukraine, struggling to export wheat from its territory in the early stages of the war with Russia, apparently found a solution for exports despite Russia's suspension of the Black Sea Open Sea Initiative (Nichols & Faulconbridge, 2023).

Unlike the quantities, wheat prices were fairly unchanged during the COVID-19 pandemic. However, since the crisis in 2008, we have witnessed a constant increase in energy prices and fertilisers, an essential element of wheat cultivation, which have also increased by up to 80% (Ben Hassen & El Bilali, 2022). The war in Ukraine contributed much more to the price of wheat on the market. In just two months from the beginning of the war, we witnessed a 25% increase in the wheat price index, mainly caused by Russia's prevention of the Ukrainian export of the aforementioned commodity through the Black Sea. However, in the same period, the

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wheat price index also fell to pre-war levels two months later and, mainly thanks to the Black Sea Initiative between Russia, Turkey and the UN, it continued to decline moderately. Otherwise, the stability of the price of wheat on the market weakened slightly after Russia again abandoned the initiative in July 2023 and started preventing exports to Ukraine. Still, the consequences of this are much smaller than at the beginning of the war.

The research delved into two research questions:

- How has the COVID-19 pandemic affected wheat production, consumption, availability, and price in the EU?
- How did the Russian-Ukrainian war affect the dynamics of wheat exports in Ukraine and world wheat prices, and how did these changes affect wheat supply in the EU?

Both the global COVID-19 pandemic and the Russian-Ukrainian war have harmed wheat supply chains in the EU, with varying degrees of impact. The pandemic significantly reduced the amount of wheat stocks. It slightly reduced wheat consumption, production, and availability in the EU while the price on the market remained unchanged. The latter was much more influenced by the beginning of the Russian-Ukrainian war, which in the initial months jumped to the levels of 14 years ago, which we witnessed during the global crisis of 2008. The suspension of wheat exports in the first few months of the war ensured the volatility of the market price of wheat, which calmed down with the conclusion of the Black Sea grain initiative. Despite mention, there were no significant changes in the stock number, consumption, production, and availability of wheat annually in the EU area.

Future studies could include examining the impact of the COVID-19 pandemic and the war in Ukraine on the entire food market in the EU, with focus impact indicators similar to this research, volumes related to exports, imports, processing and storage, and food prices on the market. Based on the mentioned indicators, it would be reasonable to carry out a study which would carry out various simulations of the war's unfolding scenarios and connect the mentioned scenarios with the impact on the food market in the EU area.

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