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WAR AND PANDEMIC: IMPACT ON GLOBAL FOOD SECURITY

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Abstract:
The Covid-19 pandemic and ongoing war between Russia-Ukraine have impacted global food security and had significant impact on global food supply disruption. These challanges has had significant impact on six key areas including food production, processing and storage; food transport and logistics; food markets; consumers; food-dependent services; and food quality. Europe and Africa are the regions that have been most significantly affected. The objective of this research is to investigate the effects of the COVID-19 pandemic and the ongoing conflict between Russia and Ukraine on the worldwide food security situation. The data underwent analysis and comprehensive examination from exsisting literature over the course of the year 2022. The study findings indicate that the Russia-Ukraine conflict during the COVID-19 pandemic had a significant impact on global food supply disruptions. The ongoing conflict poses a threat to the realization of SDGs related to poverty, hunger, and responsible consumption and production. Therefore, governments can take public policy and education actions to address these challenges as strategic measures.

Keywords:
COVID-19, Russia-Ukraine, War, Global, Food security

1. Introduction

The ongoing conflict between Russia and Ukraine has resulted in notable agricultural damages, particularly in Ukraine, which is a prominent agricultural producer in the area. The occurrence of the war between the two countries has resulted in a significant increase in concern regarding global food security within the framework of globalized agricultural markets. Russia and Ukraine are recognized for their significant contribution as worldwide suppliers of food and fertilizer. According to a report by the Food and Agriculture Organization of the United Nations -FAO (2022), Russia and Ukraine were identified as two of the leading global exporters of wheat, maize, rapeseed, sunflower seeds, and sunflower oil. It has been explained that a majority of 50 nations depend on imported wheat to fulfill their requirements.

Russia and Ukraine collectively account for approximately 25% of the worldwide export of wheat. The escalation of global conflict in late February has had a significant impact on the price of wheat, with a surge of over 40% observed. This increase has been further compounded by export restrictions, leading to a decrease in the global supply and a subsequent rise in demand. Futures prices have also risen by over 60% in response to these

developments. The trade connectivity between Russia and Ukraine has been disrupted by the war and subsequent sanctions, which has had an impact on the logistics of the broader region (Ruta, 2022).
The perturbation in food production has given rise to apprehensions regarding food insecurity, particularly in the European market (Ruta, 2022) and Africa. Africa's agricultural imports from Russia amounted to approximately US$4 billion in 2020, with wheat comprising nearly 90% of these imports (Kappel, 2022). Additionally, the continent imported agricultural products from Ukraine worth around US$2.9 billion, with wheat and maize accounting for 48% and 31% of these imports, respectively. A situation where there is a heavy reliance on a single source of importers can render the food supply patterns vulnerable to disruption, potentially resulting in a significant reduction in food availability. This can occur if the partner countries experience a food system shock or are exposed to rapid spread of disturbances in various parts of the trade network (Wass, Porkka and Nystr, 2023). The occurrence of the war between the two nations has resulted in significant impacts on both countries and the global scenario.
The COVID-19 pandemic has intensified the consequences of the Russia-Ukraine conflict and has had a significant impact on global stability, particularly in the realm of supply chain management, which has implications for the food security sector (Jagtap et al., 2022). However, comprehending the ramifications of the global food supply disruption resulting from the Russia-Ukraine conflict in the midst of the Covid-19 pandemic from a global standpoint is imperative for comprehending the comprehensive impact on global food security and devising solutions to address the global food supply disruption.

2. Methodology

2.1. Methods and Information Collection

This study employed the literature review methodology to examine the effects of the Russia-Ukraine War on worldwide food security in the context of the Covid-19 pandemic.
The primary database search utilized for conducting the literature review was Google Scholar. The current study deems this database search appropriate owing to its extensive coverage of academic publications, encompassing peer-reviewed articles, theses, books, conference proceedings, and other scholarly resources.
The researcher conducted a literature search utilizing pertinent keywords, including Russia-Ukraine, War, The Global Food Security, and Covid-19 Pandemic. The selection of the aforementioned keywords was predicated on their pertinence to the research subject matter and their efficacy in procuring literature pertaining to the ramifications of the Russia-Ukraine conflict on worldwide food security in light of the Covid-19 outbreak.
In order to ensure that the literature review accurately reflects contemporary discussions and trends within the field, the scope of articles considered was restricted to those published exclusively between the years 2022 and 2023.
Apart from scholarly sources, pertinent grey literature sources, including government reports, conference proceedings, and working papers, were also examined. Incorporating grey literature sources facilitated the expansion of the search and acquisition of diverse information and perspectives that may not be readily available in conventional scholarly sources.

2.2. Study Setting

The study was carried out in Jakarta, Indonesia. The investigative period spans from 2022 to 2023. In order to maintain precision and uniformity in the nomenclature employed in the research, diverse expressions were specified and employed to signify the entities under investigation. The aforementioned concepts encompass the ongoing conflict between Russia and Ukraine, the issue of ensuring food security on a global scale, and the current Covid-19 pandemic. The academicians participated in a scholarly discussion and presented a succinct summary of these topics, which facilitated the development of a shared comprehension and structure for further examination.

2.3. Information Processing

In order to guarantee a methodical and thorough literature review, a predetermined protocol was adhered to during the search process. The protocol encompassed a well-defined research inquiry, criteria for literature search selection, and a systematic approach for screening and analyzing the obtained literature.
The process of conducting the literature search was carried out through multiple stages. At the outset, the inquiry was constrained to scrutinizing titles and abstracts in order to ascertain conceivably pertinent articles. The articles that satisfied the criteria for inclusion were subsequently subjected to a comprehensive analysis of their full text.

The process of full-text analysis entailed a meticulous examination of the articles with the aim of extracting pertinent information and gaining valuable insights. The information that was extracted was subsequently synthesized and presented in a manner that was both clear and concise, with a focus on highlighting the primary findings and conclusions of the literature that was reviewed.
In order to guarantee the caliber and dependability of the literature review, a number of steps were implemented. The search procedure was carried out by two autonomous reviewers who evaluated the articles according to pre-established selection criteria. In instances where inconsistencies were observed, a third evaluator was consulted. Furthermore, a comprehensive search of various databases and sources was conducted to ensure that all pertinent literature was included.

2.4 Information Analysis

Upon obtaining the pertinent literature, the data was subjected to analysis through the utilization of descriptive narratives. The information that was obtained was synthesized and then presented in a manner that was both clear and concise. This presentation served to emphasize the primary findings and conclusions that were drawn from the literature that was reviewed. The aforementioned methodology facilitated a comprehensive comprehension of the ramifications of the Russia-Ukraine conflict on worldwide food security in the midst of the Covid-19 outbreak. In order to bolster the analysis, pertinent figures were incorporated to graphically depict the data and enhance comprehension of the results.

3. Results and Discussion

3.1. The Impact of Russia-Ukraine War on the Global Food Security

Global food security refers to the condition in which all people have access to sufficient, safe, nutritious, and culturally appropriate food at all times to meet their dietary needs and food preferences for an active and healthy life. Food security encompasses a wide range of factors, including physical, social, and economic access to food, food availability and quality, and dietary nutritional adequacy. Food security is an important global issue. (FAO, 2008) mentioned there are 4 pillars of food security, namely: 1) Availability, 2) Accessibility, 3) Utilization, and 4) Stability.
Furthermore, due to invasion, the blockade of Ukraine's southern ports choked off grain exports sent prices soaring on March 2022 (The Economist, 2022). It is exacerbate by the the war of Russia-Ukraine, which by June 18, 2022, the total area of damage fields stood at 292,262 ha (Deininger et al., 2022). Until now, the problem has largely been spiralling prices rather than availability. Russia and Ukraine were among the top global exporters. So when the war broke out, supplies of many staple foods were seriously affected (Chilkoti, 2022). There are also several efforts to alleviate the impact of the global food crisis due to the war, such as the partial reopening of food shipments from Ukraine's Black Sea Ports, which was marked by the approval of the "Black Sea Grain's Initiatives" agreement, an agreement between Russia-Ukraine to safe the transportation of grain and foodstuff from the Ukrainian's Ports.

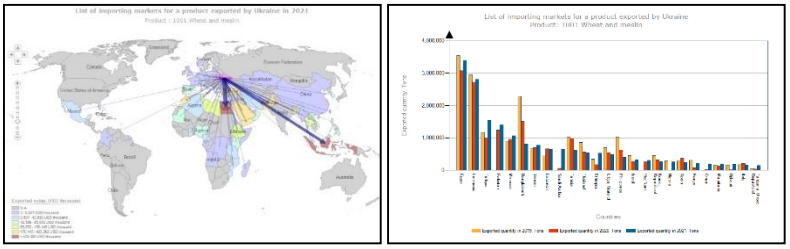

Figure 1: List of importing markets for a product (Wheat and Meslin) exported by Ukraine
Sources: trademap.org

Since the war of Russia-Ukraine happen, both Russia and Ukraine are affected as well as the global supply chain. Ukraine is a significant producer of grains, including wheat and corn, and it's an essential supplier to other countries. In 2021, Ukraine exported it's wheat and meslin production up to 19,394,935 tons and maize (corn) up to 24,539,481 tons to the world. The top 3 exporting markets for Ukraine's wheat and meslin are Egypt, 3,401,372 tons; followed by Indonesia, 2,810,205 tons; and Turkiye, 1,547,376 tons. Another list of importing markets for wheat product exported by Ukraine can be seen in Figure 1.

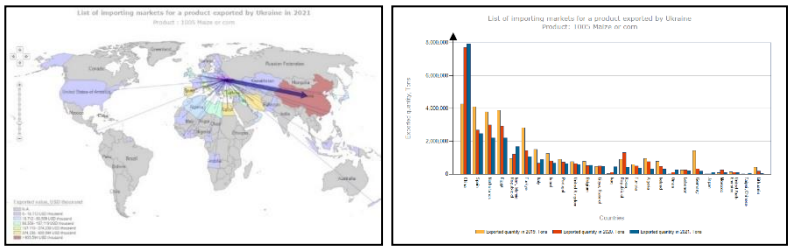

Figure 2: List of importing markets for a product (Maize or Corn) exported by Ukraine
Sources: trademap.org

The list of importing markets for maize exports by Ukraine is depicted in Figure 2. China is the primary destination for Ukraine's maize exports, with a total of 7,919,964 tons exported to China in 2021. In addition, it is noteworthy that the maize exports of Ukraine hold significant importance in the European Union market, particularly in countries such as Spain, Netherlands, and Italy. The Ukrainian maize export market encompasses Middle Eastern countries such as Egypt, Iran, Turkey, Israel, Libya, Tunisia, Algeria, and others.
Russia is ranked among the top 10 global producers of wheat, according to the Food and Agriculture Organization (FAO, 2023). In 2021, Russia exported 27,366,371 tons of wheat and meslin, as well as 2,936,351 tons of maize (corn). Figure 3 displays the markets that import wheat products from the Russian Federation. In 2021, Turkey emerged as a significant export destination for Russia, with a total of 6,711,074 tons of wheat and meslin being exported to this country. Egypt, Azerbaijan, Kazakhstan, Nigeria, and several other Middle Eastern and African countries are subsequent in order.

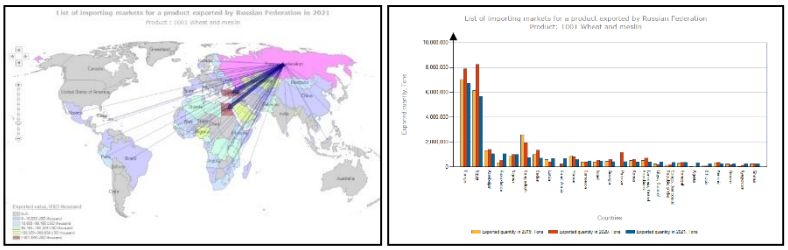

Figure 3: List of importing markets for a product (Wheat and Meslin) exported by Russian Federation
Sources: trademap.org

In 2021, Turkey emerged as the primary export destination for maize (corn) from Russia, with a total export volume of 1,075,734 tons. In 2021, several countries, including the Republic of Korea, Georgia, Latvia, Greece, Vietnam, Italy, and China, have reported maize (corn) export volumes exceeding one hundred thousand tons. Maize has also found a market in European and Middle Eastern countries.

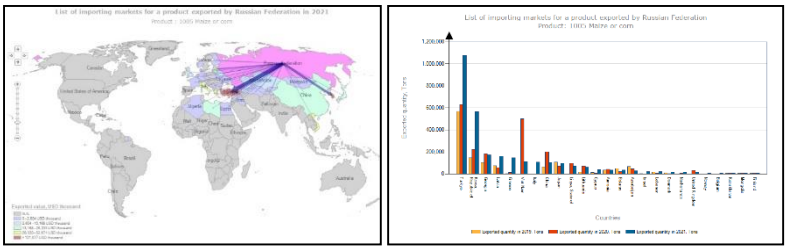

Figure 4: List of importing markets for a product (Maize and Corn) exported by Russian Federation
Sources: trademap.org

The global wheat shortage is having a negative impact on many countries around the world, with many in the Middle East and Africa relying heavily on wheat imports from Russia and Ukraine. For example, wheat and wheat products account for one-third of average national cereal consumption in East Africa, with Djibouti, Eritrea, and Sudan having the highest per capita consumption. Russia is also one of the world's largest fertilizer exporters. The war has caused a sharp increase in fertilizer prices, which could exacerbate food crises in some African countries, particularly those that rely on agricultural development (Kappel, 2022).

Egypt and Yemen also including in the countries that rely heavily on cereal imports from Russia and Ukraine, with Egypt for about 85% of its wheat imports comes from Russia and Ukraine. Because of their reliance on Ukrainian wheat, these importers may find it difficult to switch to alternative export sources quickly, potentially resulting in supply shortages in food. Beside food, the fertilizer prices were also rising prior to the crisis, partly due to: (1) lower harvests in Latin America, Southeast Asia, and Europe in 2021, (2) COVID-19-induced supply disruptions, and (3) rising food demand in Asia. These combined factors have resulted in low inventory levels in key staple crops, creating ideal conditions for any new shock to result in significant price increases. With the outbreak of the Ukrainian conflict, global markets feared a reduction in expected agricultural exports from Russia and Ukraine. As a result, the war triggered significant increases in food prices as well as significant policy responses from several exporting countries, including export restrictions, which exacerbated the situation (Abay et al., 2023). Overall, the Russia-Ukraine war had a significant impact on wheat and maize prices, causing disruptions in global food supply chains and contributing to higher food prices and inflation.

To meet the world's demand for wheat and maize, major producers such as China, India, United States, Canada, France, Pakistan, Germany, and Australia are relied upon. Despite this, the Food and Agriculture Organization (FAO) has forecasted a decline in world wheat production for 2023 by as much as 1.3% compared to 2022. This decrease can be attributed to various factors, including dry weather, financial constraints, and infrastructure damage in Ukraine caused by the war (FAO, 2023a). The ongoing conflict between Russia and Ukraine has disrupted agriculture production and infrastructure, particularly in the eastern and southern regions (AMIS, 2023).

The ongoing conflict between Russia and Ukraine has an impact on wheat and corn prices in the global and EU markets. The impact of the Russia-Ukraine war on the global supply chain is significant, and the bans on wheat distribution have directly affected it. Although the harvest season in Ukraine is expected to continue, farmers will face challenges storing and transporting their grains due to the lack of infrastructure. Russia and Ukraine's targeted markets heavily rely on wheat imports, and the distribution blockade and sanctions have resulted in increased prices (Figure 5). The rise in prices is more damaging for low-income economies that rely on importing wheat. Additionally, the Russian-Ukraine war has led to higher food inflation, which exacerbated the sharp spike in global food commodity prices. It is not surprising that the war has caused a shock in food markets, given that famine and pestilence are often reported as companions to war and death (Jagtap et al., 2022). However, it is important to note that the impact of the Russia-Ukraine conflict on wheat and corn prices can vary depending on the specific market as well as the duration and intensity of the conflict.

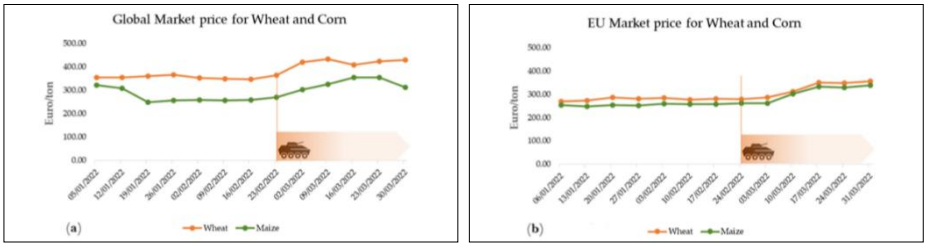

Figure 5: Global Market Price and EU Market Price for Wheat and Corn
Sources: (Jagtap et al., 2022)

The disruptions to transportation routes and infrastructure have made it more difficult. One of the key transportation routes affected by the Russia-Ukraine war is the Kerch Strait, that connects the Black Sea and the Sea of Azov, located between Russia and Ukraine (Toygar and Yildirim, 2023). During the war, the sea in Ukraine is inaccessible because of the military blocade from both countries resulted in a significant number of ships waiting to pass through Kerch Strait. This war has cut off many important shipping routes, forced transport companies to suspend service, and soaring air freight rates that cause serious disruptions (Hoang Tien, 2022). In addition, Ukraine with its important ports (the Port of Odessa on the Black Sea and the Port of Chornomorsk on the Sea of Azof) are also impacted by Russia invasion. Furthermore, Russia plays a significant role in the global food logistics trade route, given its strategic location between Europe and Asia. One of the important Russia's route is it's Railways route (Trans-Siberian Railway) which is the global trade shortest rail connection that connects Moscow to Vladivostok (Pepe, 2020), on the Pacific coast and its Seaports (the Port of Novorossiysk on the Black Sea and the Port of Saint Petersburg on the Baltic Sea) that plays crucial role in transporting goods and food products (Vinokurov and Tsukarev, 2018). But then due to invasion, Russia have to deal with several sanctions which cause re-routing from many companies, resulted on the longer journeys and additional costs, which contribute in increasing price of the products (Cekerevac and Bogavac, 2023) including the options to use the middle corridor route.
Thus, the impact of Russia-Ukraine war can be felt directly and indirectly. The direct impacts can be feel through: 1) The disruption on the production and trade which threaten the supply of grains to countries that rely on Ukraine and Russia production, 2) Immediate surge in global food and fertilizer prices after Rusia invaded Ukraine. It is recorded on the FAO Food Price Index that it's reached the highest level in March 2022, which 12.6% higher than in February 2022, 159.3 points, 3) The increase of the fertilizer prices due to the sanction on Russia and Belarus which disrupted the fertilizer supplies. On the other hand, indirect impacts are also felt due to this war such as: 1) Increasing the uncertainty for global market actors due to the increase of price volatility which affects production and marketing decisions, 2) Difficulties for farmers to invest, produce, and trade in the food and agriculture sector, which leads to the less availability and higher price, 3) Limited number of supplies trigger various policy responses such as export restrictions, 4) Affecting the wellbeing of low-income households who spend most of their income on food, and 5) Exacerbate the food security crisis in vulnerable and food insecure areas, e.g. Asia and Africa (Abay et al., 2023), as well as the disruption of food transportation route which contribute in increasing food prices.

3.2. Covid-19 Pandemic Impact on Global Food Security Based on Russia-Ukraine War

For few years, the Covid-19 pandemic has put people's lives and livelihood at risk. The Covid-19 pandemic itself has threaten the health care, hunger, poverty, education sectors, and access to food mainly through the loss of income and assets which impairs the ability to buy food. The reduced of food and agricultural product exports due to border closures and health quarantines are other consequences that can lead to product accumulation and lower prices (Ghanbari Movahed et al., 2022).
After the Covid-19 pandemic, it is exacerbate by this war which had wider economic impacts, affecting the overall stability of the global food security market. Some countries are particularly vulnerable, including those experiencing slow and uneven economic recovery to the Covid-19 pandemic, conflict affected and fragile economies, and low-income countries with high levels of import dependence for food (Abay et al., 2023). The war between these two countries, also disrupted agricultural production, transportation, and trade, leading to shortages, price increases, and

food insecurity in some regions. One of the key impacts of the conflict has been on agricultural production, which has led to the damage of farmland, irrigation systems, and other agricultural infrastructure, leading to a decrease in crop yields and production (Galanakis, 2023).

Another most significant impact of Covid-19 pandemic on food security is through income declines, which put food access at risk, particularly for the poorest and most vulnerable populations. It is also reported that food shortages and lower incomes affect dietary choises. The analysis of 300,000 households in low- and middle-income countries reveals that poor people spend more than a quarter of their total income on staple foods such as wheat, rice, or maize, whereas non-poor households spend only 14%. This reduces in dietary diversity, micronutrient intake, and nutritional status, raising the risk of negative health consequences (Laborde et al., 2020). The pandemic has disrupted the functioning of food supply chain that made it difficult for some people to get sufficient and nutritious food. Furthermore, we know that the pandemic has a negative impact on the well-being of people, especially who are living in crisis-affected countries.

On the other hand, the Russia-Ukraine war has disrupted nearly a third of production and increased food prices, resulting in a global food crisis especially when the restriction of food supply distribution happen (World Food Programme, 2022). It is also warned, that this combination can led to the biggest food crisis after World War II by United Nations. The conflict would put as many as 1.7 billion people in hunger, with 276 million experiencing severe food insecurity (Lin et al., 2023).

The long-term consequences of Covid-19 and the war of Russia-Ukraine on global food security is significant. The pandemic has increased global food insecurity in almost every country by reducing incomes and disrupting food supply chains (Husain, 2022) (U.S. Global Leadership Coalition, 2022). The Russia-Ukraine war is driving up the prices of food, fuel, and fertilizer, causing a global food crisis (World Food Programme, 2022). The war has resulted in immediate and wide consequences on global food security, exacerbated by the pandemic. The pandemic continues to create devastating effects on global food security and poverty, especially on the poorest and most vulnerable populations.

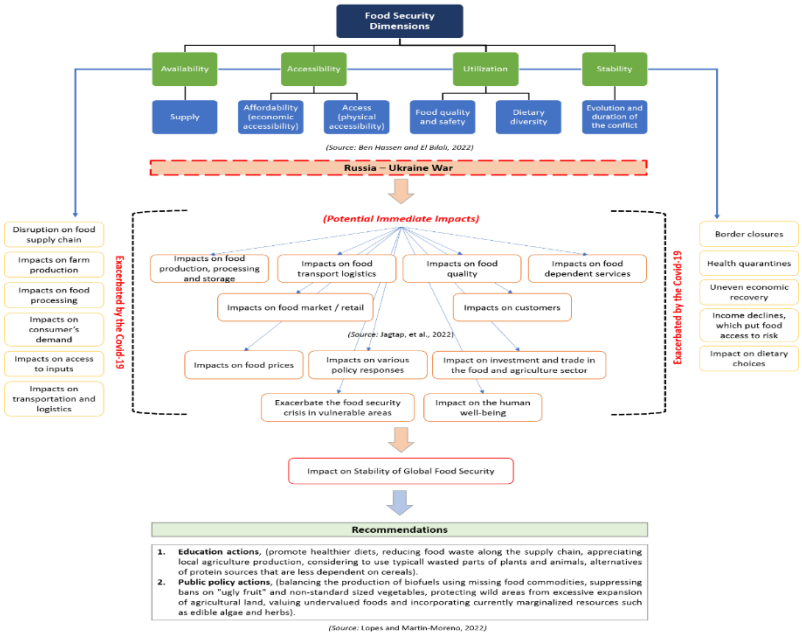

Figure 6: The Impact of Russia-Ukraine war on Global Food Security under the Covid-19

At first, the ongoing restrictions from effect of both events could continue to disrupt global supply chains and reduce the availability of food in certain regions, particularly in low-middle income countries and another conflict-affected regions. This could lead to the higher of food prices and increase the vulnerabilities in the populations, especially the prices of main commodities from Russia and Ukraine productions, such as wheat, maize, oilseeds, fertilizer, etc. Then, the conflict could deteriorate Ukraine's infrastructure and agricultural land, which could have long-term consequences for the country's agricultural production capacity. As Ukraine is a major producer and exporter of wheat, corn, and sunflower oil, this could have an impact on global food supplies.

Overall, the ongoing pandemic and the conflict between Russia and Ukraine pose serious threats to global food security. Continuously efforts are needed to mitigate these threats and promote international cooperation is also important to ensure the food supplies remain stable and accessible to all people. Despite this, the long-term consequences of both events pose challenges to many countries, require urgent action and challenging to evaluate.

The impact of the Russia-Ukraine war on global food security amidst the Covid-19 pandemic has necessitated a variety of actions to mitigate potential famines and food shortages, as well as improve the quality of diets worldwide (Lopes and Martin-Moreno, 2022). Education actions include taking advantage of the food crisis to promote healthier diets, reducing food waste along the supply chain, appreciating local agricultural production, and considering the use of typically wasted parts of plants and animals. Additionally, fostering the search for alternatives to animal proteins requiring high cereal consumption is recommended. Public policy actions must include balancing the production of biofuels using missing food commodities, suppressing bans on "ugly fruit" and non-standard sized vegetables, and protecting wild areas from excessive expansion of agricultural land. Valuing undervalued foods and incorporating currently marginalized resources such as edible algae and herbs can also improve food security. These measures seek to prevent famines and mitigate food shortages, enhance diet quality, improve food education, and reduce the impact of food production on climate change.

4. Conclusion

The global food supply chain has been severely disrupted due to the ongoing conflict between Russia and Ukraine and the Covid-19 pandemic, which has posed a significant threat to food security worldwide. The conflict has had a significant impact on the agricultural sector, transportation, and trade, leading to scarcities, escalated prices, and food insecurity. This situation has particularly affected low- and middle-income nations and regions that have been affected by the conflict. The current pandemic situation has further intensified the disruption of food supply chains and decreased earnings, resulting in scarcities of food and escalated costs. The armed conflict has led to significant casualties, damage to property and infrastructure, and loss of assets. These factors have had a detrimental impact on the agricultural sector, specifically hindering the sowing campaign and disrupting the supply of agricultural products. The escalation in the costs of wheat and other commodities, resulting from disturbances in supply chains, in conjunction with inflationary forces, has generated concerns regarding the possibility of food insecurity, specifically in Europe and Africa. Some strategies to mitigate it may include implementing educational initiatives aimed at promoting healthier diets, reducing food waste throughout the supply chain, supporting local agriculture production, exploring the use of typically discarded parts of plants and animals, and identifying alternative protein sources that are less reliant on cereals. Additionally, public policy measures such as balancing the production of biofuels with the availability of food commodities, lifting bans on "ugly fruit" and non-standard sized vegetables, safeguarding wild areas from excessive agricultural expansion, recognizing undervalued foods, and incorporating currently marginalized resources such as edible algae and herbs may also prove effective.

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