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Polish-Ukrainian Trade in Selected Fruits and Vegetables in the Face of the War in Ukraine

Abstract. Poland is among the top five largest producers of horticultural products in the European Union. A characteristic feature of Polish horticultural production is the great diversity in terms of scale and scope of activity. In Ukraine, the agricultural sector is also one of the key pillars of the economy; in 2021, about 14% of the country's population found employment in agricultural production. The analyses carried out indicate that Poland and Ukraine have different directions of change in the fruit and vegetable sector; namely, Poland shows a tendency to reduce the area of crops, while Ukraine, despite some declines, maintains a more stable production structure. The results of this research indicate significant variability in the import of selected fresh or frozen fruits and vegetables from Ukraine and the export from Poland in 2022. The most noticeable increase in imports in 2022 was recorded in the case of frozen blackcurrants and frozen raspberries. In terms of exports of Polish agricultural products to Ukraine, 2022 was characterised by significant increases in almost all analysed categories.

Keywords: fruit market, vegetable market, impact of war on horticultural sector, war in Ukraine, Polish trade with Ukraine

JEL Classification: Q02, Q11, Q17

Introduction

As noted by Drejerska and Fiore (2022), the agri-food sector plays a crucial role in the global economy – it is directly related to the livelihoods of almost eight billion people. Poland is one of the leading agricultural economies in Europe, with land designated for cultivation covering more than half of the country's area. It is worth emphasising that Polish agriculture shows significant diversity in terms of both the scale and scope of production. Additionally, Poland is among the top five largest producers of horticultural goods in the European Union. A characteristic feature of Polish horticultural production is the great diversity in terms of scale and scope of activity (Sobczak 2021). It should be noted that the fruit and vegetable market, although part of the agricultural market, is distinguished by the existence of independent local markets, distinct seasonality, significant participation of small informal entities and a wide range of products of varied quality (Filipiak 2014, Gołębiewski, Sobczak 2017). Horticultural products are characterised by great diversity in durability, transportability, qualitative heterogeneity and varied standards of preparation for sale. These features contribute to the instability of the horticultural market, which is further intensified by changes in supply resulting from weather conditions and incorrect decisions made by economic entities such as producers, processors and distributors. Fluctuations in trade relations between exporting and importing countries also affect the variability of the horticultural market (Trębacz 1994). Horticultural product markets and their mechanisms

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function in a manner similar to other product markets while maintaining their specificity. Among the factors distinguishing agricultural markets, one can mention a high level of competitiveness resulting from a large number of producers, a large group of end recipients, spatial character, cyclicity and seasonality, low price elasticity of supply and demand, as well as high price risk (Rembeza 2010).

Risk and uncertainty are integral components of economic activity, as well as the functioning of the entire economy, with a particular emphasis on agriculture. This sector is strongly dependent not only on economic dynamics, but also on changing climatic and weather conditions. The most dangerous events are unexpected and difficult to predict, affecting the physical parameters of production or price relations (Sadowski 2023). As the authors of this study point out, this risk is particularly noticeable in the fruit and vegetable production sector, which is characterised by a short shelf life and cannot be stored for a longer period (unlike cereals, which have a much longer storage period). A significant factor intensifying uncertainty in the agricultural market has turned out to be the war in the East, which has influenced changes in the level of supply and demand and contributed to the increase in the prices of means of production (Sadowski 2023).

The agricultural sector is one of the key pillars of the Ukrainian economy (Zolotnytska, Kowalczyk, 2022). In 2021, about 14% of the country's population found employment in agricultural production (Negrei and Taranenko, 2022). The year 2022 brought the outbreak of war in Ukraine, which initially had a regional character (covering the Donetsk Coal Basin) but, in the following months, spread to almost the entire country. This conflict caused far-reaching geopolitical and geoeconomic consequences, affecting both the main parties involved – Ukraine and Russia/Belarus – as well as Europe and the rest of the world (Sadowski 2023, Walkowski 2024). This war has become, after the COVID-19 pandemic, another serious shock to the global economy; although the warfare is regional in nature, its multidimensional effects have a global dimension (Banse et al. 2022, Walkowski 2024) – especially in the context of food security (Câmpeanu, 2022). This conflict has exacerbated the pressure on food supply chains, particularly disrupting exports from the Black Sea region (Glauben et al. 2022). As a result, Ukraine's foreign trade – especially exports – has collapsed, forcing the country to seek alternative trade routes. Consequently, there have been significant changes in the geographical structure of Ukrainian exports and imports. The launch of the grain corridor in mid-2022 was of key importance for the transport of goods from Ukraine, allowing ports to regain a dominant role in the export of agri-food products (Matuszczak et al., 2023).

This situation also had an impact on the policy of the European Union (Celi et al., 2022). The suspension of import duties and quotas on Ukrainian exports to the EU in mid-2022, along with the establishment of EU solidarity corridors, facilitated the export of Ukrainian products to the EU. However, it also caused serious disruptions in the agricultural markets of the region. Rapidly growing imports from Ukraine led to oversupply of agricultural products (mainly cereals), resulting in downward pressure on prices and the saturation of logistics chains in some EU regions, including Poland. There were also concerns about the quality of imported products, particularly regarding the issue of so-called “technical grain” (Kacprzak and Zawadka, 2023). Until February 24, 2022, Ukraine was a moderately important sales market for Polish agri-food products. The Russian invasion of Ukraine resulted in record sales returns in Polish agri-food trade with Ukraine in 2022, particularly in terms of imports (Bułkowska, Bazhenova 2023). The increase in exports of many products occurred despite the challenges and problems related to the

development of agriculture during the war (Cherevko 2024), such as the destruction of crops and temporary restrictions on grain exports from Ukraine to world markets (Gołębiewski and Stefańczyk 2023). Ultimately, Ukraine managed to maintain agricultural production and remain a significant supplier of agricultural products in the global market, as emphasised by Cherevko (2024). The large production and trade potential of Ukraine, alongside the growing import of agri-food products by land within the EU solidarity corridors, necessitates an assessment of the effects of the war on trade in agri-food products in EU countries bordering Ukraine, including Poland, which plays a key role in this process (Bułkowska, Bazhenova 2023).

Taking into account the importance of the horticultural sector in Polish agricultural production and its specific conditions, as well as the significant potential of Ukraine in agricultural production, including horticultural, it seems important to attempt to characterise changes in the fruit and vegetable market in the context of trade between Poland and Ukraine. Despite the growing interest in the impact of the war in Ukraine on economic relations in Eastern Europe, there is a lack of detailed research on Polish-Ukrainian trade in selected fruits and vegetables. Analyses conducted so far have focused mainly on general aspects of international trade, including trade in grains, without a thorough exploration of the fruit and vegetable sector – which is particularly sensitive to changes in logistics. This study fills the research gap in the literature on the subject, including changes in trade in the fruit and vegetable sector during the conflict in Ukraine. The paper analyses a specific agricultural sector, namely the fruit and vegetable market in the context of war perturbations, which will allow for a better understanding of the mechanisms occurring in this market segment.

Material and methods

The aim of this article was to characterise changes in the fruit and vegetable market in the context of trade between Poland and Ukraine. Attention was focused on the transformation of the market under the influence of the war in Ukraine. The assessment was made by analysing changes in trade during 2022-2023 compared to previous years. These changes were evaluated based on annual data for selected periods. Data from the FAOSTAT Database for 2017-2022 was used to present the general situation in the fruit and vegetable market in Poland and Ukraine. Data from the EUROSTAT database was utilised to assess the impact of the war in Ukraine on the situation in Polish markets from 2017 to 2022. Annual data on the level of imports of selected species of fresh and frozen fruits and vegetables between Ukraine and Poland, as well as exports from Poland to Ukraine, was employed to illustrate these changes. The selection of species was intentional, focusing on those of significant importance to both Poland and Ukraine.

The data analysis process in this study involves using annual data for selected periods to assess the changes in the market for selected fruits and vegetables. The following steps were taken to conduct the analysis:

1. Data collection: Annual data on the area of crops and harvests of selected fruit and vegetable species in Poland and Ukraine was collected, along with data on the import of selected products from Ukraine by Poland and the export of these products from Poland to Ukraine. This data came from the above-mentioned databases.

2. Data cleaning and preparation: The collected data were checked for missing values. Necessary corrections and adjustments were made to ensure data integrity and accuracy.

3. Data Transformation: Collected data was organized and transformed into a format suitable for analysis.

4. Descriptive analysis: Descriptive statistics, including trend measures, were calculated to summarize the data..

5. Interpretation of results and conclusions: Analysed data and statistical findings were interpreted to understand the observed changes in the market. Results were examined in the context of the war in Ukraine, considering its potential impact on market instability.

Results

The potential of horticultural cultivation in Poland and Ukraine

Analysis of data on the area of crops of selected fruit and vegetable species in Poland and Ukraine from 2017 to 2022 indicated changes in the structure of agricultural production in both countries (Table 1). In Poland, a significant decrease in the area of crops for many key species was observed. The largest change can be seen in the case of tomatoes, with a reduction of almost 41%. A similar trend is evident for strawberries, the area of which decreased by 37%, and for raspberries, where the decrease was about 26%. In Ukraine, changes in the area of crops were much less dynamic. A comparison of Poland and Ukraine indicates different trajectories of change in the studied sector; namely, Poland shows a tendency to reduce the area of crops, while Ukraine, despite some decreases, maintains a more stable production structure.

Table 1. Area of selected horticultural crops in Poland and Ukraine, in thousand ha

Specification	Poland							Ukraine						
	2017	2018	2019	2020	2021	2022	2022 to 20217	2017	2018	2019	2020	2021	2022	2022 to 20217
Apples	176.4	166.2	155.6	152.6	161.9	151.9	86%	91.2	91.8	87.7	85.0	84.4	76.9	84%
Blueberries	7.1	8.1	8.5	9.7	10.7	11.4	161%	0.4	0.5	0.5	0.1	0.1	0.1	25%
Cabbages	24.4	26.4	25.8	16.1	16.5	16.4	67%	64.6	62.4	65.9	69.1	67.8	59.3	92%
Carrots and turnips	22.1	22.7	22.5	17.7	17.5	16.8	76%	42.7	43.1	43	43.5	43.2	38.2	89%
Cauliflowers and broccoli	14.3	15.2	15.8	10.3	10.7	10.8	76%	3.3	1.3	1.4	1.5	1.4	0.8	24%
Cherries	9.6	8.9	9.0	10.4	9.7	9.9	103%	10.2	9.8	10.0	10.0	10.3	7.0	69%
Cucumbers and gherkins	15.0	16.5	17.1	8.8	9.2	6.7	45%	50.4	49.5	52.1	54.1	53.3	45.1	89%
Currants	44.0	43.7	43.4	42.5	43.4	44.8	102%	4.8	4.7	4.2	3.9	3.7	3.5	73%
Onions and shallots, dry	26.0	25.5	25.2	23.2	23.4	22.8	88%	54.8	52.5	53.9	55.1	53.8	44.2	81%
Other berries and fruits of the genus vaccinium n.e.c.	12.6	14.2	14.3	22.3	21.6	21.2	168%	1.4	1.7	1.5	1.6	1.8	2.2	157%
Plums and sloes	14.3	13.5	13.6	18.7	16.5	16.5	115%	18.0	18.2	17.3	17.6	17.9	16.7	93%
Raspberries	29.3	29.6	29.5	17.9	19.8	21.7	74%	5.0	4.9	5.2	5.3	5.4	4.8	96%
Sour cherries	29.5	28.0	28.3	24.8	25.3	26.0	88%	19.7	19.8	20.0	19.9	20.2	18.7	95%
Strawberries	49.6	49.2	49.9	33.0	33.9	31.3	63%	7.8	7.9	7.9	8.1	8.0	7.0	90%
Tomatoes	11.4	13.1	13.5	7.8	7.7	6.7	59%	74.4	73.1	72.9	74.9	75.8	51.5	69%

Source: Own study based on FAOSTAT Database data (accessed 16/06/2024).

The analysis of the harvest of selected products in Poland and Ukraine from 2017 to 2022, as well as the area of crops, reveals differences in the dynamics of production in both countries (Table 2). In Poland, significant changes were observed in the production of various crops; notably, the production of apples increased substantially, nearly doubling to reach 4.26 million tonnes in 2022. This indicates an intensification of production and the absence of unfavourable production conditions. When comparing both countries, Poland demonstrates a greater dynamism in changes to horticultural production, with clear increases in some sectors and decreases in others, while Ukraine is characterised by more stable production.

Table 2. Harvests of selected fruits and vegetables in Poland and Ukraine, in thousand tonnes

Specification	Poland							Ukraine						
	2017	2018	2019	2020	2021	2022	2022 to 20217	2017	2018	2019	2020	2021	2022	2022 to 20217
Apples	2,441.4	3,999.5	3,080.6	3,555.2	4,067.4	4,264.7	175%	1,076.2	1,462.4	1,154.0	1,114.6	1,278.9	1,129.1	105%
Blueberries	16.3	25.3	34.8	55.3	55.3	64.0	393%	1.4	1.2	2.4	0.6	0.1	0.2	14%
Cabbages	1,083.6	985.4	899.1	767.5	726.4	687.5	63%	1,673.4	1,650.8	1,732.9	1,759.2	1,722.6	1,533.5	92%
Carrots and turnips	827.1	726.4	678.3	681.0	638.4	619.6	75%	839.0	841.8	869.5	862.5	863.3	748.9	89%
Cauliflowers and broccoli	317.0	292.8	282.5	244.1	225.9	208.0	66%	59.9	21.2	22.6	20.2	17.9	9.1	15%
Cherries	19.7	60.0	44.4	51.3	59.1	76.6	389%	70.9	84.6	68.6	63.6	61.9	58.2	82%
Cucumbers and gherkins	543.7	538.7	519.4	526.5	473.0	472.2	87%	896.3	985.1	1,034.2	1,012.5	1,080.0	825.6	92%
Currants	128.8	164.6	126.2	145.9	152.0	145.8	113%	27.1	29.6	26.6	25.8	27.0	24.7	91%
Onions and shallots, dry (excluding dehydrated)	667.4	562.9	535.4	667.8	618.1	651.1	98%	976.7	883.9	998.1	1,033.7	1,024.4	809.8	83%
Other berries and fruits of the genus vaccinium n.e.c.	53.4	66.0	54.0	88.1	87.6	85.2	160%	1.3	1.8	1.4	2.3	4.1	3.0	231%
Plums and sloes	58.4	121.1	95.0	117.4	117.4	133.2	228%	200.5	198.1	181.1	173.2	188.3	168.6	84%
Raspberries	104.5	115.6	75.7	123.2	103.9	104.9	257%	34.2	35.2	35.5	35.3	36.3	33.6	105%
Sour cherries	71.6	200.6	151.9	155.5	166.6	183.8	112%	172.3	218.7	167.5	174.6	193.7	180.2	99%
Strawberries	177.9	205.2	185.4	157.6	162.9	199.4	175%	55.0	62.3	62.6	55.2	62.3	54.7	55%
Tomatoes	898.0	928.8	917.8	766.6	815.8	787.2	88%	2,267.5	2,324.1	2,224.4	2,250.3	2,444.9	1,257.5	14%

Source: Own study based on FAOSTAT Database data (accessed 16/06/2024).

As already indicated, in the years 2017-2022, the analysis of data on the area of crops and harvests of selected fruit and vegetable species in Poland and Ukraine indicates that these countries followed slightly different trajectories. These changes may be the result of

several factors. First, rising production costs, such as the prices of fertilisers, fuel or plant protection products, made some crops less profitable for farmers, which prompted them to reduce acreage or completely abandon certain crops. Second, changes in consumer preferences and competitive pressure from international markets could have influenced decisions to limit production. Additionally, climate change is a significant factor influencing changes in the structure of crops. Rising temperatures, increasingly frequent droughts and irregular rainfall have had a negative impact on crops, especially the more sensitive ones, such as strawberries and raspberries. In the case of Poland, attention should also be paid to the need to adapt production to the requirements of the Common Agricultural Policy and EU standards. At the same time, the increase in harvests in the cases indicated above may result from production intensification and investment in modern cultivation technologies, such as more efficient varieties and advanced plant protection methods.

Export structure in the fruit and vegetable sector in Poland and Ukraine

In Poland, the dominant export category in the fruit and vegetable sector is apples (status as of 2022), with exports reaching 732.73 thousand tonnes, indicating Poland’s significant position as a key exporter of apples in the international market. Apple production in Poland is concentrated and intensive, which allows for a large scale of exports. The second important category is tomatoes (82.46 thousand tonnes), followed by the export of cabbage (487.53 thousand tonnes) and pears (6% share) (Figure 1).

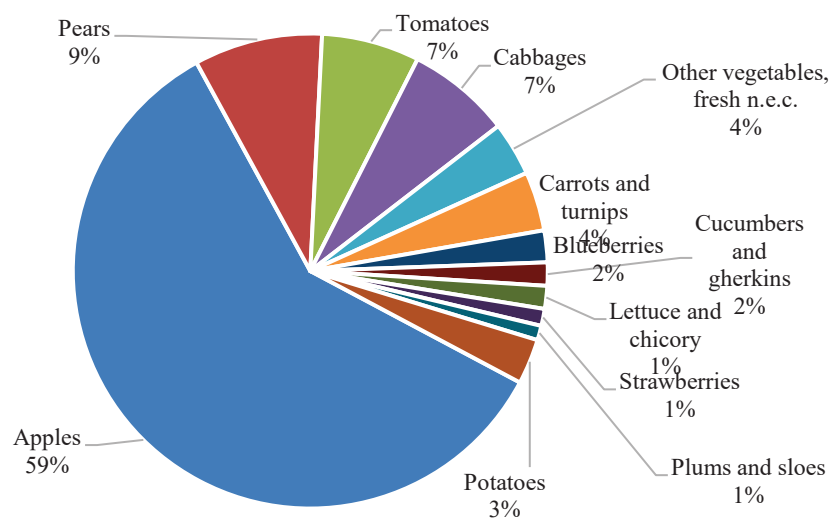


Fig. 1. Structure of Polish exports of selected fruit and vegetable species in 2022

Source: Own study based on FAOSTAT Database data (accessed 16/06/2024).

As in Poland, apples also play a significant role in the export of fruits and vegetables in Ukraine. However, it should be noted that although they are important, their export reached 20.28 thousand tonnes in 2022 – which is a much smaller value compared to

Poland. A significant export category were/was potatoes (30.08 thousand tonnes) and cabbage (1.15 thousand tonnes) (Figure 2).

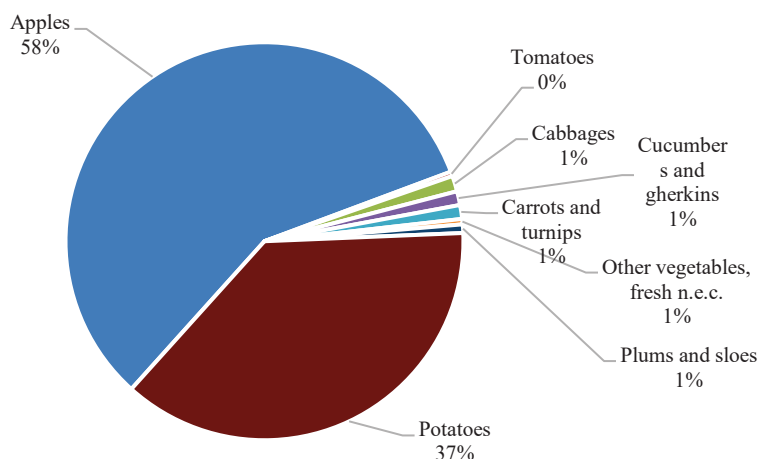


Fig. 2. The structure of Ukrainian exports of selected fruit and vegetable species in 2022

Source: Own study based on FAOSTAT Database data (accessed 16/06/2024).

Comparing the general export structure of both countries, it is evident that Poland dominates the production and export of apples and vegetables such as tomatoes and cabbage. Ukraine, on the other hand, despite having smaller export volumes, focuses on other categories.

Changes in the export and import of selected fruits and vegetables

In the analysed period from 2017 to 2021, there was a noticeable increase in the import of fruits and vegetables (fresh or processed) from Ukraine to Poland. As the data indicate, the import of frozen raspberries increased from 7,173.2 tonnes in 2017 to 17,146.5 tonnes in 2021, representing a significant, almost 140% increase. A similar situation occurred in the case of the import of edible vegetables and roots/tubers, which showed an increase from 5,902.7 tonnes to 11,821.6 tonnes (the largest jump was recorded in 2018, reaching 29,863.7 tonnes) (Table 3). In the case of other products, such as fresh raspberries, strawberries, tomatoes and plums, changing trends are observed – which may result from various factors, including weather conditions or changes in demand. The year 2022 brought significant changes in the structure of imports of the analysed products, which can be linked to the escalation of the armed conflict in Ukraine and the resulting disruptions in supply chains, as well as changes in trade policy. The most noticeable increase in imports in 2022 was recorded for frozen blackcurrants, where imports increased from just 22.1 tonnes in 2021 to 1,255.9 tonnes in 2022, an increase of over 5,600%. Similarly, imports of frozen raspberries increased from 17,146.5 tonnes in 2021 to 22,089.4 tonnes in 2022, a rise of 28.8%. Also, in the case of edible vegetables and roots and tubers, imports increased from

11,821.6 tonnes to 21,078.5 tonnes. However, not all products saw an increase in imports in 2022; the import of fresh raspberries and fresh tomatoes dropped significantly, which may indicate problems with the production and logistics of these fresh products in Ukraine – especially under wartime conditions.

Analysis of data from subsequent years showed that in 2023 the growth in imports of frozen raspberries continued, reaching 24,286.6 tonnes. However, compared to 2022, the growth rate was lower, while imports of edible vegetables and roots fell to 14,322.7 tonnes, which may indicate normalisation after a sharp increase in 2022. A significant decline in imports in 2023 was also noticeable in the case of plums (a drop to 812.4 tonnes) and apples (a drop to 359.5 tonnes).

Table 3. Import of selected fruits and vegetables from Ukraine to Poland, in tons

Specification	2017	2018	2019	2020	2021	2022	change 2022 to 2021	2023
Black currants, uncooked or cooked by steaming or boiling in water, frozen, unsweetened	0.0	42.9	183.8	69.1	22.1	1,255.90	5683%	126.3
Cucumbers, fresh or chilled	1,698.5	2,118.0	2,318.4	2,183.9	2,065.8	727.9	35%	940.6
Dried prunes	542.7	3.2	20	42	272.4	188.2	69%	65
Dried, shelled lentils, whether or not skinned or split	4.0	34.0	127.3	544.7	376.5	140.2	37%	572.5
Edible vegetables and certain roots and tubers	5,902.7	29,863.7	37,131.1	20,377.4	11,821.6	21,078.5	178%	14,322.7
Fresh apples	39.5	514.6	18.6	20.3	0.0	59.0		359.5
Fresh or chilled horse-radish "Cochlearia armoracia"	0.0	196.0	808.7	295.5	55.8	169.0	303%	43.8
Fresh plums	6,637.1	0.0	136.2	79.7	329.2	79.3	24%	812.4
Fresh raspberries	929.3	879.6	860.3	534.6	397.3	408.4	103%	383.7
Fresh strawberries	51.9	48.0	367.9	222.8	410.1	209.7	51%	100.6
Frozen strawberries, uncooked or cooked by steaming or boiling in water, whether or not sweetened	2,032.6	2,437.8	2,393.1	1,475.7	2,740.0	3,316.6	121%	1,488.6
Raspberries, uncooked or cooked by steaming or boiling in water, frozen, unsweetened	7,173.2	7,782.3	6,893.9	11,440.0	17,146.5	22,089.4	129%	24,286.6
Tomatoes, fresh or chilled	1,816.1	1,193.3	1,438.1	829.5	879.8	247.6	28%	352.6

Source: Own study based on EUROSTAT data (read on 27/07/2024).

Table 4. Export of selected fruits and vegetables from Poland to Ukraine, in tons

Specification	2017	2018	2019	2020	2021	2022	change 2022 to 2021 (in %)	2023
Cabbages. cauliflowers. kohlrabi. kale and similar edible brassicac. fresh or chilled	575.08	706.97	1,780.44	1,741.29	1,780.79	24,208.66	1359%	8,691.54
Cucumbers. fresh or chilled	28.25	90.46	908.79	317.95	107.42	2,262.38	2106%	1,927.67
Edible vegetables and certain roots and tubers	17,300.89	18,248.48	36,355.65	62,142.53	119,020.50	170,826.44	144%	96,084.13
Fresh apples	40,094.22	1,837.71	24,147.19	12,163.30	15,924.65	793.64	5%	5,983.33
Fresh or chilled aubergines "eggplants"	298.29	213.38	855.06	740.95	963.05	1,002.41	104%	1,285.66
Fresh or chilled cabbage	811.56	1,258.47	3,019.73	3,055.34	4,254.28	2,433.77	57%	4,557.07
Fresh or chilled carrots and turnips	1,964.68	938.58	339.21	94.12	57.85	26,032.86	45001%	14,691.89
Fresh or chilled cauliflowers and headed broccoli	317.22	324.51	1,423.45	1,575.52	1,560.19	1,747.59	112%	1,553.11
Fresh or chilled celeriac "rooted celery or German celery"	82.99	46.33	176.98	101.4	116.72	974.6	835%	1,540.66
Fresh or chilled sweet peppers	2,069.88	2,173.40	5,316.93	5,538.20	4,622.24	5,207.29	113%	4,973.63
Fresh or chilled vegetables n.e.s.	188.38	212.15	136.72	232.43	374.35	1,008.14	269%	554.63
Mixtures of vegetables. uncooked or cooked by steaming or by boiling in water. frozen	1,335.56	2,005.39	2,789.34	3,887.46	5,077.69	4,860.48	96%	4,892.58
Onions. shallots. garlic. leeks and other alliaceous vegetables. fresh or chilled	4,089.46	1,061.57	2,903.87	9,978.15	2,564.68	56,756.18	2213%	28,292.67
Tomatoes. fresh or chilled	877.82	939.42	5,878.11	12,764.61	4,687.09	22,202.17	474%	12,324.79
White and red cabbages. fresh or chilled	123.61	303.57	20.25	32.27	51.61	20,858.86	40416%	5,750.29

Source: Own study based on EUROSTAT data (read on 27/07/2024).

In the case of fruit and vegetable exports from Poland to Ukraine between 2017 and 2021, there were variable but generally upward trends (Table 4). It is worth emphasising particularly significant increases in some categories; for example, the export of edible vegetables and certain roots and tubers increased from 17,300.89 tonnes in 2017 to 119,020.50 tonnes in 2021. The export of fresh apples, one of Poland's key export commodities, was characterised by greater variability. After an impressive export level of 40,094.22 tonnes in 2017, there was a decrease to 1,837.71 tonnes in 2018. This may be the result of the low harvest of these fruits in Poland in 2017. From 2019 to 2021, apple exports did not reach the level of 2017, although some increases were recorded during 2019-2021.

The year 2022 was a turning point in the export of Polish agricultural products to Ukraine, with record increases in almost all analysed categories. Total exports of edible vegetables and roots and tubers increased to 170,826.44 tonnes, representing an increase of 43.6% compared to 2021. This is the highest export value in the analysed period. A similar situation occurred in the case of onion group exports, which increased from 2,564.68 tonnes in 2021 to 56,756.18 tonnes in 2022. Similarly dynamic increases were recorded in the case of carrots and turnips; exports increased from 57.85 tonnes in 2021 to 26,032.86 tonnes in 2022, indicating an urgent need for supplies of these products in the Ukrainian market. Comparable increases were also observed in other categories, such as cabbages (up from 51.61 tonnes to 20,858.86 tonnes) and tomatoes (up from 4,687.09 tonnes to 22,202.17 tonnes). The only category that did not record such dynamic growth was fresh apples, whose exports fell from 15,924.65 tonnes in 2021 to just 793.64 tonnes in 2022. The year 2023 brought some stabilisation and even declines in exports compared to the record year 2022. Total exports of edible vegetables and roots and tubers amounted to 96,084.13 tonnes, which represents a decrease of 43.8% compared to 2022. Nevertheless, the level of exports in 2023 remained higher than before 2022.

In summary, the analysed data indicates that 2022 was an exceptional year for the growth of Polish agricultural exports to Ukraine, likely in response to sudden changes in the supply of products related to the war crisis. However, the following year saw a stabilisation of the export level. Differences in the level of production and specialisation within the fruit and vegetable sector are also evident in the export of these products. Although apples play a significant role in exports for both countries, their importance is much greater in Poland. The year 2023 brought a decline in exports of selected fruits and vegetables from Poland to Ukraine.

Conclusion

The analyses carried out indicate that Poland and Ukraine have different directions of change in the fruit and vegetable sector. Specifically, Poland shows a tendency to reduce the area of crops, while Ukraine, despite some decreases, maintains a more stable production structure. On the other hand, when comparing the levels of fruit and vegetable harvests in both countries, Poland demonstrates greater dynamics of change in horticultural production, whereas Ukraine is characterised by more stable production.

The war in Ukraine has become, after the COVID-19 pandemic, another serious shock to the global economy. Despite the fact that the military operations are regional in nature, their multidimensional effects are global. As suggested by Franc-Dąbrowska and Drejerska (2022), considering the recent shocks in the agricultural products market – namely COVID-19, the war in Ukraine and rising inflation – one can expect a problematic situation in the food market in the near future, particularly concerning products for which Ukraine is a significant producer on the international stage.

The analyses carried out indicate significant variability in the import of selected fresh or frozen fruits and vegetables from Ukraine and exports from Poland. 2022 was exceptional in terms of changes in their levels, which were related to extraordinary geopolitical circumstances. It should be noted that in 2023, the pace of change slowed down. The most noticeable increase in imports in 2022 was recorded for frozen blackcurrants, where imports rose from only 22.1 tonnes in 2021 to 1,255.9 tonnes in 2022,

and frozen raspberries saw an increase of 28.8%. On the other hand, the import of fresh raspberries and fresh tomatoes decreased significantly. Analysis of data from subsequent years indicated that in 2023, the increase in the import of frozen raspberries continued, reaching 24,286.6 tonnes. However, compared to 2022, the growth rate was lower.

In the case of Polish agricultural exports to Ukraine, 2022 was characterised by significant increases in almost all analysed categories. Total exports of edible vegetables, roots and tubers increased by 43.6% compared to 2021. This was the highest export value in the analysed period. A similar situation occurred with onion exports, which increased from 2,564.68 tonnes in 2021 to 56,756.18 tonnes in 2022, and with carrots and turnips, which rose from 57.85 tonnes in 2021 to 26,032.86 tonnes in 2022.

The main limitations of this paper include the lack of access to up-to-date data from the Ukrainian State Statistical Office, limited representativeness of the results and a short time frame. In addition, the instability of markets caused by the war and unpredictable changes in trade policy may distort the conclusions drawn. To deepen the analysis in future research, it is worth focusing on the long-term impact of war on trade and changes in trade structure after the end of the conflict. An analysis of Polish-Ukrainian trade in selected fruits and vegetables in the context of the war in Ukraine may suggest that changes in production directions in both countries are necessary in the future. It is also worth noting the need for logistical support and infrastructure investments to minimise disruptions in supply chains under difficult conditions.

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