Food and Agriculture Organization of the United Nations

INFORMATION NOTE **5 December 2022 Update**

THE IMPORTANCE OF UKRAINE AND THE RUSSIAN FEDERATION FOR GLOBAL AGRICULTURAL MARKETS AND THE RISKS ASSOCIATED WITH THE WAR IN UKRAINE

EXECUTIVE SUMMARY

1. Market and trade profiles and recent price trends

1.1. Market shares

1. The Russian Federation and Ukraine are among the most important producers of agricultural commodities in the world. Both countries are net exporters of agricultural products and are leading global suppliers of foodstuffs. The Russian Federation is also a top exporter of fertilizers. In world food and fertilizer markets, exportable supplies are often concentrated in a handful of countries, rendering these markets vulnerable to shocks and volatility.
2. In 2021, either the Russian Federation or Ukraine, or both, ranked among the top three global exporters of wheat, barley, maize, rapeseed, rapeseed oil, sunflower seed and sunflower oil. The Russian Federation also ranked as the world's top exporter of nitrogen fertilizers, the second leading supplier of potassic fertilizers and the third largest exporter of phosphorous fertilizers.

1.2. Trade profile

3. A large number of food- and fertilizer-importing countries, many of which belong to the groups of Least Developed Countries (LDCs) and Low-Income Food-Deficit Countries (LIFDCs), rely on Ukrainian and Russian food supplies to meet their needs. Many of these countries were already grappling with the negative effects of the COVID-19 pandemic and the high international food and fertilizer prices prior to the war.

1.3. International prices and import bills of basic foodstuffs and agricultural inputs

4. The rising international food commodity prices, as relayed by the FAO Food Price Index, are imposing a heavy fiscal burden on importing countries. Due to higher prices, the global food import bill is set to reach a record high of USD 1.94 trillion in 2022. Many economically vulnerable countries are paying more while receiving less food this year. They are finding it increasingly difficult to finance their food import costs and potentially heralding an end of their resilience to higher international prices.
5. Soaring costs of agricultural inputs are similarly expected to result in a near 50 percent annual leap in global expenditures on imported inputs to USD 424 billion in 2022. All regions and country income groups are expected to be affected by this rise. However, for many low-income countries, the sharp increase in the input import bills, together with the depreciation of their national currencies, are further aggravating existing balance of payments problems. The soaring costs of inputs also risk decreasing input application.

2. Risk analysis: Assessing the risks emanating from the War in Ukraine

2.1 Trade risk

6. When the war broke in late February, Ukraine and the Russian Federation were in the middle of the 2021/22 marketing season. As such, it had immediate impacts on the countries' capacities to execute existing export contracts and enter into new ones for crops already harvested. This was particularly the case in Ukraine, where the war caused the cessation of all commercial shipping operations, the temporary suspension of activities by private grain and crushing operators, damages to inland transport, storage and processing facilities.
7. The launch and renewal of the Black Sea Grain Initiative, as well as efforts to boost export capacity through non-marine channels, have helped ease the severe exports constraints faced by Ukraine due to the closure of Black Sea ports at the start of the war. However, concerns exist that war-induced damages to domestic infrastructure, energy shortages and reduced crop production could keep Ukraine's exports of grains and vegetable oils below potential.
8. For the Russian Federation, reports suggest that food exports continued, nonetheless concerns that difficulties with access to financial services needed to complete international transactions may have limited exports. Furthermore, while Russian Black Sea ports continue to function, there were apprehensions about increases in insurance premiums for vessels destined to berth in the Black Sea, affecting trade and the costs of internationally sourced food paid by importers.

2.2 Logistical risks

9. In Ukraine, the war has damaged parts of the processing, storage and transport infrastructure. For as long as hostilities persist, additional damages to crucial infrastructure cannot be excluded. This could possibly constrain the country's ability to complete harvests and export. With the exception of three seaports included in the Black Sea Grain Initiative, commercial shipping operations have been suspended on security grounds. Damages to energy infrastructure and preferential use of energy supplies to satisfy the heating needs of the population in the winter could limit available energy for post-harvest operations and food processing and transportation.
10. Increases in insurance premia or lack of war coverage in insurance contracts for vessels sailing into the northern Black Sea have exacerbated the already high costs of maritime transportation, raising the cost of food imports.

2.3 Production risks

11. While the war in Ukraine is ongoing and its outcome remains unclear, the damage to the country's agrifood sector is already of an unprecedented scale. With the war-induced damage to the agriculture sector in Ukraine estimated at USD 2.2 billion (excluding irrigation and water, forestry and fisheries) and the aggregate losses totaling USD 28.3 billion (as of 1 June 2022[1]), the total reconstruction and recovery needs from the public sector were estimated at USD 18.7 billion over a ten-year period.
12. FAO forecasts the 2022 cereal harvest in Ukraine to decline 33 percent below average levels to a total of 51 million tonnes, as active fighting and the economic impacts of the war have constrained the winter crop harvest and even more so production of spring crops. A slump in producer prices, combined with high energy costs and damages to energy infrastructure, are being especially detrimental for the ongoing maize harvest. These factors, combined with limited labor, a lack of liquidity to cover input costs and constrained credit availability also dampen expectations for the 2023 winter crops, which could see their plantings fall 40 percent below the average extension.
13. The war has disrupted animal production in commercial, smallholder and backyard sectors in Ukraine. Usual supply chains of animal feed, veterinary drugs and product transportation were massively disrupted. Active and passive surveillance, laboratory diagnostics and control measures of endemic and emerging infectious diseases, notably African swine fever (ASF), are currently severely undermined due to the security situation and availability of resources and personnel. The interruptions of electricity, water and gas supplies in the country have affected livestock production and related value chains, as well as veterinary clinics and laboratories.
14. In the Russian Federation, no major disruption to agricultural production was anticipated following the outbreak of the war. The country depends on imported inputs, namely seeds and pesticides. Should there be disruptions to importing these inputs, this could result in less plantings, lower yields and lower quality of crops in the future.

2.4 Humanitarian risks

15. The war has increased humanitarian needs in Ukraine and will arguably exacerbate the severity of the situation in the 2022-2023 winter season. It will deepen the needs of millions of people who were already displaced or required assistance because of the war in the eastern part of the country that has lasted more than eight years. By directly constraining agricultural production, limiting economic activity and raising prices, the war has further undercut the purchasing power of local populations, with consequent increases in food insecurity and malnutrition.
16. Despite some returns after the active fighting retreated to the eastern part of the country, humanitarian needs in Ukraine's neighboring countries where displaced populations are seeking refuge have also increased substantially.
17. Heavy targeted shelling has decimated Ukraine's energy infrastructure, resulting in power cuts across the country and a rapid deterioration of the existing humanitarian crisis. Skyrocketing energy prices increase the cost of living, ultimately leading to increased food insecurity.
18. Older women and single mothers comprise the majority of Ukraine's poor, and female-headed households are more food insecure than their male counterparts. The current war is deepening pre-existing gender inequalities in Ukraine, increasing unemployment among women and pushing them further into the informal economy. While men aged 18 to 60 are not allowed to leave the country, the migration and refugee flows the war has triggered are also largely gendered. Of the 3.7 million people that had fled Ukraine to neighboring countries by 25 March 2022, 90 percent were women and children. Women faced many challenges at the borders, minority groups were often unable to leave, and vulnerable groups were left behind struggling with the disruptions to services and resources, such as education, health services, including access to sexual and reproductive health, safe and accessible shelters, with a high risk of abandonment and family separation for people with disabilities.

[1] https://documents1.worldbank.org/curated/en/099445209072239810/pdf/P1788430483791063 0b9c6040ac12428d5c.pdf

19. Disruptions to education are affecting 5.7 million children and mothers tend to take on the responsibility for homeschooling their children. Women and girls from the Roma population also face more challenges in accessing education, and a lack of documentation limits their opportunities to receive humanitarian assistance. There are also emerging protection concerns for women and girls, with increased safety risks, including physical and sexual violence, abductions and persecution.
20. The impacts of higher food and input prices have also affected the poor most vulnerable around the world. Projections of acute food insecurity indicate that up to 222 million people in 53 countries and territories could face food crisis or exacerbated levels of acute food insecurity in 2022. While most of these analyses did not take into account for the possible impacts of the war, the global food security situation will likely deteriorate further in 2022 without rapid and sustained humanitarian action that includes a strong focus on local food production.

2.5 Energy risks

21. The Russian Federation is a key player in the global energy market. The sharp increase in energy prices that has accompanied the war is affecting agriculture, as it is a highly energy-intensive industry, especially in developed regions.
22. Prices of fertilizers and other energy-intensive products were pushed up by the war and, despite some recent declines, they remain elevated. Higher input prices translate into higher production costs and eventually into higher food prices. They could also lead to lower use of inputs, lowering yields and harvests in the 2022/23 season and possibly beyond. This risks further price hikes and threatens global food security in coming years.
23. Higher energy prices also make agricultural feedstocks, especially maize, sugar and oilseeds/vegetable oils, more attractive for producing bioenergy. Given the large size of the energy market relative to the food market, this could raise food prices up to their energy parity equivalents.

2.6 Macroeconomic risks

24. The war in Ukraine has aggravated the macroeconomic challenges the world was already facing. It has contributed to elevating the world food and energy prices and created a lot of additional uncertainty, further aggravating food security globally, and particularly for lower-income countries and vulnerable populations.
25. In October 2022, the International Monetary Fund (IMF) projected that global growth rate will drop from 4.4 percent in 2022 to 3.8 percent in 2023. Moreover, global inflation is forecast to rise from 4.7 percent in 2021 to 8.8 percent in 2022, before declining to 4.1 in 2024.
26. The war in Ukraine, the global cost-of-living crisis, the tightening financial conditions in most regions, and the COVID-19 pandemic are considered to be driving these developments.
27. The reduction of GDP growth in several parts of the world, combined with the soaring prices, has affected the food and input import bills and is expected to continue to affect global demand and supply of agrifood products, with negative consequences for global food security and nutrition. Lower GDP growth will also likely reduce the availability of funds for development, especially if priority is given to military expenses.
28. The United States dollar has sharply strengthened against other currencies since May 2021. Increases in interest rates by the US Federal Bank, aiming to reduce the inflationary pressure has been an important driver behind the United States dollar appreciation.
29. Agriculture is the backbone of the economy in many developing countries, the majority of which rely on the United States dollar for their borrowing needs. As such, a stronger United States dollar can have significant economic consequences for these countries, including for their agrifood sectors.
30. The deployment of funds by multilateral creditors, such as the World Bank and the IMF, to support the affected countries can play an important role in mitigating the negative impacts of the rising food, input and energy prices and the tightening financial conditions.

3. Policy recommendations and proposals

31. It is essential to support Ukraine and its people. FAO has strengthened its team on the ground to support the country. FAO has completed nationwide needs assessments in Ukraine, targeting local level administrations and commercial farmers, and has conducted rural household surveys across the country. In March, FAO developed its Rapid Response Plan to target specific actions within Ukraine. The plan has been updated since then.
32. To limit the war's harmful impacts on the food and agricultural sectors, every effort should be made to keep international markets and trade in food and fertilizers open. Supply chains should be kept fully operational, including by protecting standing crops, livestock, food processing infrastructure and all logistical systems.
33. It is critical to support the provision of working capital to farmers and post-war reconstruction and recovery work. As of end of June 2022, the total reconstruction and recovery needs in agriculture (excluding irrigation and water, forestry and fisheries) were estimated at about USD 18.7 billion over a ten-year period. FAO will continue to work with the World Bank, the European Bank for Reconstruction and Development and other development financial institutions to raise the needed funds.
34. It is recommended that countries highly dependent on food imports diversify their import sources and identify various export suppliers for their food purchases to absorb the impacts of shocks and remain resilient. They should also use existing food stocks and enhance the diversity of their domestic production bases.
35. Recognizing that at least two-thirds of people experiencing acute food insecurity are rural populations who rely on agriculture-based livelihoods, humanitarian responses both within Ukraine and globally must prioritize actions boosting the production of nutritious food and making agriculture more resilient. The war's impact on the food security of vulnerable population groups necessitates timely and well-targeted social protection interventions to alleviate hardship and foster a fast recovery.
36. To assist the internally displaced people, refugees and other groups directly affected by the war, Ukraine's national social protection system should be expanded to register additional population groups with the Unified Social Information System and to enhance its delivery mechanisms, particularly to reach those that do not hold bank accounts or that currently live in occupied territories.
37. In countries hosting refugees, access to existing social protection systems and job opportunities should be eased by lifting legal access barriers and increasing the capacity of host countries' social protection systems to absorb additional caseloads.
38. Countries must carefully consider the potentially damaging effects that any trade-related measures they adopt could have on international markets and other countries. Particularly, export restrictions should be avoided and existing ones should be removed. They increase uncertainty and exacerbate price volatility, limit the buffer capacity of global markets, and can serious have negative impacts over the medium to long term.
39. The most affected countries by the war must be supported to be able to face the higher food prices and soaring food import bills. FAO has proposed the establishment of a global Food Import Financing Facility (FIFF) to assist countries with balance-of-payment problems and address the impacts of the war on global food security. Tapping into the Facility would allow vulnerable countries to mitigate long-lasting impacts on their agrifood systems and reduce future needs for emergency assistance. FAO welcomes the adoption by the IMF of a new Food Shock Window, which is in line with FAO's proposed FIFF.
40. Special attention should be paid to identifying and addressing the different needs and priorities of men and women, boys and girls (including those left behind and displaced people), and design gender-responsive interventions that tackle existing inequalities and the multiple forms of discrimination that women and girls face.
41. Information of the food security situation in different geographic areas and population groups at the sub-national level will be key to guiding interventions and actions. FAO has also developed a proposal to implement the Food Insecurity Experience Scale at national and sub-national level in the most vulnerable countries to allow a better targeting of social protection assistance.

42. It is essential to increase efficiencies in food and agricultural production. Two policy recommendations are of great importance in this regard. First, detail soil nutrient maps should be developed to reduce waste in the use of fertilizers and increase efficiency, coupled with appropriate technologies. This will particularly support the most vulnerable countries in using fertilizers efficiently, following lessons learned from other countries. FAO welcomes the support of the United States of America in funding the development of detailed soil nutrient maps in three countries. FAO has also developed a Fertilizer Trade Tracker, an online tool that allows countries to gauge remaining import needs and unrealized export availabilities of fertilizers for the current crop and calendar year.
43. Food loss and waste must be reduced. Currently the high amounts of food loss and waste, which have a huge negative impact on the environment, could feed around 1.26 billion people per year. Estimations show that if food loss and waste were reduced by 50 percent, there would be sufficient fruits and vegetables available in the food supply to cover the recommended amount of 400 grams per person per day.
44. The spread of African swine fever and other animal diseases must be contained by improving biosecurity and husbandry practices at all production and value chain systems, taking steps to facilitate early detection, timely reporting and rapid disease containment, and implementing measures that support virus detection such as surveillance schemes and targeted sampling of animals.
45. Market transparency and policy dialogue should be strengthened, as they play a key role particularly when agricultural commodity markets are under increased uncertainty and disruptions. Transparency is essential for guiding policy decisions and ensuring that international markets continue to function properly and that trade in food and agricultural products flows smoothly. The value of timely and credible data and information cannot be overemphasized. FAO welcomes the support to the Agricultural Market information System (AMIS) by the G7 and G20 and will work with all AMIS Members to strengthen the role and capacities of the system.

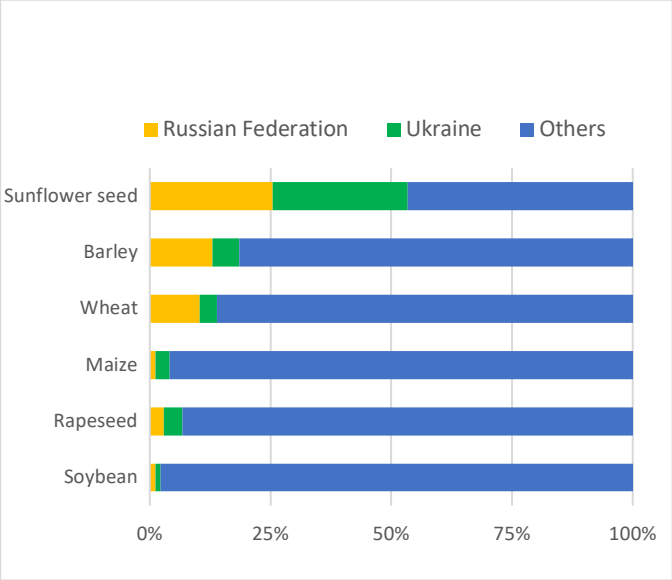
INFORMATION NOTE

1. Market and trade profiles of the Russian Federation and Ukraine and recent price trends[2]

The Russian Federation and Ukraine are among the most important producers of agricultural commodities in the world. In the cereal sector, their contribution to global production is especially significant for barley, wheat and maize. The two countries together on average accounted for 8.8 percent of global output of those crops between 2017/18 and 2021/22, with the Russian Federation accounting for 5.4 percent and Ukraine 3.4 percent.

In the oilseed complex, the contribution of the two countries to global production was particularly important for sunflower seed, accounting for nearly half of world output during this period. Their shares in global rapeseed and soybean production are more limited, with the Russian Federation accounting for 4 percent of the production and Ukraine for 5 percent.

FIGURE 1
Share in global production of selected crops (2017/18-2021/22 Avg.)



Source: FAO, XCBS database

1.1 Market shares

The critical role that the Russian Federation and Ukraine play in global agriculture is evident from an international trade perspective (see figures 2 to 5 and tables 1 and 2). Both are net exporters of agricultural products, and they both play leading roles in supplying global markets with foodstuffs. Exportable supplies for global food markets are often

[2] This update includes information available up to November 2022.

concentrated in a handful of countries, making these markets vulnerable to shocks and volatility. For instance, in the wheat and meslin sector, where the top seven exporters accounted for 89 percent of international trade in 2021, the Russian Federation stands out as the second largest wheat exporter, shipping a total of 32.9 million tonnes of wheat and meslin (in product weight), or the equivalent of 15 percent of global shipments (see figure 6). Ukraine ranked sixth largest wheat exporter in 2021, exporting 20 million tonnes of wheat and meslin, with a 10 percent global market share.

The two countries play similarly prominent roles in global markets of maize, barley and rapeseed, and even more so in the sunflower oil sector, where their combined world export market share is close to 71 percent (figures 7 to 11). The high export concentrations that characterize food commodity markets are also mirrored in the fertilizer sector, where the Russian Federation plays a leading supplier role. In 2021, the Russian Federation was the top exporter of nitrogen (N) fertilizers, the second leading exporter of potassic (K) fertilizers and the third leading exporter of phosphorous (P) fertilizers, as shown in figures 12 to 14.

1.2 Trade profiles

The Russian Federation and Ukraine are key suppliers to many countries that are highly dependent on imported foodstuffs and fertilizers. Several of these countries fall into the Least Developed Country (LDC) group, while many others belong to the group of Low-Income Food-Deficit Countries (LIFDCs). As illustrated in figure 15, for instance, Eritrea sourced the entirety of its wheat imports in 2021 from both the Russian Federation (53 percent) and Ukraine (47 percent).

Figure 15 also illustrates that many countries in North Africa and Western and Central Asia import the majority of their wheat from the Russian Federation and Ukraine. Overall, 40 net importers of wheat are dependent on the two countries for over 30 percent of their wheat import needs.

The very high likelihood of disruptions to Ukraine's grain and oilseed harvests in 2023, combined with disruptions to Ukrainian and Russian shipments and persistently elevated international food prices, would jeopardize food security of many countries around the world, especially those that are economically vulnerable.

The global reliance on Russian N, P and K fertilizers is less pronounced, with some 26 net importing countries depending on them for 20 percent or more of their fertilizer imports. Ukraine does not feature as a major fertilizer exporter, despite some sales to India. Many net importers of fertilizers located in Latin America, Eastern Europe and Central Asia have an import dependency of well over 30 percent on the Russian Federation, for all three ingredients.

High prices of natural gas, the main source of fuel for N fertilizer production, could turn unprofitable energy production methods, such as fracking installations in the United States of America, commercially viable. Energy production, including from renewable sources, could likewise accelerate in other countries, eventually easing international fertilizer prices. However, as energy production requires time, shortages and constrained access to fertilizers could continue into 2023.

Countries that are highly dependent on the Russian Federation and Ukraine for essential food and fertilizer supplies must prepare contingency plans to source from other countries.

FIGURE 2

Agricultural imports of the Russian Federation in 2021

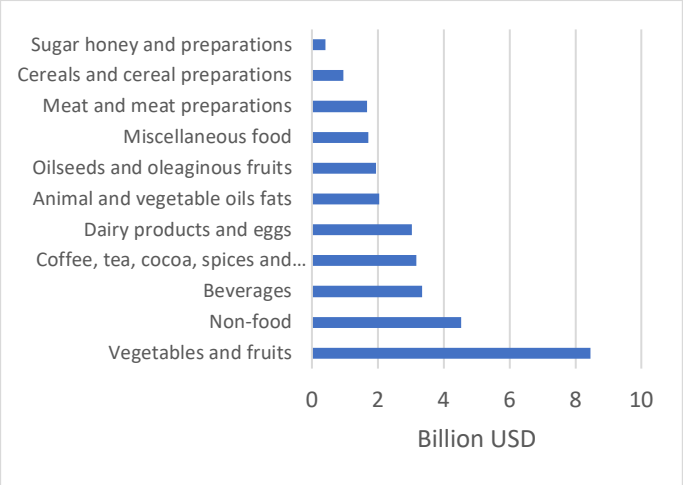


FIGURE 3

Agricultural imports of Ukraine in 2021

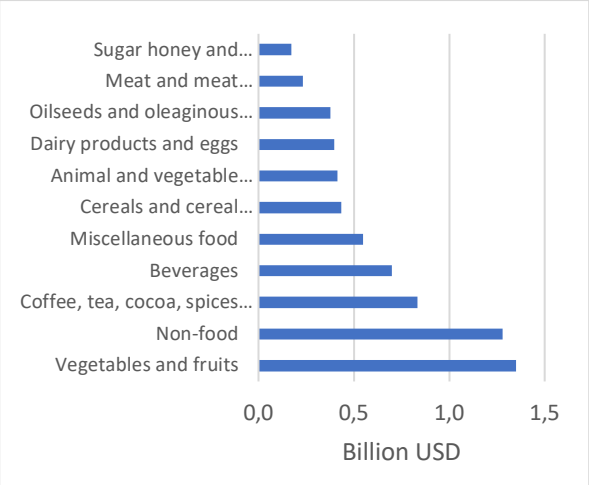


FIGURE 4

Agricultural exports of the Russian Federation in 2021

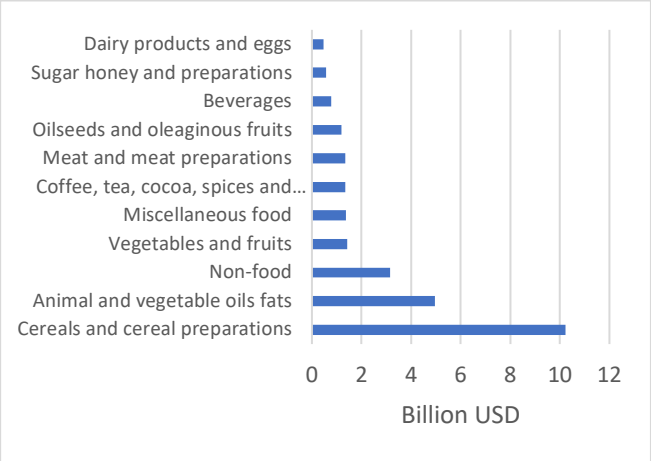
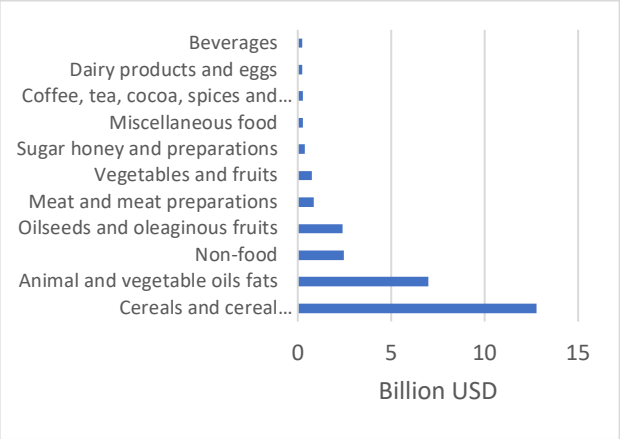


FIGURE 5

Agricultural exports of Ukraine in 2021



Source: Trade Data Monitor (TDM), FAO calculations.

TABLE 1

Russian Federation: exports of selected commodities (thousands of metric tonnes)

Commodity	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Wheat	2020	2 101	1 576	3 361	4 765	605	214	2 337	4 671	5 015	4 643	4 290	4 867	38 445
	2021	3 083	4 537	1 150	802	458	2 228	1 882	5 221	4 581	2 834	3 190	2 951	32 917
Barley	2020	469	239	307	863	135	140	712	593	885	721	394	549	6 007
	2021	223	404	777	368	550	77	505	564	553	292	410	433	5 156
Maize	2020	352	335	548	877	248	87	250	156	88	140	333	389	3 803
	2021	374	451	982	287	551	202	134	68	79	252	351	407	4 138
Soybean	2020	93	108	210	98	76	47	138	122	100	99	123	174	1 388
	2021	674	52	31	12	18	26	27	19	14	35	36	50	994
Rape	2020	49	61	24	28	23	12	29	77	99	138	97	77	714
	2021	14	26	33	30	24	36	19	23	15	14	14	29	277
Sunflower	2020	157	201	342	72	61	10	1	2	33	204	184	106	1 373
	2021	6	3	8	3	2	2	3	1	4	10	16	35	93
Sunflower oil	2020	283	289	455	437	359	276	300	329	107	180	291	357	3 663
	2021	298	297	495	375	176	143	153	374	99	92	318	292	3 112
Rapeseed oil	2020	57	46	50	40	65	32	38	39	82	84	92	63	688
	2021	56	41	53	68	66	53	50	64	83	91	85	92	802

Source: Trade Data Monitor (TDM)

TABLE 2

Ukraine: exports of selected commodities (thousands of metric tonnes)

Commodity	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Wheat	2020	924	681	1 310	1 200	1 191	257	1 239	3 701	3 710	2 156	1 191	495	18 055
	2021	508	709	697	713	858	662	961	3 613	4 363	3 415	2 375	1 174	20 048
Barley	2020	152	141	309	339	152	190	839	1 315	750	491	296	71	5 045
	2021	120	61	131	25	23	64	1 097	1 658	1 016	737	435	244	5 611
Maize	2020	4 543	3 457	3 529	3 091	2 379	1 547	425	179	29	1 842	3 106	3 824	27 951
	2021	1 996	2 476	2 620	2 628	2 245	1 698	962	302	165	895	3 792	4 897	24 676
Soybean	2020	333	176	122	103	53	35	9	1	57	344	301	255	1 789
	2021	109	92	86	104	36	44	31	5	10	172	215	192	1 096
Rape	2020	2	2	2	5	1	4	183	880	546	316	276	164	2 381
	2021	11	3	13	3	1	0	52	772	879	635	234	57	2 660
Sunflower	2020	5	4	4	9	10	2	3	2	8	69	38	34	188
	2021	12	20	2	2	4	1	0	1	3	8	23	4	80
Sunflower oil	2020	581	627	608	717	639	588	593	329	304	525	756	594	6 861
	2021	482	484	381	391	502	325	328	202	277	434	639	690	5 135
Rapeseed oil	2020	0	33	2	0	0	0	5	35	35	19	6	2	137
	2021	0	0	0	0	0	0	4	47	61	35	15	2	164

Source: Trade Data Monitor (TDM)

Figure 6: Wheat

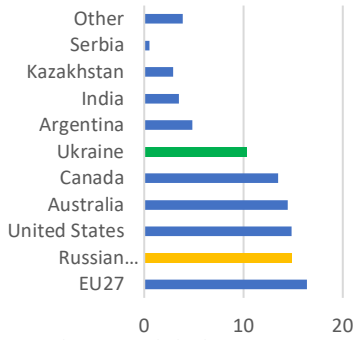


Figure 7: Barley

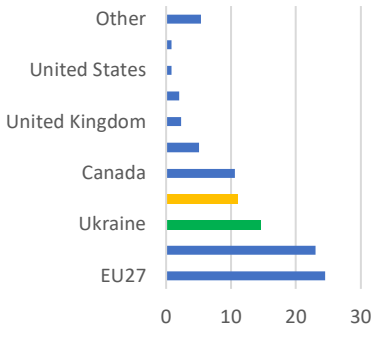


Figure 8: Maize

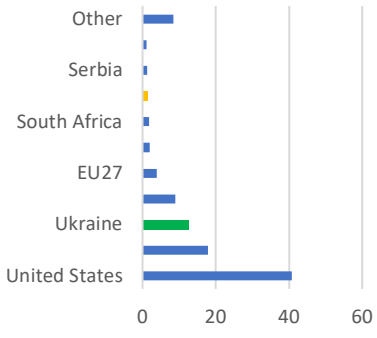


Figure 9: Rape seed

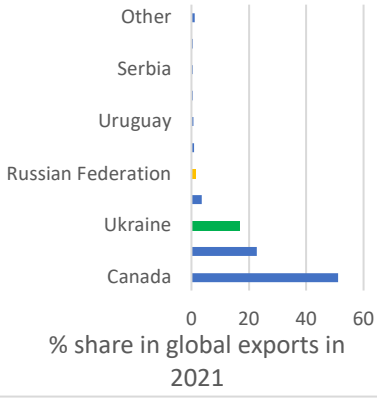


Figure 10: Sunflower seed oil

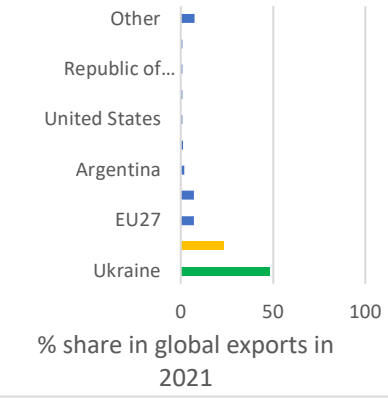


Figure 11: Rape seed oil

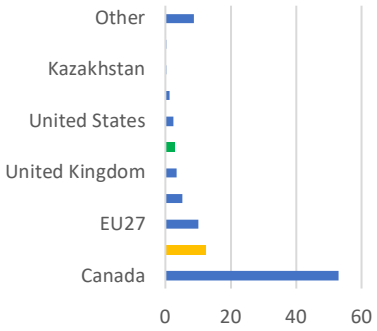


Figure 12: N-Fertilizer

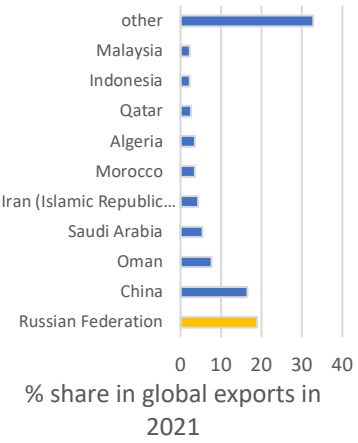


Figure 13: P-Fertilizer

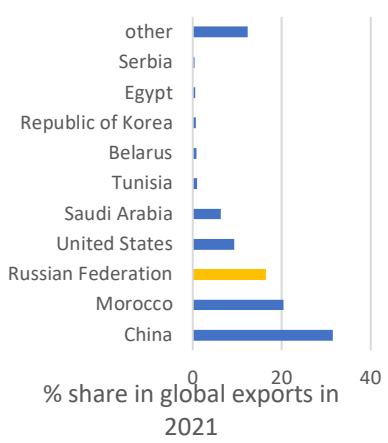


Figure 14: K-Fertilizer

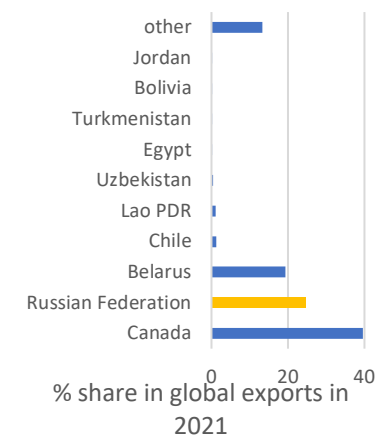


FIGURE 15

Wheat import dependency: share of wheat imports from the Russian Federation and Ukraine in total wheat purchases by net importers in 2021 (%)

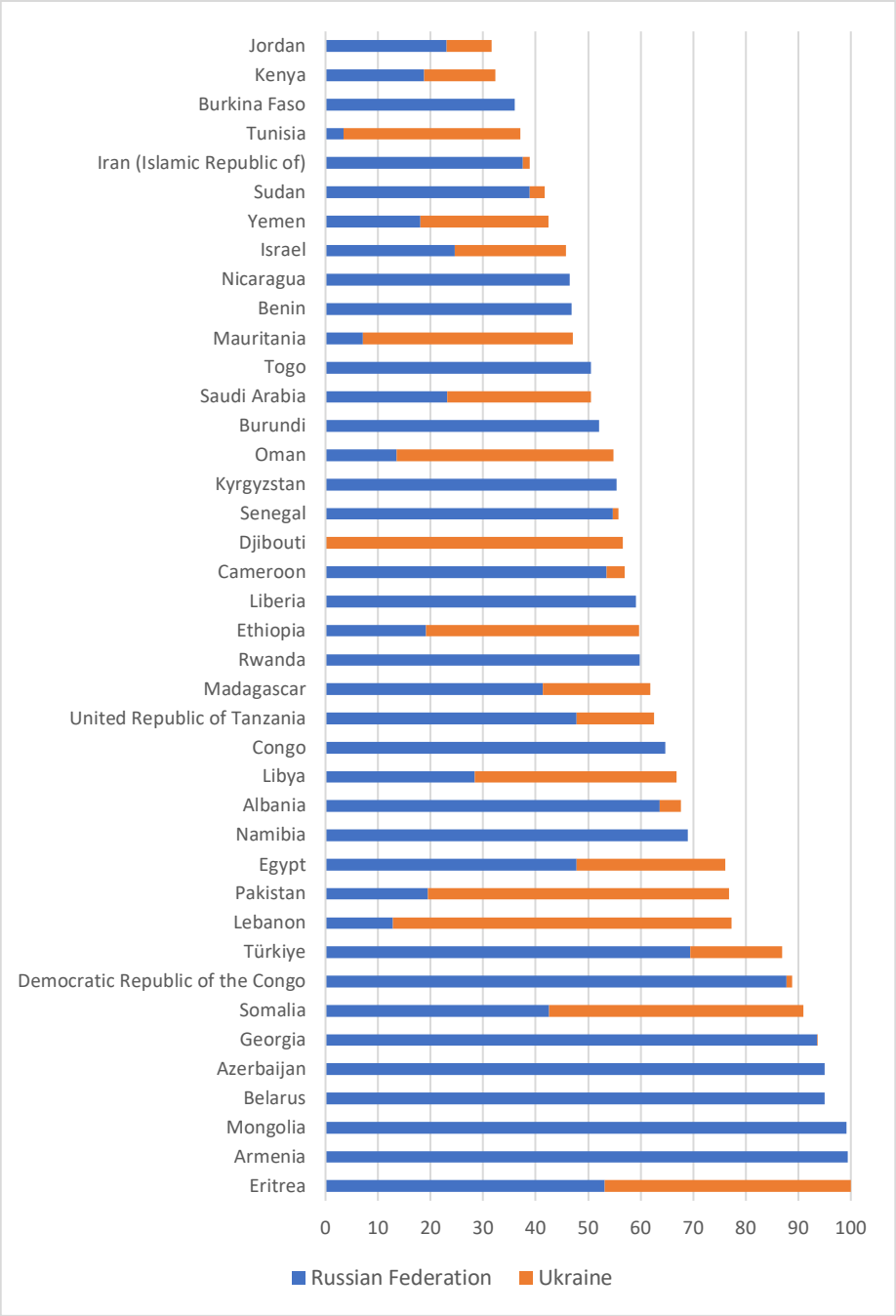
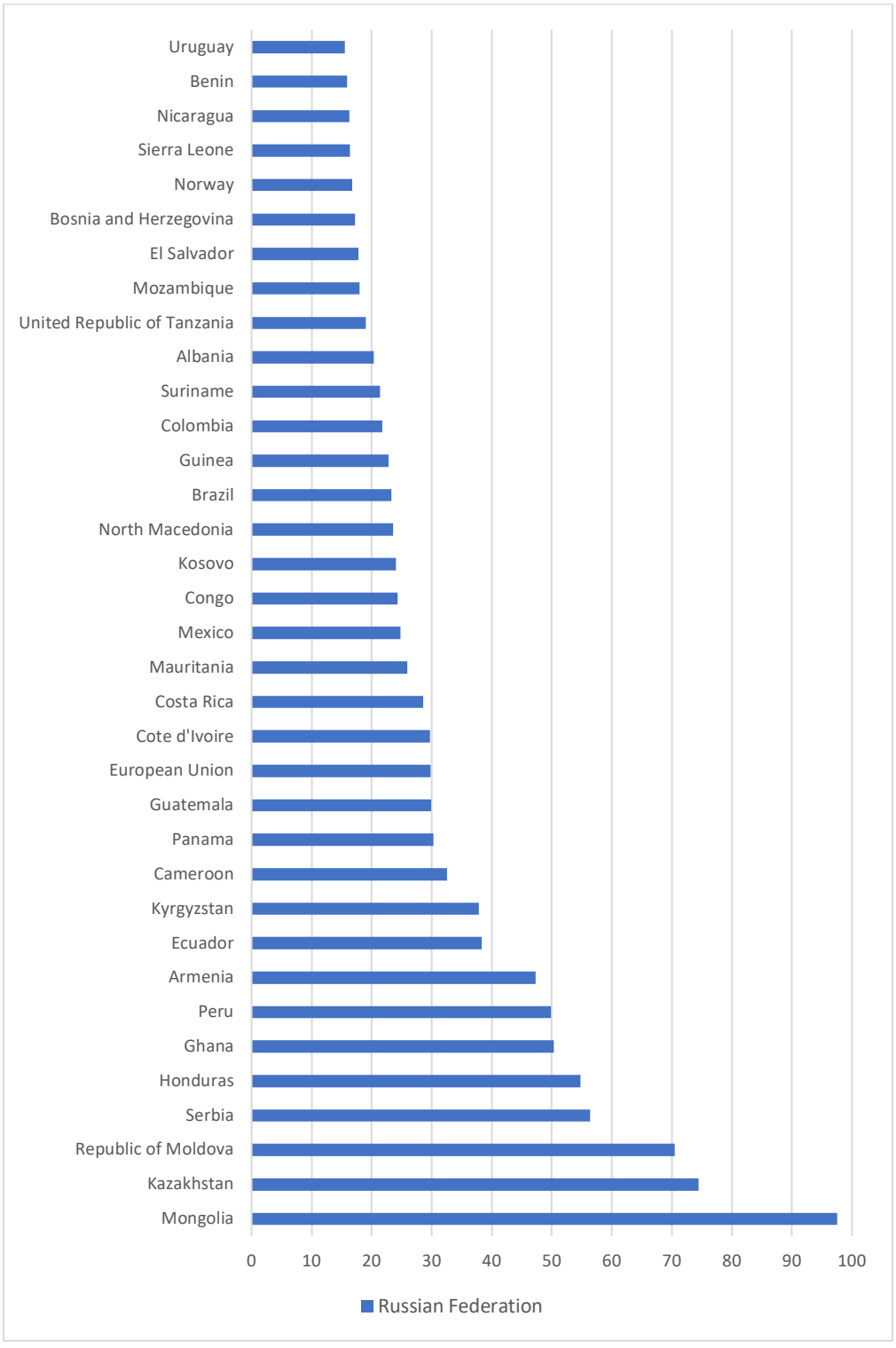


FIGURE 16

Fertilizer Import Dependency: share of fertilizer imports from the Russian Federation in total fertilizer purchases by net importers in 2021 (%)



1.3 Trends in international prices of basic foodstuffs and agricultural inputs

As measured by the FAO Food Price Index (FFPI),[3] international export quotations of basic foodstuffs saw near uninterrupted increases between the second half of 2020 and March 2022, when the FFPI reached an all-time high. Although world prices overall eased by about 15 percent between April and November 2022, price quotations of most of the commodity groups encompassed by the FFPI remain high, with those of cereals among those most elevated.

Over the course of 2021, international prices of wheat and barley rose 31 percent over their corresponding levels in 2020, buoyed by strong global demand and tight exportable availabilities resulting from weather-induced production contractions in various major wheat- and barley-exporting countries. In the rapeseed oil and sunflower seed oil sectors, annual price increases registered in 2021 were 65 and 63 percent, respectively. These increases were spurred by protracted global supply tightness and robust demand, with the latter coming from the biodiesel sector in the case of rapeseed oil.

The upward momentum of grain and vegetable oil prices continued in early 2022. In the case of wheat, prices surged in March 2022, following the war-induced suspension of maritime exports from Ukraine, which took place in a global context already marked by tight exportable availabilities. Export restrictions adopted by various countries tended to exacerbate global supply concerns, causing wheat prices to rise to a fourteen-year peak in May. Prices subsequently eased, mostly reflecting the impact of the Black Sea Grain Initiative, as well as seasonal factors and solid northern hemisphere harvests. In October 2022, world wheat prices were 7 percent above their year-earlier levels, while in November, they were at the same level as a year ago.

FIGURE 17
International grain price indices

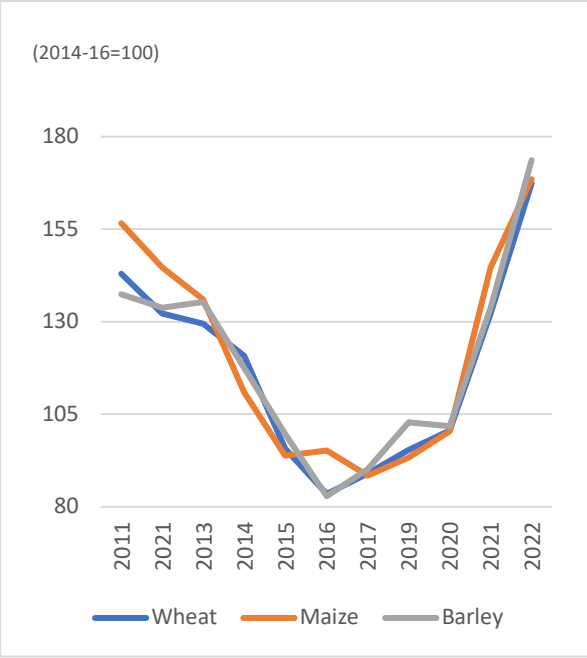
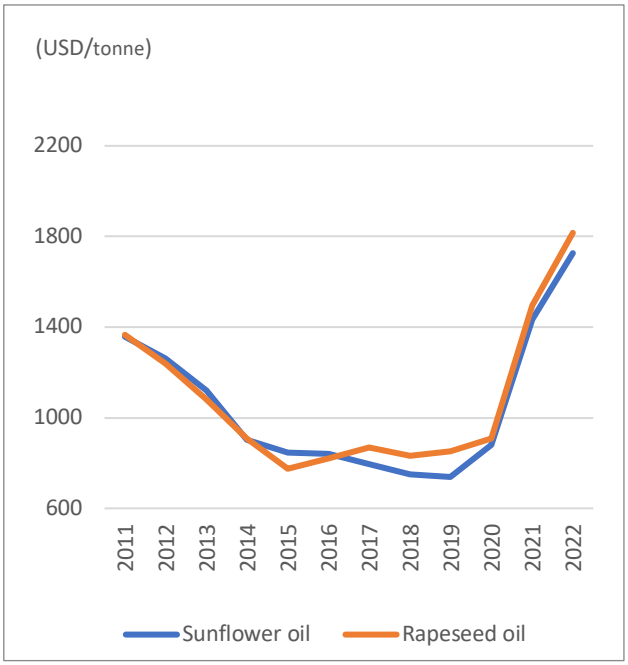


FIGURE 18
International vegetable oil prices



Source: FAO, International Grains Council (IGC) and Oil World. Averages for 2022 computed based on prices available through the month of October.

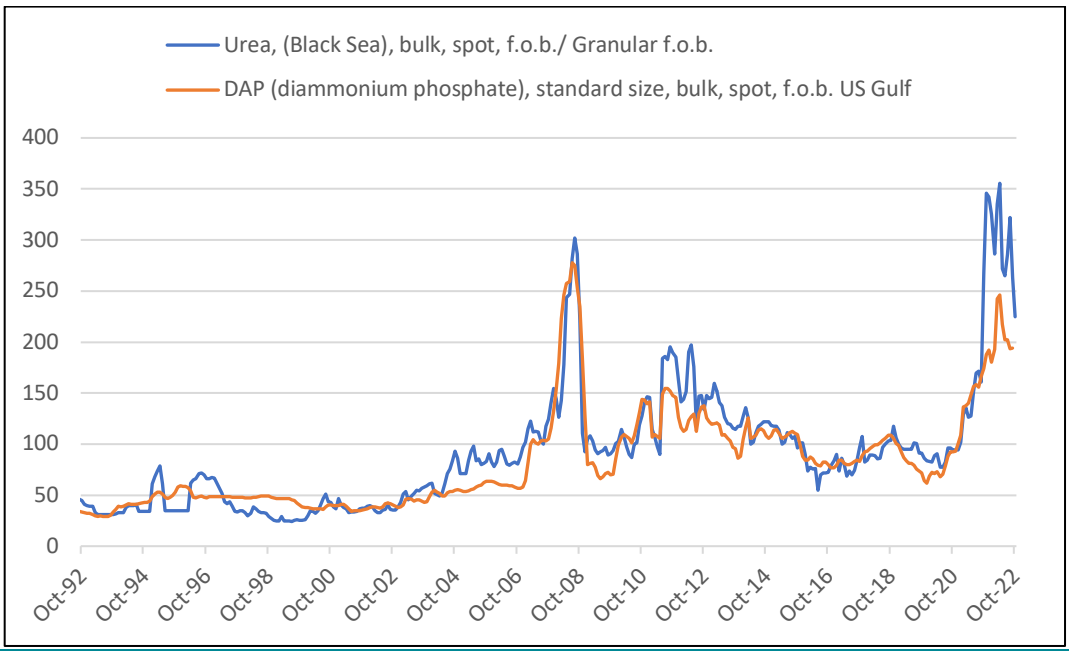
[3] The commodity groups covered by the FFPI are cereals, vegetable oils, meat, dairy products and sugar.

In the case of maize, export prices rose steadily in the first two months of 2022, supported by weather related concerns over crop conditions in Argentina and Brazil, spillover effects from the wheat market, and rising energy and fertilizer costs. Like wheat prices, maize prices rose sharply in March to reach a record high, in response to the significant reduction in maritime maize exports from Ukraine. Even though the arrival of freshly harvested supplies from Argentina and Brazil helped ease quotations between April and July, uncertainty regarding the continuation of Ukrainian exports and tight global maize availabilities have since supported a partial price recovery. In November 2022, maize export prices remained 13 percent above their already elevated November 2021 levels.

Export disruptions in the northern Black Sea region have also affected the sunflower and rapeseed oil markets. Prices for these oils reached record highs in March and declined in the following months largely due to the demand rationing caused by the sharply higher import costs faced by buyers. International prices of palm oil, a potential substitute for these oils, also rose markedly in early 2022, buoyed by reduced export availabilities from Indonesia, which tightened export controls in a bid to contain rising domestic prices. Although the successive removal of these measures in Indonesia and prospects of improved supplies of palm, soy and rapeseed oils in the 2022/23 season have helped to ease the pressure on prices in recent months, in November 2022, world vegetable oil quotations remained well above their levels in recent years, even though they were down 16 percent from their November 2021 levels.

International benchmark prices of fertilizers rose similarly throughout 2021 and in the first months of 2022, with many quotations reaching all-time highs. The most notable increases were registered for nitrogen fertilizer. Prices of urea, a key N fertilizer, peaked in April 2022, when they stood nearly four times above their level in December 2020. Prices of phosphorous fertilizer rose in tandem. While N fertilizer prices have declined somewhat since May, influenced by reductions in natural gas prices, in October, prices of N fertilizers still hovered around levels that were two and a half times their longer-term average. Potash (K-fertilizer) prices also registered considerable gains between February and March 2022, when they steadied at multi-year highs maintained since then. Like other commodity prices, these fertilizer price dynamics were determined by the interplay of supply and demand. On the demand side, the higher output (crop) prices registered in 2021 boosted affordability of fertilizers, thereby pushing fertilizer prices upwards. On the supply side, energy prices were high and volatile, especially for natural gas, which is crucial for producing N fertilizer in many countries. Several other factors contributed to the sharp rise in N fertilizer prices, including weather-induced disruptions to renewable energy. Additional upward pressure on fertilizer prices stemmed from supply disruptions and high transportation costs following the imposition of export restrictions. Sharp increases in bulk and container freight rates caused by the COVID-19 pandemic also contributed to the fertilizer price surge.

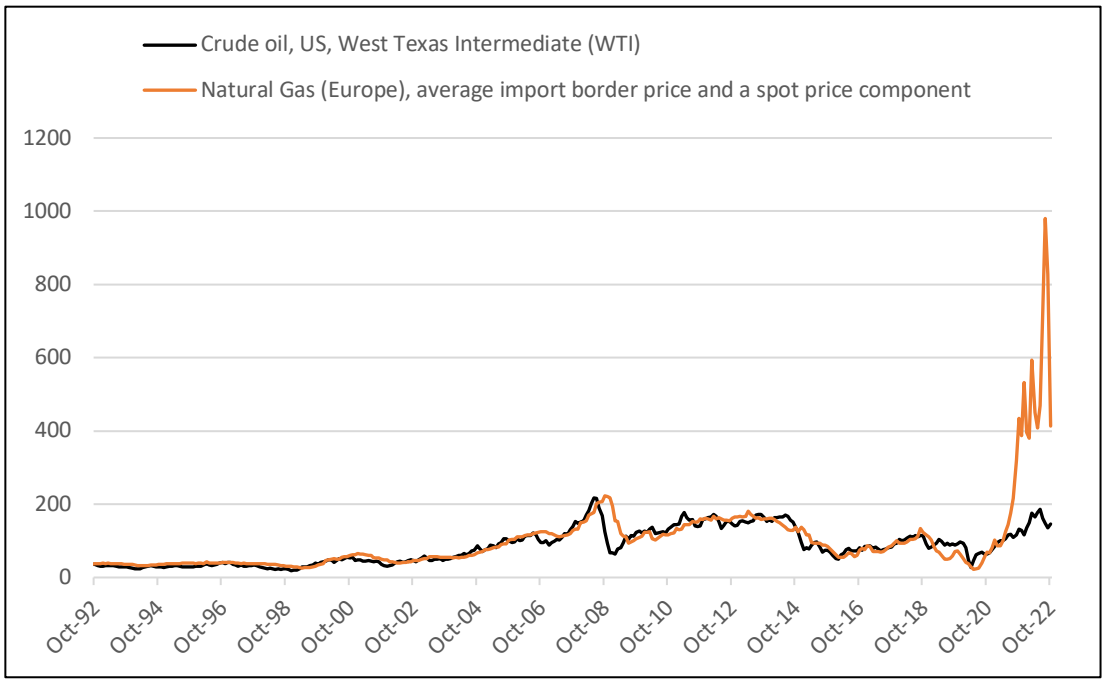
FIGURE 19
International urea prices (2014-2016 = 100)



Source: Index Mundi

FIGURE 20

Natural gas price vs crude oil price, 2014–16 = 100



Source: Index Mundi

1.4 The world food import bill in 2022

High international prices of basic foodstuffs, as relayed by the FAO Food Price Index, are imposing a heavy burden on importing countries, especially on low income economies which are worryingly importing lower volumes of food.

The world food import bill is forecast to reach another all-time high in 2022, surpassing USD 1.9 trillion. While this represents an increase of 10 percent, or USD 180 billion, over last year's record level, the expansion is foreseen to slow significantly compared to the 18-percent annual increase registered in 2021. This slowdown reflects higher world food prices and depreciating currencies against the United States dollar, which are expected to weigh on the purchasing power of importers and subsequently on the quantity of imported foods.

Overall, in 2022, high-income countries (HICs) and upper-middle-income countries (UMICs) are expected to account for 85 percent of world expenditures on imported food and over 80 percent of the growth in these expenditures. The bulk of the increase in the food import bill is expected to be cost-driven, reflecting record international food prices that come on the back of surging input prices as well as disrupted food supply chains. Imports by least developed countries (LDCs) are expected to become increasingly responsive to higher prices; their volumes are forecast to come to a standstill in 2022.

Higher import bills do not translate into higher inflows for vulnerable countries. Decomposing food import bills to ascertain the extent to which changes in prices and volumes drive changes in expenditures at the global level, the anticipated increase in the 2022 import bill is almost entirely on account of higher prices, with USD 157 billion due to higher international prices and merely USD 27 billion reflect higher volumes[4]. The upshot is that higher import bills mainly reflect higher unit costs rather than higher volumes, with many regions or country groups set to face higher bills in return

[4] There is a negative "mixed effect" of USD 4 billion in the decomposition of the overall change in the global food import bill (FIB). This explains the difference between the overall increase in the global FIB of USD 180 billion and the sum of the price and quantity effect of USD 157 billion plus USD 27 billion.

for lower or the same volumes. Worryingly, this development is much more pronounced for some economically vulnerable country groups. Sub-Saharan Africa, for instance, is expected to spend USD 4.8 billion more on food imports but to see a decline in volumes worth USD 0.7 billion. Similarly, least developed countries are expected to see an expansion in their food import bill by USD 4.9 billion fully on account of higher prices. As for net food-importing developing countries (NFIDCs), they are forecast to face USD 21.7 billion in extra costs for merely USD 4 billion of extra imported food volumes. The aggregate food import bill for low-income countries (LICs) is expected to remain unchanged in value terms but could shrink by as much as 10 percent in volume terms, highlighting growing accessibility issues for such countries. These are alarming signs from a food security perspective, indicating importers are finding it increasingly difficult to finance rising international costs, potentially heralding an end of their resilience to higher international prices.

High-income regions account for most of the growth in the world import bill for all foodstuffs, while low-income countries focus on imports of staple food items. From a food group perspective, existing differences across importing regions are likely to become more pronounced in 2022. While high-income countries continue purchasing across the entire spectrum of food products, the expenditures of developing regions will be increasingly concentrated on importing staple foods. Unsurprisingly, the share of imported staple foods in the total FIB rises with lower income levels; staple foods account for 19, 37, 43 and 46 percent of the total FIBs for HICs, UMICs, lower-middle-income countries (LMICs) and LICs, respectively.

1.5 Global expenditures on imported inputs in 2022

Similar to the food import bills, the bills for imported agricultural inputs have surged, adding to the pressure exerted by the rising food import bills and, together with the stronger United States dollar, are further aggravating existing balance-of-payments problems of many lower-income countries.

The agricultural input import bill (IIB) includes four major rubrics of inputs, namely, fertilizer, seeds, pesticides and energy, used in agriculture.[5] The global IIB is forecast to reach a total of USD 424 billion in 2022, representing a leap of 48 percent or USD 138 billion over the total reached in 2021. Relative to 2020, the 2022 IIB is projected to rise by as much as 112 percent, albeit from a depressed level of USD 200 billion, owing to lower overall imports during the near ubiquitous trade contractions caused by the COVID-19 pandemic. Higher bills for imported agricultural inputs add to rising food import bills for many low-income countries and, together with a rising exchange rate of the United States dollar, further aggravate existing balance-of-payments problems.

Higher costs for imported energy and fertilizer are the main drivers behind the soaring global IIB in 2022. These two inputs accounted for well over 75 percent of the overall world bill in the past and are likely to reach a new record of 86 percent in 2022. Fertilizer and energy are particularly important items in the import bills of LICs and LMIC, accounting for 92 and 91 percent of total imported inputs, respectively.[6] Saddled with higher costs of fertilizer and energy imports, these countries may be forced to cut down on the use of imported inputs, and, where domestic substitutes are not available, will eventually reduce input applications overall. Reduced use of inputs would almost inevitably result in lower agricultural productivity, potentially resulting in lower domestic food availability.

Higher import bills do not translate into higher product inflows. The decomposition of changes in the IIB between 2022 and 2021 shows that price effects dominate volume effects at the global level, meaning that countries around the world are encumbered with higher costs for imported inputs without necessarily receiving higher quantities – they pay more for imported inputs in 2022 while receiving lower volumes than in 2021. While this is a near ubiquitous development, the price effect is less pronounced for LICs, where higher prices account for "only" 67 percent of the respective overall increase in their IIB. This could signal the beginning of a more general slowdown in the demand for imported agricultural inputs.

Pesticides are an exception, especially in sub-Saharan Africa (SSA), where volume effects invariably outweigh price effects, indicating that countries are getting more of the input at the same price. For sub-Saharan Africa, a plausible explanation

[5] Feeds are excluded from the bill for methodological reasons. Available import statistics do not distinguish between different forms of utilization for commodities that can be used as food, feed or otherwise, e.g. as feedstocks for biofuels.
[6] For high and upper-middle-income countries, almost 55 percent of the increased IIB stems from higher fertilizer imports. This compares to 26 and 10 percent for lower-middle and low-income countries, where the increased IIB is dominated by energy imports.

for the buck in trend is the upsurge of desert locusts, resulting in international purchases of subsidized pesticides. No discernible global trend emerges for seeds, which constitute a minor cost in the import schedule of many countries.

2. Risk analysis: Assessing the risks emanating from the war in Ukraine

2.1 Trade risks

The war has injected added uncertainty to global food and fertiliser markets, exposing them to heightened risks of tighter availabilities from disruptions to exports from the Russian Federation and Ukraine, unmet import demand and higher international prices.

The onset of the war significantly undermined Ukrainian exports, including of grain and oilseeds, as seaborne shipments were constrained by a lack of access to Black Sea ports between late February and late July 2022. Alternative modes of transportation, such as rail, river or road transport, although active, did not compensate for the decline in maritime shipments. The Black Sea Grain Initiative, agreed in late July 2022 and subsequently renewed in November 2022, has helped ease these constraints, allowing grain exports to resume from three Ukrainian Black Sea ports. Efforts are also underway to boost export capacity through non-marine channels. Still, concerns exist that war-induced damages to domestic infrastructure, energy shortages and reduced crop production could keep Ukraine's grains exports below potential. Going forward, the duration of the Initiative, the speed of vessel inspections, the safety of transport and the country's ability to compensate for production cuts by drawing from its stockpiles will also play important roles in shaping Ukrainian shipments. Assuming exports from the Black Sea ports continue, FAO forecasts Ukrainian wheat exports to fall to 14 million tonnes in 2022/23 (July/June), 26 percent (5 million tonnes) below the already constrained 2021/22 levels and 23 percent below their five-year average. Ukrainian maize exports are forecast to decrease to 23 million tonnes, 2 percent (0.6 million tonnes) below their reduced 2021/22 level and 8 percent below average levels.

Global wheat trade in 2022/23 (July/June) is forecast to fall 0.8 percent below the 2021/22 record high to 194.0 million tonnes. In addition to reduced exports from Ukraine, shipments from Argentina may decline due to supply tightness, while export restrictions may also lower shipments from India relative to 2021/22 levels. Countering these declines, greater exports are anticipated from the Russian Federation and Canada thanks to good harvests, as well as from the European Union. On the import side, the anticipated slight decline in global wheat demand stems mostly from smaller purchases by China, the Islamic Republic of Iran and Kazakhstan, on account of bigger national harvests. Most countries that typically import from Ukraine are expected to continue to import from Ukraine this season as well as from other origins, especially from the Russian Federation and the European Union. For instance, purchases by Egypt, the largest global wheat importer, are expected to increase in 2022/23, with most imports expected to be sourced from the Russian Federation, the European Union, and Ukraine. Among other top wheat importers which also typically purchase from Ukraine, imports by Bangladesh and Tunisia are also forecast to rise in 2022/23.

Global maize trade in 2022/23 (July/June) is forecast to remain near the 2021/22 level at 182.3 million tonnes. A significant increase in shipments from Brazil, owing to a record harvest, is forecast to compensate for a slight reduction in Ukrainian shipments and large export declines from Argentina and the United States of America. On the import side, purchases by the European Union, one of Ukraine's primary maize export destinations, are forecast to increase by more than 30 percent year-on-year to compensate for a significantly reduced harvest, and are largely expected to be sourced from Ukraine. On the other hand, imports by China, another primary destination of Ukrainian maize exports, are forecast to decline, while still remaining above their historical average.

As regards to sunflower seed oil, following a marked decline in exports during the 2021/22 (October/September) marketing season, Ukraine's shipments are forecast to rebound to 4.9 million tonnes in 2022/23, but to remain below their pre-war average level of 5.8 million tonnes. Ukrainian, shipments of sunflower seed oil declined significantly between March and July due to halted exports from the Black Sea port facilities. Although the Black Sea Grain Initiative has partially resolved these, limited export capacity through neighboring countries via truck, rail or barge, coupled with subdued crushing operations due to disruptions to electricity supplies and high energy prices, are expected to keep shipping volumes below potential, and possibly shift the exports from oil to seeds. Noticeably, while sunflower oil exports declined markedly in 2021/22, shipments of sunflower seed from Ukraine increased sharply, from under 200 000 tonnes

per year to 1.8 million tonnes, as importing countries sought to compensate for lower sunflower oil purchases by crushing sunflower seed themselves. This trend is expected to continue in 2022/23, but amid an anticipated partial recovery of sunflower oil exports, Ukraine's sunflower seed shipments are seen declining to 800 000 tonnes. In the Russian Federation, sunflower seed oil exports are also forecast to rebound from a subdued performance registered in 2021/22 amid high export tariffs and the introduction of export quotas, which were in force from mid-April until the end of August. Shipments in 2022/23 are seen 27 percent above their 2021/22 levels at 4.4 million tonnes, on the back of improved supplies facilitated by a bumper sunflower seed harvest.

Given the significant export shares of Ukraine and the Russian Federation in the global sunflower seed oil market, any disruption to their shipments would have notable implications for major sunflower seed oil importers, namely India, the European Union, China, Türkiye and the Islamic Republic of Iran. While purchases by the European Union and Türkiye rose in 2021/22 thanks to their geographical proximity to Ukraine, vegetable oil imports by India, China and the Islamic Republic of Iran dropped markedly, as their ability to compensate for cuts to their sunflower seed oil imports through greater purchases of substitutes, such as palm and soy oils, was constrained by soaring international edible oil prices in early 2022 and tight export availabilities. In 2022/23, global imports of vegetable oils are forecast to rebound, as the overall tightness gripping the oilcrops complex may ease somewhat due to prospects of improving sunflower oil shipments from the Black Sea region and higher production of palm, soy and rapeseed oils. Yet, these forecasts remain tentative and are subject to numerous uncertainties, including the continuation of the Black Sea Grain Initiative and the materialization of ample soybean and rapeseed harvests.

As for rapeseed and rapeseed-derived products, Ukraine stands out as the world's third largest rapeseed exporter. However, its share in global rapeseed trade is more limited, suggesting that there could be room for alternative suppliers, like Canada and Australia, to compensate for potential reductions in Ukrainian rapeseed exports. In addition, as rapeseed was preferred by exporters over other crops due to relatively low transportation costs, Ukraine's rapeseed shipments have remained largely unaffected since the beginning of the 2022/23 season (July/June). The Russian Federation accounts for about 10 percent of world trade outflows in the global rapeseed oil market. Data from industry sources[7] suggest that Russian sales of rapeseed oil in 2022 have been broadly in line with past years' levels.

2.2 Logistical risks

In Ukraine, active fighting across vast areas of the country has damaged parts of processing, storage and transport infrastructure both inland and in ports. Ongoing targeting of energy networks and other crucial infrastructure makes additional damages likely, with consequences for daily life but also the movement of goods, both internal and for export. The impact of the war on transportation infrastructure remains a significant source of concern. This includes inland infrastructure (mostly railways) carrying goods for export to seaports along the Black Sea, such as Novorossiysk, Taman and Tuapse, which serviced shipments by the Russian Federation (although no damages have been reported to far) and to Odesa and Mykolaiv ports, Ukraine's main ports for bulk agricultural commodities.

2.2.1 Non-marine exports channels

An immediate effect of the war in February 2022 was the suspension of exports from Ukrainian Black Sea ports, which compelled Ukraine to turn to alternative export channels, including road, river barges and, especially, rail. Yet, the declining importance of railroad shipments for exports of agricultural products in the country entailed that only about 300 000 tonnes of agricultural commodity were transported trans-border through rail per month prior to the onset of the conflict.[8] In addition, in the early stages of the war, the use of locomotives and rail infrastructure was prioritised to evacuate people from the areas that were most affected by fighting, with rail shipments also constrained by a lack of rail carriages in neighboring countries.

Internal civilian road and rail infrastructure remained operational and largely unaffected by the war, despite localized infrastructure damages and loss of life, making it a crucial component of moving goods and humanitarian aid. However, deliveries to and from Baltic ports via Ukraine's western borders with Poland (the most direct rail export route to marine access) and less frequented rail routes via landlocked Slovakia and Hungary, require that railcars' chassis be changed at

[7] Black Sea Vegoil market report, 21 November 2022 - UkrAgroConsult
[8] https://www.csis.org/events/agriculture-and-food-security-casualties-war-ukraine

the border due to the use of conflicting gauges between the countries of the former Soviet Union and the rest of Europe. Alternatively, cargo (bulk or containerized) has to be transloaded to different train cars. Road transportation of cargo also suffered from bottlenecks, particularly long waiting times at the border. During the spring of 2022, waiting times for trains and lorries often exceeded twenty days on some crossings. These constraints limited Ukraine's export capacity through these alternative routes to 500 000 tonnes of agricultural produce per month throughout early 2022. Interrupted access to Danube ports, in particular Reni and Ismail, allowed some quantities to be moved by river barges, but also resulted in significant bottlenecks in the Sulina channel, prompting the introduction of quotas on the number of barges allowed in those ports.

Faced with such roadblocks, various initiatives were launched to expedite and increase the capacity of Ukraine's non-marine trade. For instance, the European Union's "Solidarity Lanes", were introduced in May 2022 to ensure Ukraine can export grain, but also import the goods it needs, from humanitarian aid to animal feed and fertilizers.[9] Initiatives under the Solidarity lanes include adding freight rolling stock, vessels, and lorries, increasing capacity of export networks and transshipment terminals, introducing certain flexibility into customs operations and other inspections, including sufficient staffing, and securing more temporary storage capacity for Ukrainian goods in the European Union. Similarly, benefiting from the same railroad gauge used by Ukraine and Moldova, in August 2022, a rail link between the two countries was reestablished after a 23-year hiatus[10]. The volume of exports via Danube ports, in January 2022 limited to about 55 000 tonnes per month, gradually increased to 1.5 million tonnes in August 2022. It is assumed that river ports could handle a similar capacity in the future. While these commendable initiatives have helped Ukraine's volumes of non-marine shipments to increase, they will require time to fully realize their potential.

2.2.2 Maritime transport

Prior to the onset of the war, seaborne shipments accounted for at least 90 percent of Ukraine's commodity exports. Since other means of transport were unable to fully compensate, Ukraine's loss of access to Black Sea ports between late February and late July 2022 significantly constrained its ability to ship food abroad. During this period, several vessels were reported to have been hit by shelling in the northern Black Sea region. Those civil maritime vessels (including those used for food shipments) that could still transit through the Turkish Straits (Dardanelles and the Bosporus) were also faced with increasing insurance premia or a lack of war coverage in insurance contracts for vessels sailing into the greater Black Sea region. This exacerbated the already elevated costs of marine transportation, compounding further on the final costs of internationally sourced food paid by importers.

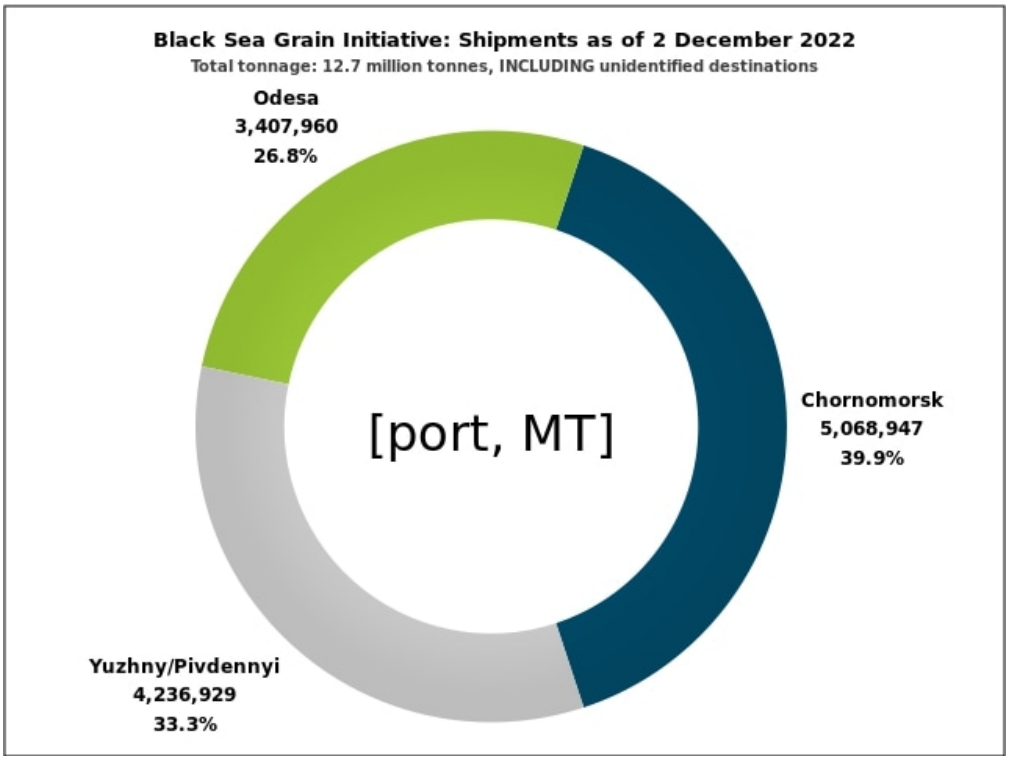
The Turkish Straits are a critical international grain trade juncture, with one fifth of world wheat exports and one sixth of global maize shipments, much of which originate from the Russian Federation, Ukraine and Kazakhstan, passing through them.[11] The impact of any shipping disruption in this area is most directly felt by importers in the Near East and North Africa region. The reliance of countries in these regions on grains originating from the Russian Federation and Ukraine is also associated with lower shipping costs facilitated by these countries' physical proximity to the Black Sea basin.

The Black Sea Grain Initiative,[12] launched by the United Nations, Türkiye, the Russian Federation and Ukraine on 22 July 2022, enabled the resumption of exports of grains, other foodstuffs and fertilizers, including ammonia, through a safe maritime humanitarian corridor from three key Ukrainian ports, Chornomorsk, Odesa and Yuzhny/Pivdennyi. Up to 2 December 2022, 12.7 million tonnes of various commodities, mostly grains and oilseeds were exported under the Initiative (see Figure 21 for the distribution of these shipments by seaport). Originally, agreed to take effect for 120 days, the Initiative was renewed in November for an additional 120 days, or until March 2023. As such, it should facilitate Ukrainian exports of surplus wheat and maize crops from the 2022 harvests. The Initiative is important for improving

[9] https://transport.ec.europa.eu/news/european-commission-establish-solidarity-lanes-help-ukraine-export-agricultural-goods-2022-05-12_en
[10] https://www.reuters.com/world/europe/ukraine-restores-moldova-rail-link-could-carry-10-mln-tonnes-year-2022-08-22/ The connection could carry 10 million tonnes of freight a year.
[11] https://www.chathamhouse.org/sites/default/files/publications/research/2017-06-27-chokepoints-vulnerabilities-global-food-trade-bailey-wellesley-final.pdf
[12] https://www.un.org/en/black-sea-grain-initiative

global food availability and lessening the pressure on world prices. Going forward, the duration of the Initiative, the speed of vessel inspections, the safety of transport and the functioning of ancillary inland infrastructure will all play critical roles in ensuring that food and agricultural products reach the world markets.

FIGURE 21



2.2.3 Other key agricultural infrastructure and operations

In Ukraine, many international companies in the grain and oilseed export sectors reduced their operations following the start of the war to protect the safety of their employees. Even though the security situation across much of the country improved as active fighting eased, export volumes still remain constrained by the high cost of inland transportation and active security risks. This has prevented Ukraine's agricultural sector from fully restoring its export operations.

For as long as fighting persists, additional damages to crucial infrastructure cannot be excluded. This could put in peril the country's ability to complete maize harvests and export its produce. Damages to energy infrastructure and preferential use of existing energy supplies to satisfy the heating needs of the population during the winter months are also likely to limit available energy for post-harvesting operations (such as grain drying) and processing, including oilseed crushing. This could alter export patterns going forward, shifting the balance towards less energy intensive (and less value added) products. Energy blackouts could also impact the functioning of ports authorized to operate under the Black Sea Grain Initiative. Rapidly rising fuel prices further add to the cost of inland transportation.

Before the outbreak of the war, 1 378 grain elevators operated across Ukraine, with a total capacity of over 57 million tonnes.[13] This was sufficient to store more than 80 percent of total cereal production. Total storage capacity in the country was estimated at 75 million tonnes, of which 14 percent had been damaged or destroyed as of August 2022, while 10 percent is located in the areas outside the government control.[14] In order to ease storage constraints, the FAO Grain Storage Support Strategy, implemented with the financial support of the governments of Canada and Japan, and

[13] https://elevatorist.com/karta-elevatorov-ukrainy
[14] https://www.fao.org/newsroom/detail/ukraine-fao-canada-join-forces-to-address-grain-storage-deficit/en

Australian Minderoo Foundation, in cooperation with the Ministry of Agriculture, is in the process of distributing 30 000 polyethylene grain sleeves (so called silo bags), enough to temporarily store 6 million tonnes of grain on farms.

Although grain elevators and oilseeds crushing facilities are spread across the country, their concentration and carrying capacity are closer to important transportation points and ports, thus increasing their risk of being damaged in war. Smaller regional processing facilities, which do not usually operate for the whole season due to lack of raw materials, are needed for crushing oilseeds.[15] If modern oil crushing facilities are damaged, the excess capacity of smaller regional processing facilities could balance losses. However, many of the smaller facilities lack the technology to switch between oilseeds varieties.

In the Russian Federation, a number of multinational agribusiness companies have withdrawn from their export-oriented operations. However, some remain active in the domestic market, such as in feed production or oil crushing. In both countries, delaying exports requires greater reliance on storage facilities, especially silos. Under favourable conditions, grains can be stored for multiple seasons, but the duration that raw oilseeds can be stored is usually shorter. Moreover, to achieve the highest possible oil yields, oilseeds must be crushed shortly after harvest.

2.3 Production risks

2.3.1 Assessing crop production risks in Ukraine

The retreat of fighting to the eastern part of Ukraine in early April 2022 allowed economic activities elsewhere to resume. However, concerns persist about population displacements, damages to civil infrastructure and restricted movement of people and goods, all of which could prevent farmers from attending to their fields, harvesting and marketing their crops. This is further exacerbated by disruptions to essential public services such as the provision of water, energy, transport, markets, and banking.[16] Since autumn, heavy targeted shelling has decimated Ukraine's energy infrastructure, in particular significant power stations, resulting in power cuts across the country. Skyrocketing energy prices increase the cost of industrial and agricultural activities, including irrigation, harvesting, post-harvest operations, food processing and distribution. Ultimately, the cost of production and the capacity of farmers to secure inputs will determine the types of crops planted. Given current constraints, it is likely that Ukrainian farmers will move towards increased plantings of crops with lower production costs such as soybeans, or higher profit crops such as sunflower seed.

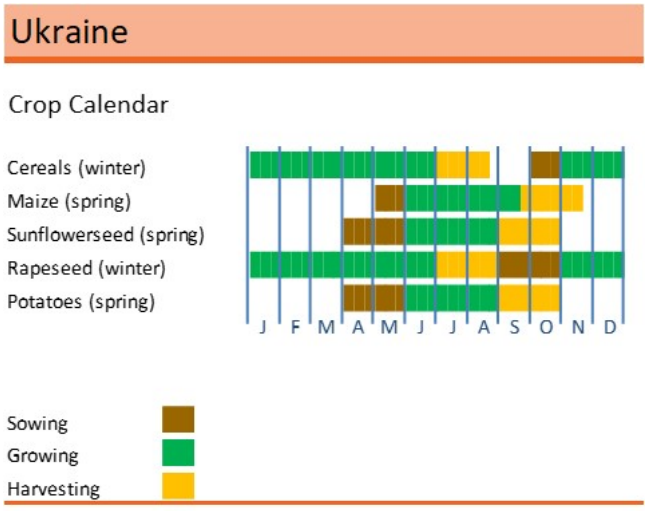
Drawing from a household level analysis, FAO's October 2022 report on the "Impact of war on the agriculture and livelihoods of the rural population in Ukraine", indicated that at the national level, the major difficulties experienced by the rural households involved in the production and sale of crops include access to fuel or electricity to power equipment (reported by 24 percent of the respondents), access to fertilizers or pesticides (23 percent), low output prices from sales (20 percent), and access to seeds (18 percent). For oblasts along the front-line, the major difficulty faced during the upcoming crop season (2022/23) was expected to be access to seeds (22 percent). In western and central regions, about one third of the respondents reported difficulty in accessing fertilizers/pesticides and energy (fuel and electricity) to power equipment as the main obstacle. Consequently, the impact analysis showed that one fourth of the rural households interviewed nationally had either stopped or reduced agricultural production due to the war. Increases in production costs for both crops and livestock activities due to war were widely felt across the country, negatively affecting income levels of rural households. To mitigate the effects of the conflict on their agricultural production, rural households incurred additional expenditures for the maintenance of their productivity. These additional unforeseen costs have amounted to USD 234.8 million in the crop sector and USD 48.5 million in the livestock sector.

While the current situation may persist and even become aggravated, the coping capacity of rural households is likely to remain strained. The upcoming winter season may compound it, with a large segment of the population potentially further displaced toward the rural areas as energy shortages affect mostly urban centres.

[15] https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Oilseeds%20and%20Products%20Annual_Kyiv_Ukraine_04-15-2021)

[16] https://www.care-international.org/news/press-releases/care-statement-conflict-escalation-in-ukraine

2.3.2 Short-term production prospects



Source: FAO/GIEWS.

As of end of November, the 2022 harvest of spring crops (mostly maize) was approaching its final stages in the Russian Federation and Ukraine, while sowing of the 2023 winter cereals (mainly wheat), to be harvested from July 2023, was virtually complete. In the Russian Federation, abundant rains in September and October 2022 in the key-producing Volga and Central federal districts impeded planting operations. However, since improved weather conditions in November allowed some late sowings, the area sown to winter cereals is estimated at near-average levels. In Ukraine, the area sown to 2023 winter cereal crops is forecast to incur a 40 percent reduction compared to the average.

The 2022 winter wheat crop was planted before the onset of the war. However, active fighting and the economic impacts of the war successively impaired the crop through constrained access to fields, lack of labour, high cost of production and depressed farm gate prices. Remnants of the war such as mines in many cases hampered the application of fertilisers and harvesting activities, and large swathes of cropped areas, particularly in the eastern part of the country, were reported to be unharvested. As a result, the 2022 wheat harvest is estimated at almost 20 million tonnes, a decline of almost 38 percent from the bumper 2021 crop, and about 25 percent below average.

As for spring sown cereals (principally maize), a significant area was planted to maize following the retreat of the hostilities and active fighting from main maize producing areas in central Ukraine (with the exception of Kharkiv) towards the east. However, farmers returning to their fields were often faced with the urgent need to remove unexploded ordnance before they could prepare land for spring crops. While generally favourable weather prevailed during the crop season, wet autumn conditions challenged maize harvesting activities. They also increased energy requirements needed to reduce the moisture level before the maize grain can be stored. As of 24 November, 2.2 million hectares of maize for grain, corresponding to 53 percent of the planted area were harvested, yielding 13.5 million tonnes.[17] Although the maize harvest could in theory continue until January, high energy costs and damages to energy infrastructure render it prohibitively expensive for farmers to harvest the entire crop. Depressed farm level prices and increased inland transportation costs are compounding these constraints. FAO forecasts the 2022 cereal harvest (comprising winter and spring/summer crops) to total 51 million tonnes, about two thirds of the average and 40 percent below the exceptional 2021 harvest.

Meanwhile, cropping activities for the 2023 winter crop cycle are ongoing in Ukraine. As of early November, 87 percent of the planned wheat area had been sown, or some 3.5 million hectares. This compares to the 6.1 million hectares planted with wheat at the same time in 2021. Significant production risks exist for this harvest, in terms of acreage and yields. Although no major shortages of inputs are reported, low domestic output prices are constraining the capacity of many farmers to purchase inputs. In mid-September, weighted average domestic prices for major export-oriented crops were about 60 percent lower than before the start of the war. General economic uncertainty has also constrained credit availability, with credit unlikely to be available to farmers with smaller holdings. Even though progress has been made on demining areas without active fighting, remnants of the war in many cases continue to hamper access to fields. Outbound population movements also limit the availability of labour. Consequently, a 40 percent reduction of the area sown with the 2023 winter cereal crops compared to the average is expected. Plantings are estimated at about 4.8 million hectares, including 4 million hectares of wheat.

As for oilseeds, production is expected to decline markedly in 2022/23, primarily due to a sharp reduction in sunflower seed output. Production of this crop is expected to drop by about one-third from the previous season to 10.9 million

[17] APK-Inform

tonnes, as the war disrupted sowing activities in some major sunflower seed growing regions, with yields also depressed by high input prices and, in some cases, shortages of inputs. On the other hand, rapeseed production is seen stable year-on-year at 3.1 million tonnes. With winter rapeseed plantings finished in late 2021, the impact of the war on output of this crop was limited. Early indications for the 2023/24 season point to steady plantings for winter rapeseed, with sowing facilitated by favourable weather conditions. Meanwhile, soybean production is seen down slightly from the previous season at 3.4 million tonnes.

Livestock and poultry rearing as well as production of high value crops, such as fruits and vegetables, could also be constrained. The high cost of animal feed is a recurring issue cited as a problem.

2.3.3 The spread of African swine fever: A heightened risk for Ukraine and all neighbouring countries

The war in Ukraine has disrupted the agricultural sector of the country, including animal production in commercial, smallholder and backyard sectors. Usual supply chains of feeds, veterinary drugs and product transportation were massively disrupted. This is likely to be a long-term problem due to ruining of transport infrastructure. Active and passive surveillance, laboratory diagnostics and control measures of endemic and emerging infectious diseases, notably African swine fever (ASF), are severely undermined currently due to security situation and availability of resources and personnel. The interruptions of electricity, water and gas supplies have affected livestock production and related value chains as well as veterinary clinics and laboratories.

According to FAO's assessment the preliminary damages and losses in livestock sector is estimated at USD 1 billion. According to FAO's survey, around 25 percent of the rural population involved in agricultural production stopped/reduced its production due to the war (over 40 percent in war-affected regions). In the liberated and contact line oblasts, the major challenges are access to young animals for restocking purposes and animal feeds (including access to pastures). Approximately 80 percent of commercial livestock producers, located in the territories controlled by Ukraine, continue to operate steadily.

There are risk and implications for high impact animal diseases:

1. Possible upsurge in rabies incidence due to transmission of fox rabies to abandoned cats and dogs in the areas affected by military activities implying significantly increased risk for humans
2. Spread and upsurge in the incidence of the ASF disease due to increased slaughter and uncontrolled trade in pork in the whole country, particularly in the areas on the left bank of Dnipro river
3. Unrecognized introduction and spread of Avian Influenza in backyard sector from natural reservoirs in the rural areas throughout the country, but especially in its southern regions
4. Massive mortalities or escapes of farmed animals (livestock and poultry) and problems with their keeping, maintaining proper health status or incineration of dead animals.
5. Problems with maintaining sufficient biosecurity levels at commercial poultry and livestock farms
6. Challenges for the implementation of the surveillance and laboratory diagnostic activities due to frequent and prolonged interruptions of electricity, gas, water supply.

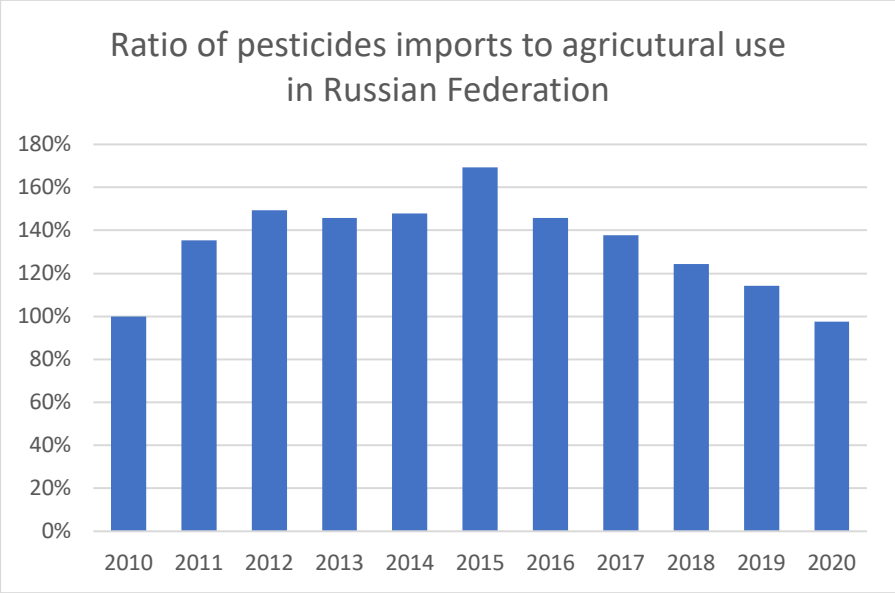
Large numbers of abandoned livestock and pet animals, might contribute to the transmission of the diseases. Uncontrolled movement of animals, or undisposed carcasses of animals left after bombardments, and encroachment and destruction of wildlife habitats can lead to spillover of pathogens to wildlife and from wild to domestic animals.

2.3.4 Assessing the global risks arising from an input-intensive Russian agricultural sector

As for output prospects for the Russian Federation, no major impacts are expected on agricultural production in the short term. Difficulties with financial transactions could directly or indirectly result in economic losses for the agricultural sector. Indeed, farmer incomes in the country risk being depressed by the loss of export markets and constrained access to financial services needed to complete international transactions. Should these risks materialize, and alternative arrangements fail to emerge, such disruptions could negatively influence future planting decisions. A high dependency on imports of agricultural inputs (other than fertilizers and some seeds) and potential trade hurdles stemming from economic sanctions imposed on the country also pose risks to the Russian agricultural sector.

Russian agriculture includes a large number of input-intensive, large-scale farms, specialized in supplying international markets with basic food commodities such as wheat and maize. The production of these crops is characterized by high application levels of domestically supplied fertilizers, as well as of imported seeds and pesticides. As evident from figure 22, agriculture in the Russian Federation is particularly dependent on imported pesticides. Even on a net-trade basis (after accounting for exports or re-exports), the Russian Federation regularly imported more pesticides than it used domestically over the last decade. This is a remarkable finding, which deserves a deeper analysis. Here it may suffice to say that this high-import dependency of close to - if not more than - 100 percent could reflect several factors, including a constant trend to stockpile pesticides for non-agricultural uses. For example, herbicides could be used to keep rail tracks free of weeds and vegetation. On the other hand, this could be simply a reflection of the limited quality of the underlying statistics.

FIGURE 22
Unusual import overall dependency on pesticides



Source: FAOSTAT

Figure 23 suggests that the main rubrics of pesticides, like herbicides, fungicides and insecticides, account for about equal value shares in total imports of pesticides. In addition, the Russian Federation imported a considerable amount of disinfectants in 2021, adding up to overall pesticides imports of USD 808 million.

The Russian Federation also imported seeds valued at USD 396 million, as well as a small amount of fertilizers. As analysed in the fertilizer trade profile section, the Russian Federation is the single largest exporter of fertilizers globally and only imports for reasons relating to transportation costs, given the vast geographic extent of the country.

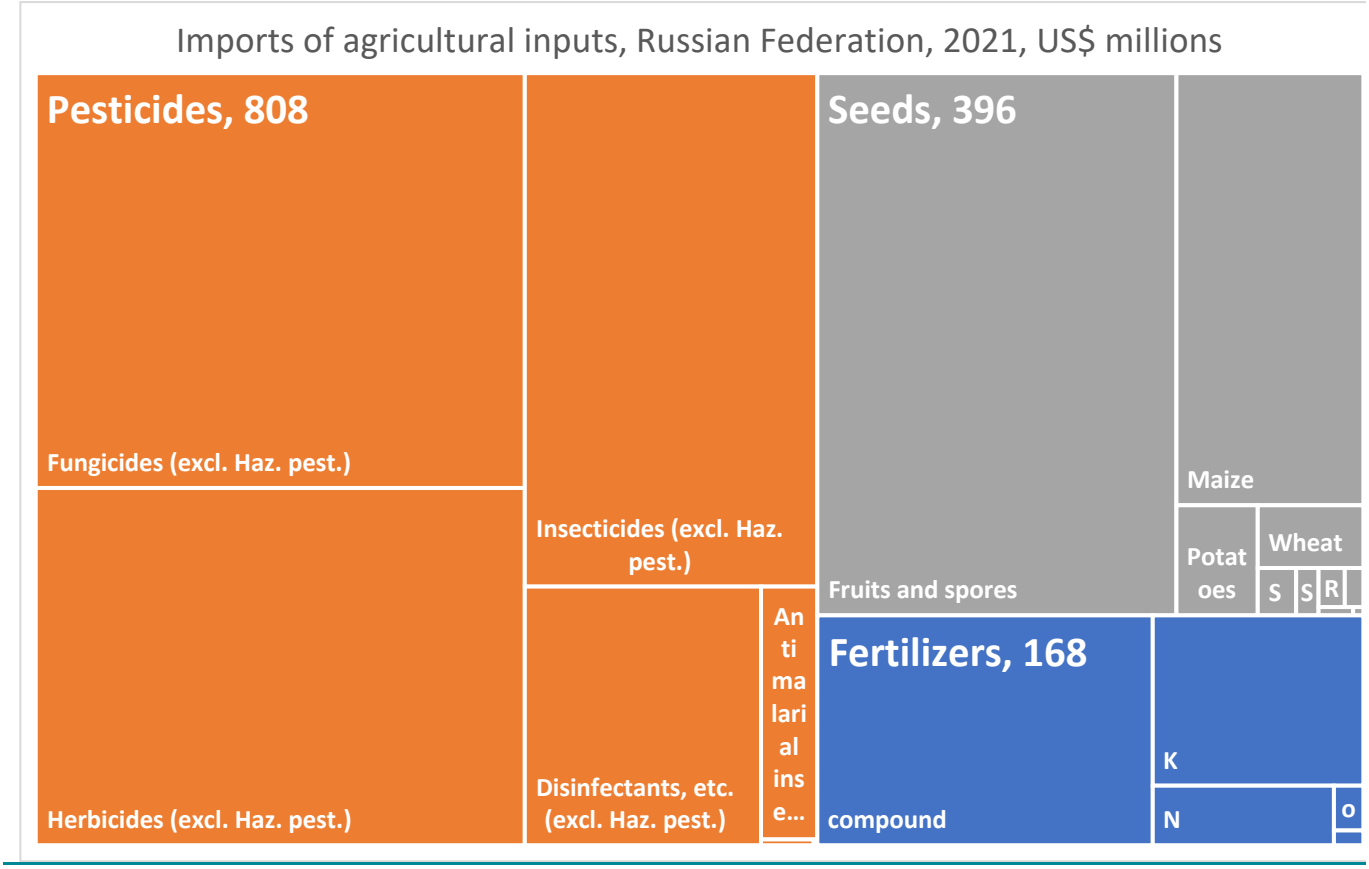
The possible sanctions have exposed the Russian Federation's agricultural sector to risks, as it heavily relies on agricultural input imports, notably pesticides and some seeds. This poses a risk to global food supplies. Not having access to enough herbicides for instance may lower yields; lack of fungicides could lower both yields and quality; the resulting fungus pressure would also make it riskier to apply large quantities of N-fertilizer.

Turning to the sources of these imports, figure 24 reveals that the lion's share of pesticide imports stem from the European Union. The European Union accounts for 59 percent of the pesticides imports by the Russian Federation, other large suppliers include China (18 percent) and Belarus (7 percent). In absolute terms, in 2021, the Russian Federation

imported pesticides worth USD 808 million, of which USD 477 million were sourced from countries within the European Union.

Similar degrees of dependencies exist for seeds. In 2021, the Russian Federation purchased seeds valued at USD 396 million, 67 percent, or USD 267 million, of which originated from the European Union, followed by the United States of America and Peru, each accounting for 4-5 percent of the country's total seed imports. It is important to note that the seed imports covered in this analysis only include "high value" seeds, i.e. hybrid, genetically modified organism (GMO), or certified seeds. In addition to these high-value imports, there are seeds that are either retained by farmers domestically or imported. These are non-hybrid and non-GMO seed varieties.

FIGURE 23
Russian imports of pesticides, seeds and fertilizers

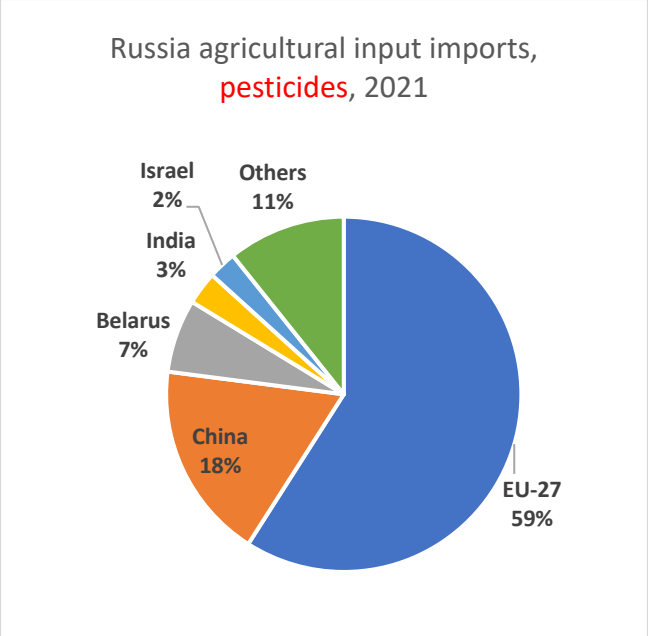


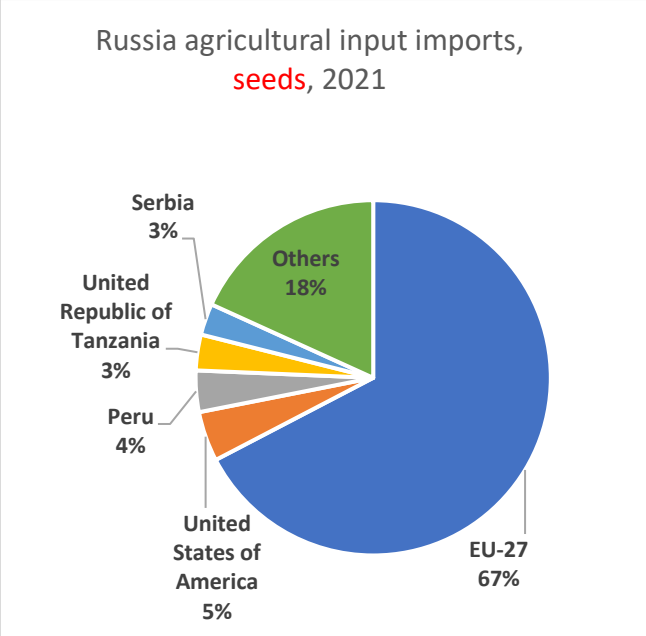
Source: Trade Data Monitor (TDM), FAO calculations

These high import dependencies in conjunction with large import shares of the European Union suggest that possible trade sanctions could take a hefty toll on crop production by the Russian Federation, although these effects have not yet materialized in 2022 as domestic markets appeared to be sufficiently supplied with imported agricultural inputs. Lower supplies and less productive varieties could result in less plantings, lower yields, and lower qualities. The combined effect of lower seed and pesticide use could weigh on the availability of many food crops, both for domestic use and, arguably, even more so for crops that are destined for international markets. This would add to upward pressure on international prices and further weigh on global food security.

Figure 24

Pesticide and seed imports by the Russian Federation





SOURCE: Trade Data Monitor (TDM), FAO calculations

2.4 Humanitarian risks

2.4.1 Assessing the possible effects of the was in Ukraine on domestic food security

The war has interrupted regular economic and livelihood activities and constrained income flows. Even in cases of sufficient local availabilities, regular supply chains may be disrupted by insecurity, infrastructure damage, energy shortages and lack of personnel. Both Ukraine and the Russian Federation had already been experiencing elevated levels of food price inflation prior to the outbreak of the war, although in both cases local prices remained[18] considerably below the peaks registered in 2015, as the war in the eastern part of Ukraine took its toll on economic activities. In the Russian Federation, annual food price inflation initially increased from 11 percent in January 2022 to over 20 percent in April, but gradually declined to 12 percent in October 2022 as the initial impact of the economic sanctions on the economy wore off. According to the State Statistics Service of Ukraine, food prices inflation in October 2022 increased by over 35 percent year-on-year, up from about 32 percent in September. The October 2022 reading was the highest since January of 2016, mainly due to skyrocketing prices of eggs, fruits and vegetables. Since autumn, heavy targeted shelling has decimated Ukraine's energy infrastructure, in particular significant power stations, resulting in power cuts across the country and a rapid deterioration of existing humanitarian crisis. Skyrocketing energy prices increase the cost of living. Given energy shortages, infrastructure damages and bottlenecks along the supply chain, additional increases in Ukraine are likely as hostilities continue. The war-induced disruptions could keep food price inflation persistently high, lowering the purchasing power of local populations, with consequent increases in food insecurity and malnutrition.

Already, prior to 24 February 2022, about 1.5 million people had been displaced as a result of the near eight-year conflict in eastern Ukraine, some 1.1 million were in need of food and livelihood assistance, and about 400 000 of them had needs related to food insecurity. The war has increased humanitarian needs within Ukraine and in neighboring countries where displaced populations have sought refuge. While the evolving situation remains uncertain even as active fighting

[18] Over 50 percent in Ukraine and slightly below 25 percent in Russian Federation.

retreated to the eastern part of the country, the prevalence and severity of domestic food insecurity will depend on the conflict's length and scale, as well as the severity of the damages it inflicts, including on infrastructure and productive assets. Sieged areas continue to report shortages of food and medicine, as humanitarian corridors have faced difficulties in reaching those in need. The urban areas are likely to be more affected, as rural dwellers typically cultivate at least some land to supplement household food needs.

According to the August update of the Ukraine Flash Appeal 2022[19] issued by the United Nations, ongoing hostilities have left 17.7 million people in Ukraine in urgent need of humanitarian assistance and protection. As of 26 September 2022, the estimated number of internally displaced people (IDPs) in Ukraine decreased to 6.2 million down from over 8 million in the beginning of May. Many have returned to their homes in the newly accessible areas, mainly in Kyiv, eastern and in northern parts of the country. Displacement dynamics are, however, fluid, and nearly 60 percent of those who returned home do not feel safe. Considering energy shortages resulting from infrastructure damages, additional displacements are likely in the upcoming winter season. Although some have returned to their homes, western parts of the country are reporting large numbers of IDPs, which continue to put a strain on local resources. Public services and resources in smaller and less economically advantaged countries receiving refugees have been under strain.20 According to the eighth round of the Ukraine Internal Displacement Report, about 42 percent of the returnees earn less than they did before February 2022. This report also estimates that about 19 percent of IDP had accepted lower paid jobs and 17 percent lower-skilled jobs,[21] 84 percent of unemployed IDPs aged 18-64 lost their jobs due to the war and around 75 percent of displaced respondents that had found new work reported earning lower wages.[22]

Preliminary findings of a recent FAO assessment on the impact of the war on the rural population depict a concerning situation for households dependent on agriculture for their livelihoods compared with the same period last year. While decreases in income were reported across the country, this trend was more accentuated in contact line oblasts, such as Sumska, Mykolaivska, Donetska and Zaporizka.

Despite the presumed ability of rural households to produce some food for their own consumption, more than half of the rural households surveyed reported to have spent over 50 percent of their total expenditure on food in the last three months. Moreover, in the contact line oblasts, almost 1 in 5 respondents reported to have spent over 75 percent of their total expenditure on food. The distressed situation of rural populations is even more evident when looking at the adoption of negative coping mechanisms. Around 40 percent of the rural households surveyed have started to adopt negative coping mechanisms to meet essential needs. Oblasts such as Zaporizka, Chernivska, Sumska and Dnipropetrovska revealed higher shares.

According to UNHCR, over 7.8 million refugees from Ukraine were recorded across Europe (including Russian Federation) as of late November 2022.[23] Given that, with some exceptions, men of fighting age are banned from leaving the country, most refugees are women and children (see section below for more on gender related impacts).

In response, the World Food Program (WFP) aims to provide in-kind and cash assistance to 3.1 million crisis-affected people and internally displaced people (IDPs) on the move within the country, as well as 300,000 refugees and asylum seekers from Ukraine in neighboring countries.24 FAO is aiming to provide urgent livelihoods assistance to almost 1 million people, including displaced and host communities. Ongoing support has reached over 100 000 people and 2 500 small farmers, with a further 20 000 people and 1 000 small farmers to be assisted in the coming weeks with current resources.

2.4.2 Assessing the gender-related impacts of the crises

[19] https://ukraine.un.org/uk/node/193988

[21] https://dtm.iom.int/reports/ukraine-%E2%80%94-internal-displacement-report-%E2%80%94-general-population-survey-round-10-17-27-october

[22] https://displacement.iom.int/sites/g/files/tmzbdl1461/files/reports/Ukraine%20Internal%20Displacement%20Report-%20General%20Population%20Survey%20Round%2010.pdf

[23] https://data.unhcr.org/en/situations/ukraine

[24] https://api.godocs.wfp.org/api/documents/a01f1168a36c4dbaa98b3eaec74f4996/download/?_ga=2.169855457.1922200705.1647596767-1938389256.1630911060

Prior to the current conflict, Ukraine had made modest gains on reducing gender inequalities, ranking 74th out of 156 countries according to the Gender Gap Index. This limited progress was already under threat by eight years of previous conflict in the east of the country, and after the outbreak of the COVID-19 pandemic. Recent data show that the current humanitarian crisis following the outbreak of the war in February 2022 has further exacerbated the complex situation and compromised the achievements made towards gender equality and women's empowerment.

According to OCHA in March 2022, over 10 million people were forcibly displaced by the war and more than 3.7 million fled Ukraine to neighboring countries, out of which 90 percent are women and children, while most men aged 18–60 are required to stay behind under the martial law. The International Organization for Migration reports that women represent 60 percent of the adult internally displaced population, while men are only 40 percent. Over 6.5 million people who have been forced to leave their homes since the start of the war are still displaced inside Ukraine, and more than half of them have been displaced in the last six months. At the same time, almost 6 million people have returned to their habitual residence, including over a million from abroad. Similarly, more than 7.8 million Ukrainians have fled to European countries, including 4.7 million registered for temporary protection or similar national mechanisms.

UN Women and CARE International conducted a Rapid Gender Analysis (RGA) in May 2022[25] showing an increase of existing inequalities, and older women and single mothers represent the majority of Ukraine's poor. According to national statistics, the war will increase the unemployment rate and further push women into unprotected informal sectors of the economy. Ukraine's 2020 National Action Plan for the Implementation of UN Security Council Resolution 1325 shows that only 43 percent of internally displaced women have found employment compared to 58 percent of men.

Available statistics show that women who are migrating face many challenges at the borders, and some minority groups are unable to leave. Many vulnerable groups are left behind and cannot access essential services and resources, such as safe and accessible shelters, with a high risk of abandonment and family separation for people with disabilities. Female-headed households – who were already more food insecure than male-headed households (23 versus 13 percent) – face higher risks.

The RGA revealed that women represent two-thirds of those in need of state benefits and social support. It is also estimated that disruptions to education are impacting 5.7 million children and mothers are increasingly taking the responsibility for homeschooling. Women and girls from the Roma population also face more challenges to access education and have limited opportunities to receive humanitarian assistance, due to their lack of documentation. Disruptions to health services, including access to sexual and reproductive health, are affecting at least 265 000 pregnant Ukrainian women. There are also emerging protection concerns for women and girls, who face increased safety risks, including physical and sexual violence, abductions and persecution.

2.4.3 Assessing the possible effects on world food security

The 2022 edition of the report on *The State of Food Security and Nutrition in the World* (SOFI), released in July 2022, estimated that the number of people affected by chronic hunger globally rose to as many as 828 million in 2021, an increase of about 46 million since 2020 and 150 million since the outbreak of COVID-19. After remaining relatively unchanged since 2015, the prevalence of undernourishment (PoU) jumped in 2020 and continued to rise in 2021, to 9.8 percent of the world population. This compares with 8 percent in 2019 and 9.3 percent in 2020. In addition, around 2.3 billion people in the world (29.3 percent) were moderately or severely food insecure in 2021 – 350 million more than before the COVID-19 pandemic. Nearly 924 million people (11.7 percent of global population) faced food insecurity at severe levels, representing an increase of 207 million in two years.

According to the Mid-year Update of the 2022 Global Report on Food Crisis (GRFC),[26] published in September 2022, up to 205 million people are expected to face acute food insecurity and to be in need of urgent assistance (IPC/CH Phase 3 or above or equivalent) in 45 countries. If additional data from the latest available analysis of 2021 is included for eight

[25] https://www.unwomen.org/en/digital-library/publications/2022/05/rapid-gender-analysis-of-ukraine
[26] https://www.fsinplatform.org/sites/default/files/resources/files/GRFC%202022%20MYU%20Final.pdf

countries and territories, this number is projected to reach 222 million people in 53 countries/territories covered by the GRFC 2022. This is the highest number recorded in the seven-year history of the report.

While most of these analyses did not account for the possible impacts of the war in Ukraine, the global food security situation is likely to deteriorate substantially in 2022 without rapid and sustained humanitarian action that includes a strong focus on local food production.

Against this background, the escalation of war engaging such important global agricultural commodity market players, at a time of already high and volatile international food and input prices, raises significant concerns over the war's potential negative impact on food security, both domestically and internationally. Much uncertainty surrounds the war itself, its intensity, geographical scope and duration. However, domestically, its escalation could directly constrain the countries' agricultural production, which coupled with limited economic activity and increasing prices, could undercut the purchasing power of local populations, with consequent increases in food insecurity levels. Responding to concerns about sufficient supplies on the domestic market, on 5 March, the Government of Ukraine introduced zero quotas for exports subject to licensing in 2022 of maize, oats, buckwheat, millet, sugar, and salt suitable for human consumption. With the exception of buckwheat and salt, zero quotas were lifted by September 2022, while export licensing remains in place for meat, eggs, millet, sugar, oats and rye. Globally, given the war's potential to disrupt agricultural activities in such significant global suppliers, international markets of foodstuffs and agricultural inputs have not been immune to its effects. Were it to result in a sudden and prolonged reduction in food exports by either country, it could put upward pressure on international food commodity prices to the detriment of low-income food-deficit countries (LIFDCs).

Although agricultural commodities of different origins are substitutable to a large extent, sourcing from different origins can entail increased shipping and transactions costs for importers, particularly in countries or regions that traditionally rely on the Black Sea food supplies due to geographical proximity. While some net food importers are concomitantly exporters of other commodities and thus may be in a more comfortable position to cover their increased food import bills, others are not. A number of countries also maintain consumer subsidies to protect their consumers from price fluctuations on international commodity markets, often at rather steep fiscal costs for governments. Therefore, securing wheat supplies from relatively more affordable destinations (including shipping costs) is crucial for these countries to maintain a certain degree of fiscal balance. In addition to increasing food import bills, high international food commodity prices make sourcing of food assistance to those most in need across the globe more expensive.

Beyond the fiscal pressure on countries, high food prices negatively impact populations with low incomes (including pensioners) in both developed and developing countries, as these groups spend a larger share of their incomes on food. To cope with high food prices, these groups may be compelled to cut other essential expenses, such as schooling, energy, heating or medicines, or to engage in negative coping strategies including skipping meals, and/or purchasing cheaper but less nutritious alternatives.

To assess the possible impacts of the war in Ukraine and other global developments on global food security in 2022, an initial analysis was conducted using the Aglink-Cosimo modeling system. Prior to the outbreak of the war in Ukraine, SOFI 2022 projected the number of undernourished in 2022 at 733.9 million people. Using the new baseline projections generated under the OECD-FAO Agricultural Outlook, and based on the projected global food consumption patterns, the number of chronically hungry people in 2022 is projected at 744.6 million, representing an increase of 10.7 million people from the pre-war baseline. This new estimate is very close to the projected number under the severe shock scenario published in the 10th of June update of this Information Note.

It should be explained that the expected increase in undernourishment in 2022 results from the incorporation of revised yield expectations, a more rapid rise in energy prices and a broad range of other emerging economic trends. Especially, economic growth prospects for low- and middle-income countries were lowered, affecting the access dimension of food security. Compared to the pre-war expectations, the currencies of many emerging economies depreciated against the United States dollar, increasing the cost of import food and energy. The higher energy and agricultural input prices contributed to the widespread food price inflation, further deteriorating access to food, especially for the poor and vulnerable populations. Almost all of the estimated increased in undernourishment in 2022 is expected to take place in the lower-income countries.

It must be noted that these estimations are preliminary and only serve to provide an initial assessment of the possible impact on global hunger. The next edition of SOFI, to be published in 2023, will provide more complete and comprehensive estimates, especially as more data and information will become available.

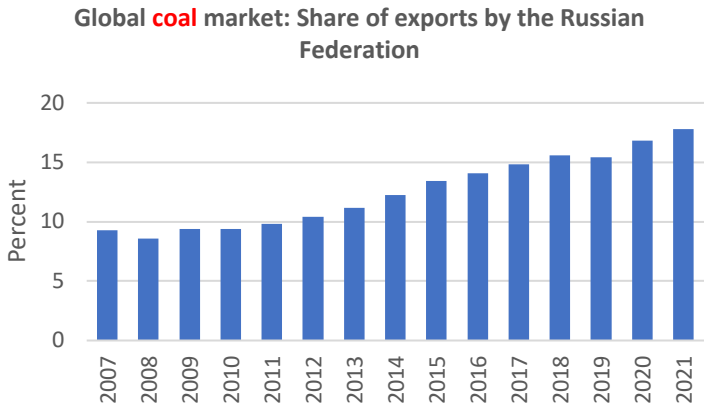
2.5 Energy risks

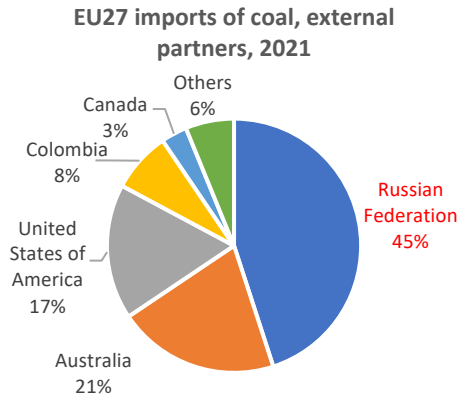
The Russian Federation is a key player in the global energy market. Its shipments of coal, oil and gas account for, respectively, 18, 12 and 20 percent of global exports. Russian energy exports are particularly important for the European Union, which in 2021 sourced, respectively, 45, 25 and 46 percent of its coal, oil and gas imports from the Russian Federation. As a highly energy-intensive industry, especially in developed regions, agriculture has inevitably been affected by the sharp increase and volatility in energy prices that has accompanied the war (Figure 25 A, B and C).

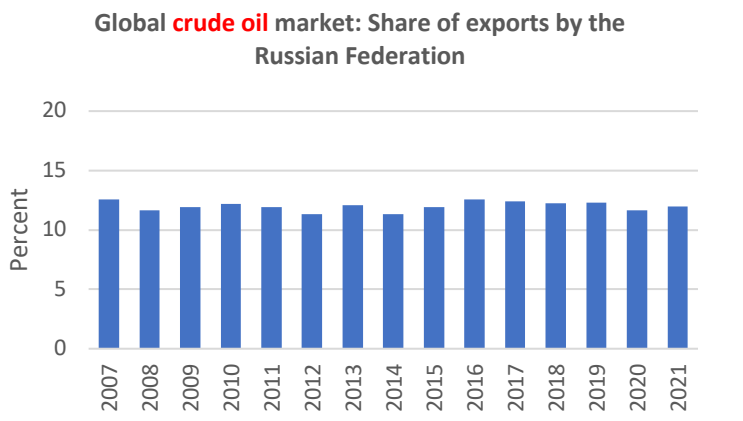
Agriculture absorbs high amounts of energy either directly through fuel, gas and electricity use or, indirectly, using agri-chemicals such as fertilizers, pesticides and lubricants, all of which have large, embodied shares of energy. N-fertilizer, for instance, is the product of an energy-intensive process, known as Haber-Bosch synthesis, in which nitrogen and hydrogen are synthesized into ammonia. Ammonia, in turn, is processed into a variety of products, notably fertilizers such as urea and ammonium nitrate, which are then blended with other plant nutrients into compound fertilizers such as diammonium phosphate (DAP), monoammonium phosphate (MAP) or a variety of N-P-K fertilizers. The main energy feedstock for N-synthesis is natural gas, notably in Europe and North America. That said, there is a wide variety of feedstocks used for the Haber-Bosch process ranging from coal to renewable energy sources. Ammonia is also used in numerous other industrial processes, all of which compete with the production of fertilizers. For instance, industrial grade ammonia is used as a liquid to reduce the amount of air pollution created by a diesel engine, which plays a pivotal role for the operation of cars, trucks, and tractors.

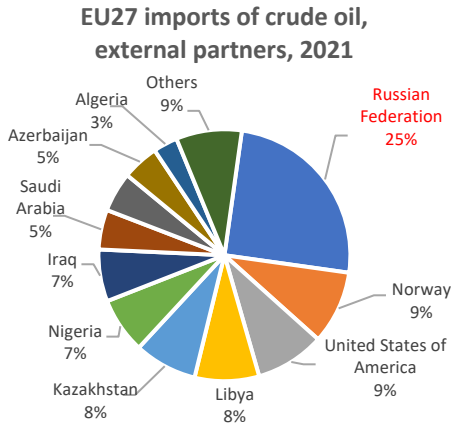
Energy is also required to manufacture feed ingredients, such as the crushing of oilseeds to produce oil meals and the milling of grains to manufacture feedstuffs (pellets, flours, and compound materials). When it comes to food processing, the price of energy features heavily in the cost schedule.

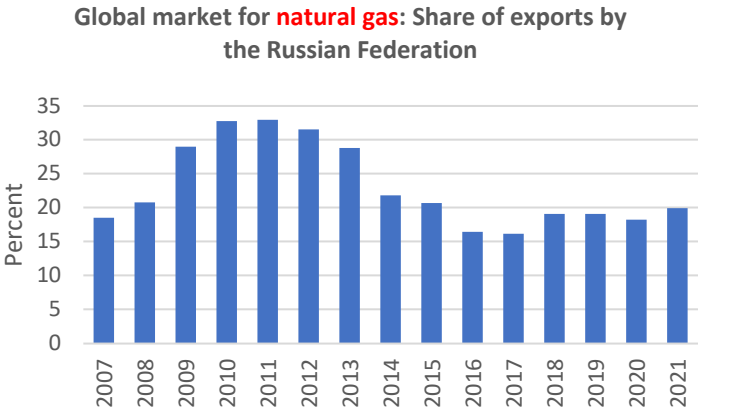
Figure 25
A, B and C: EU27 imports of energy by country of origin

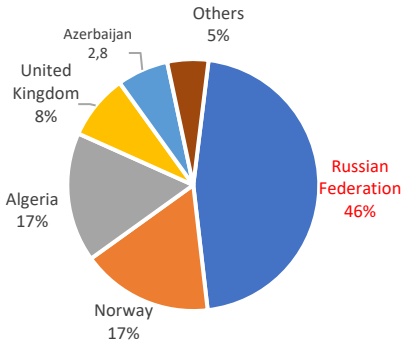












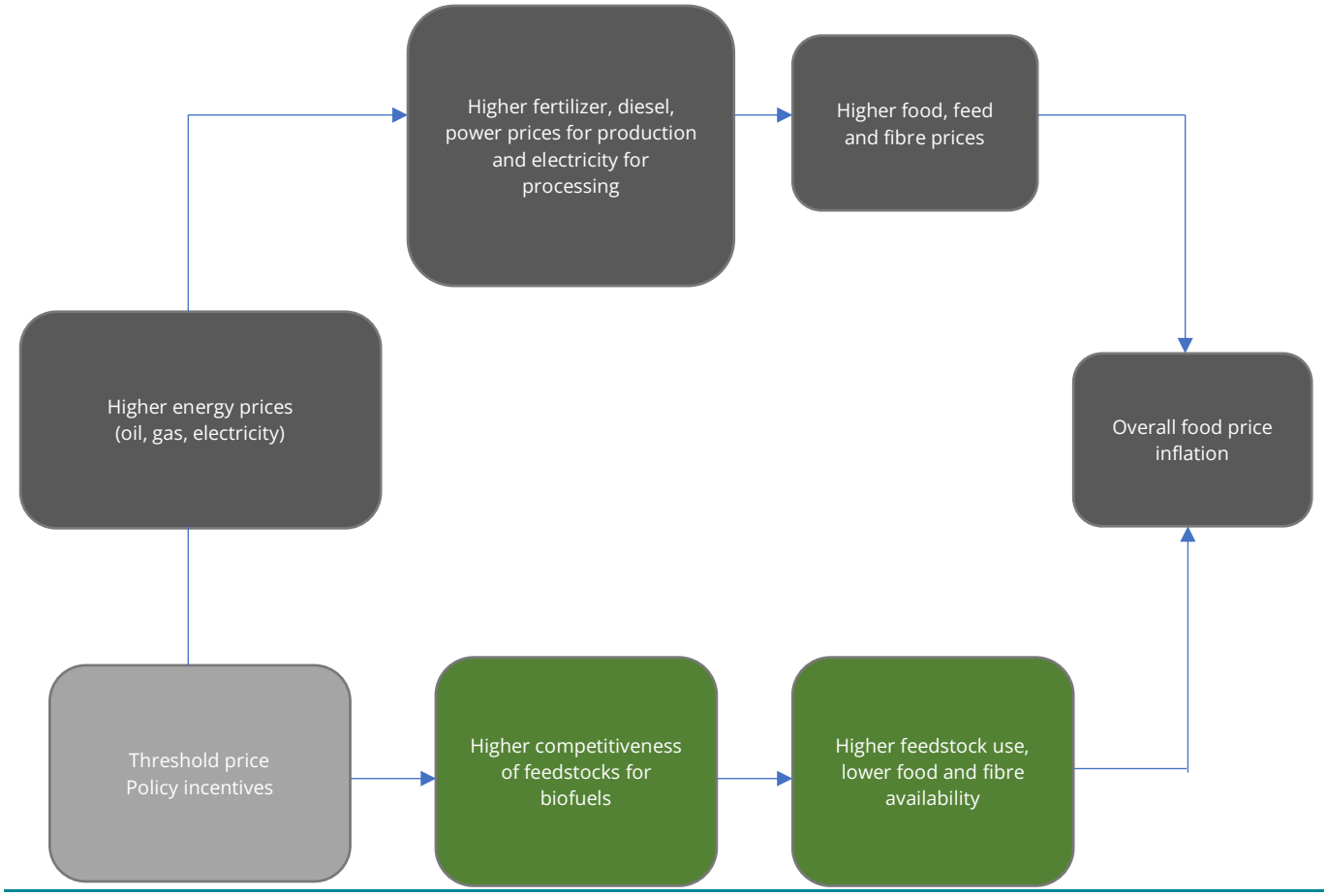
Globally, estimates of direct and indirect energy consumption vary widely across countries. In highly developed agricultural economies, they can exceed 30 percent for direct use and 15 percent for indirect consumption. These high shares mean that higher prices of these inputs will inevitably translate into increased production costs and eventually into higher food prices.

2.5.1. How the crisis affects the nexus between energy and agricultural markets

The lessons from the global food price crisis in 2007/08 show that under scarcity, the diversion of food crops to non-food uses can drive up food prices markedly. To better understand the impact pathways of energy costs on food prices, figure 26 provides a schematic illustration of the linkages and “pass through” channels to food markets.

In addition to the links through the input prices, food and fuel prices are increasingly linked through output prices. Two principal channels create the links on the output side.

Figure 26
Energy and food markets tightly linked through input and output markets



2.5.2 Price transmission through the input side

With prices for fertilizers and other energy-intensive products expected to rise because of the war, overall input prices are expected to experience a considerable boost, resulting in lower affordability for farmers and ultimately lower use levels, in theory contingent on the level of output prices. For instance, the recent price increases for fertilizers were so pronounced that they exceeded the price increases for outputs by a considerable margin. The result was a sharp decline in the affordability[27] of fertilizers, which was especially pronounced for agricultural products that have so far been spared by the otherwise widespread price increases. This was particularly the case for rice and sugar (figures 27 to 30), where sharply higher fertilizer prices resulted in a precipitous decline in affordability levels. Lower levels of affordability should in turn result in lower input use, lower yields and compromised quality of crops in the next cropping season, like lower protein levels in milling wheat.

[27] Affordability is defined as the ratio of output to input prices.

Figure 27
Rice vs fertilizer prices

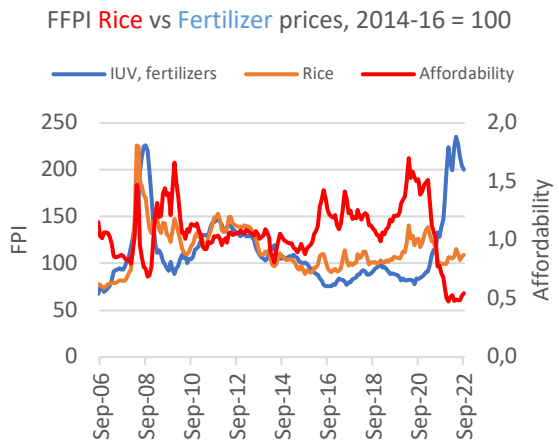


Figure 28
Sugar vs fertilizer

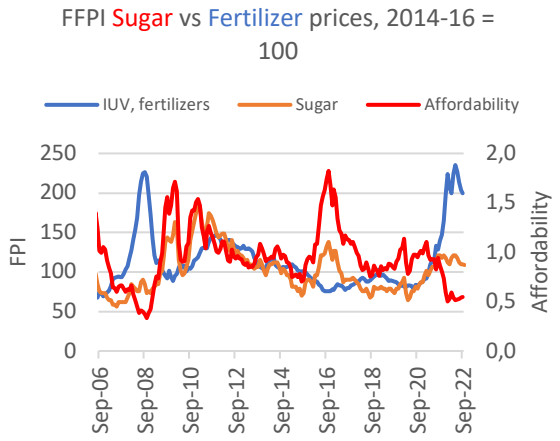


Figure 29
Rice vs urea prices

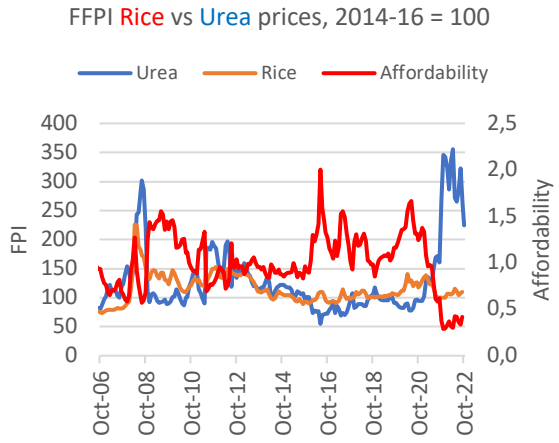
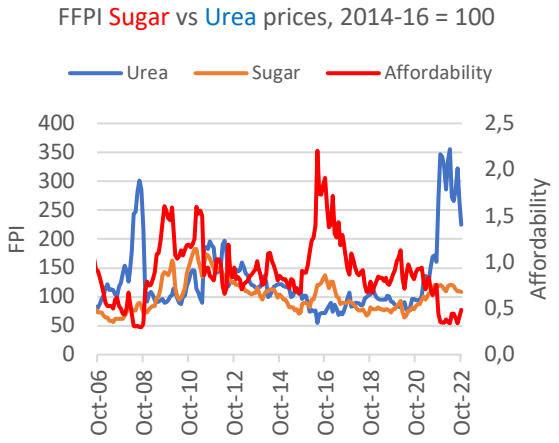


Figure 30
Rice vs urea prices



Source: Index Mundi, Trade Data Monitor (TDM), FAO calculations

2.5.3 Price transmission through the output side

The second channel of transmission involves price linkages through the output side. After the last significant energy price hike in 2008, much of the use of agricultural feedstocks for the energy market was driven by biofuel policies, which, through mandates, tariff protection or price incentives enticed biofuel producers to use a certain and rather inflexible amount of feedstocks for the production of biofuels. Maize, sugar and oilseeds (vegetable oils) are the most common feedstocks, with ethanol and biodiesel the most popular biofuels. These mandated or incentivized quantities are largely independent of the energy prices.

However, as energy prices are on a sharp upward trajectory again, the use of agricultural feedstocks can also evolve directly through energy prices. When energy prices rise, there is a threshold at which the production of biofuels from food crops, especially maize, sugar and oilseeds (vegetable oils) becomes competitive. Higher energy prices make more

and larger quantities of agricultural feedstocks competitive for conversion into energy and, given the large size of the energy market relative to the food market, pull food prices up to their energy parity equivalents. The food price rise is capped again where agricultural feedstocks become so expensive that they can no longer compete in the energy market.
2.5.4 The current war in Ukraine: will rising energy prices accelerate rising food prices?

Energy prices, notably those for natural gas and crude oil, saw swift and substantial increases in the early stages of the war. Crude oil prices exceeded USD 126/bbl on 8 March 2022 and remained consistently above the USD 100/bbl mark until June. Ever since, they have shown a tendency to weaken, falling some 28 percent below that early March high. Yet, at an October average of USD 90/bbl oil prices remained some 57 percent above pre-COVID-19 levels. If persistent, the oil price strength may keep an increasing number and quantity of feedstocks competitive as inputs into the energy sector. This has added upward pressure on feedstock prices, notably on maize, sugar and various vegetable oils. The added demand will only attenuate when feedstock prices have risen far enough to become too expensive as inputs for bioethanol or biodiesel. The additional demand will eventually come to a halt, when the energy parity price of an agricultural feedstock is reached and the agricultural feedstocks price themselves out of the energy market.

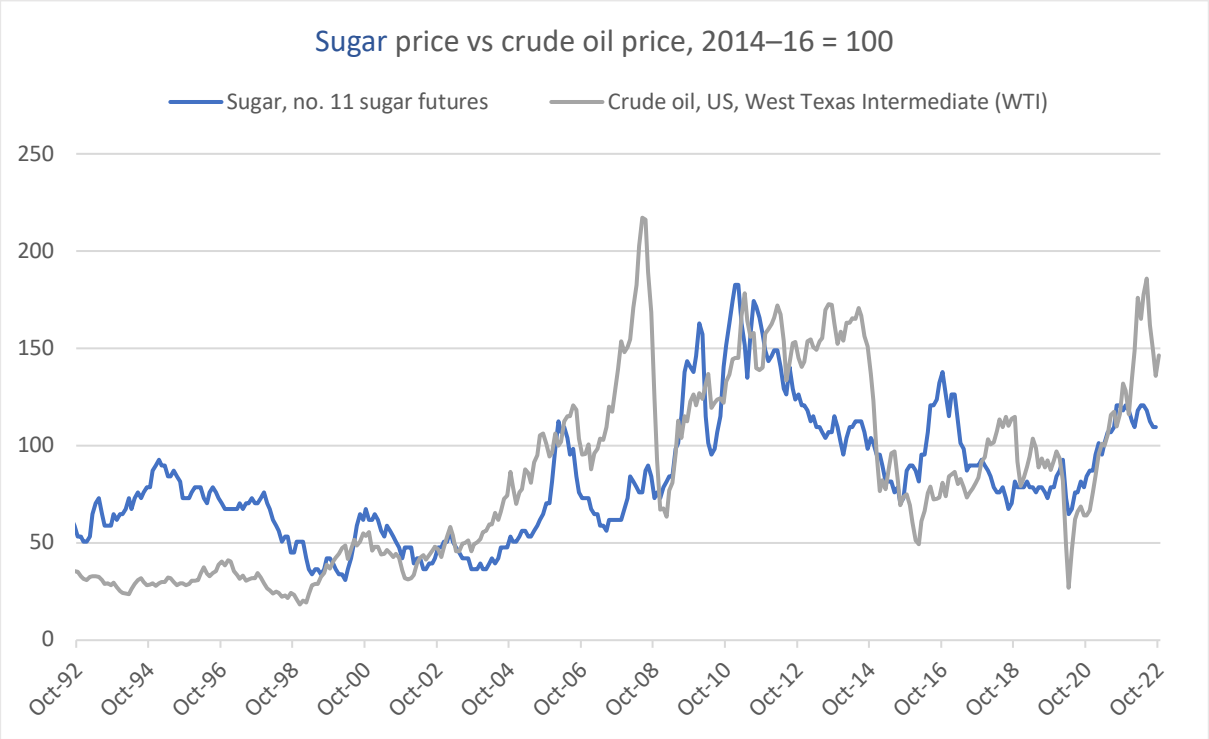
Figures 31 through 34 illustrate the various price relationships. Figures 33 and 34 depict the dependency of fertilizer prices on energy prices while figures 31 and 32 capture the link between energy prices and food prices. In terms of the price relationship between gas and urea prices, the close co-movement of these two series came to an abrupt halt in the fourth quarter of 2021 (Q4-2021), when prices for natural gas underwent a massive price hike. This hike was so pronounced that the upgrading margins between gas and ammonia as well as gas and urea prices turned negative and urea plants were forced to shut down or reduce output considerably. Since Q4-2021, prices for natural gas have remained very volatile and upgrading margins have shifted back-and-forth from positive into negative territory.

However, the increases in energy prices triggered by the war's escalation in late February were followed by a notable relaxation in the European gas market during the second week of March 2022. Aided by milder spring weather in Europe and rising liquefied natural gas (LNG) imports by the European Union, key quotations for natural gas declined by more than 50 percent from their peaks in just ten days. Despite at times pronounced oscillations since then, by October they remained close to the lower levels registered in March 2022. While this has allowed the strength in urea prices to moderate, it is likely to re-establish positive upgrading margins for fertilizer producers. With gas prices remaining at very high historical levels in Europe and the United States, there is limited scope for fertilizer prices to decline in 2023. This may cause lower yields and lower qualities in upcoming cropping seasons, giving further risk to the state of global food security in the coming years.

Uncertainties also cloud the supply outlook for natural gas and fertilizers going forward, notably in Europe (among European Union member states) and Central Asia. On the one hand, high (natural) gas prices could make once-unprofitable investments in energy production, such as fracking installations in the United States of America, commercially viable, thus easing international fertilizer prices. At the same time, amid efforts to wean themselves off imported gas (especially from the Russian Federation), European Union countries and companies could be inclined to shift from using natural gas for fertilizer production to using it for other outputs with higher marginal-value products. This could in turn have further implications for world fertilizer availability, as the European Union is also among the leading global suppliers of fertilizers.

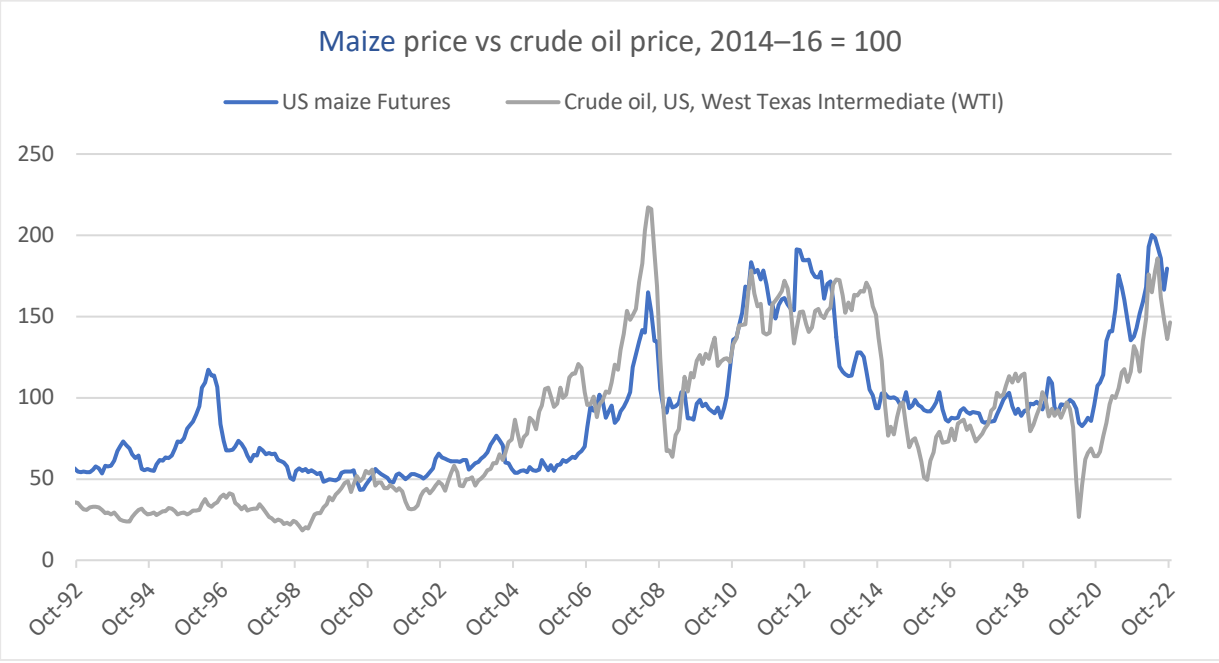
Similarly, the recent rise in crude oil prices has exceeded the price increases for some of the key biofuel feedstocks. This portends to the need of maize prices to rise to their energy price equivalent, that is, the energy parity prices. Unlike in the fertilizer market, however, industry-specific constraints such as maximum blend levels, blend walls and free refinery capacity can delay this process and keep prices for feedstocks such as maize or sugar temporarily below their energy price equivalents.

Figure 31
Energy and food markets, tightly linked through input and output markets



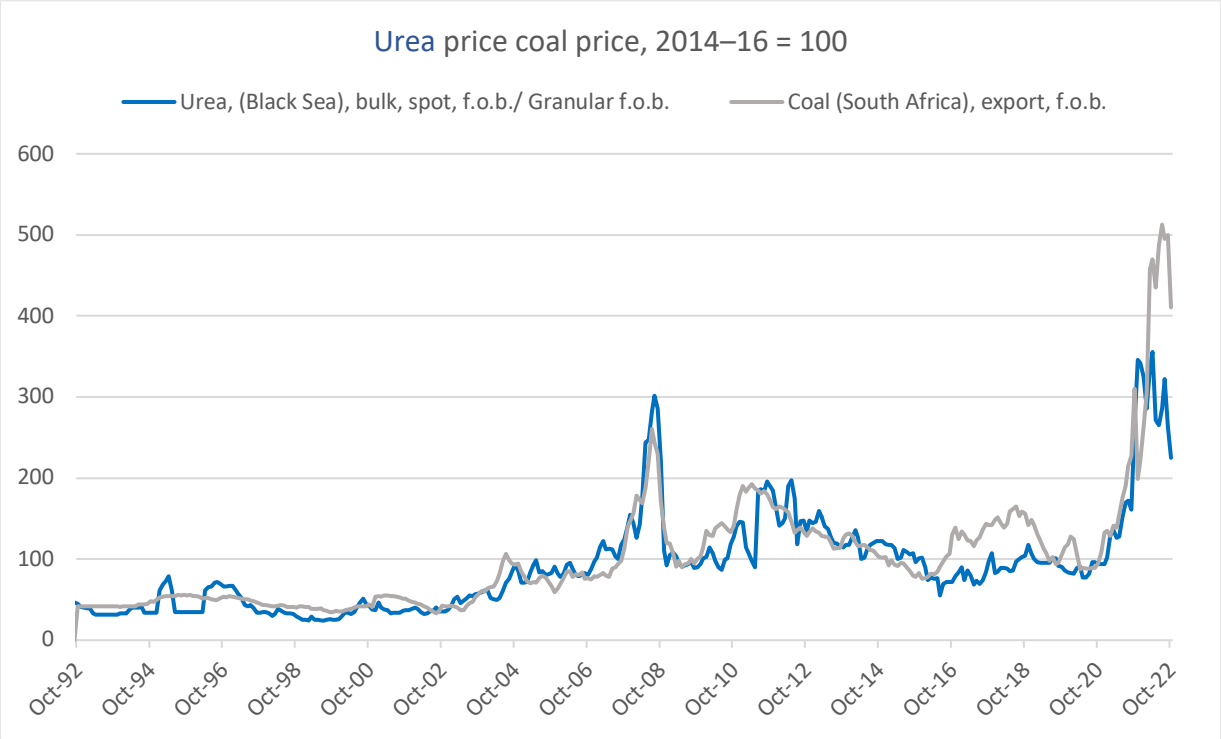
Source: Index Mundi

Figure 32
Maize prices move in sync with crude oil prices



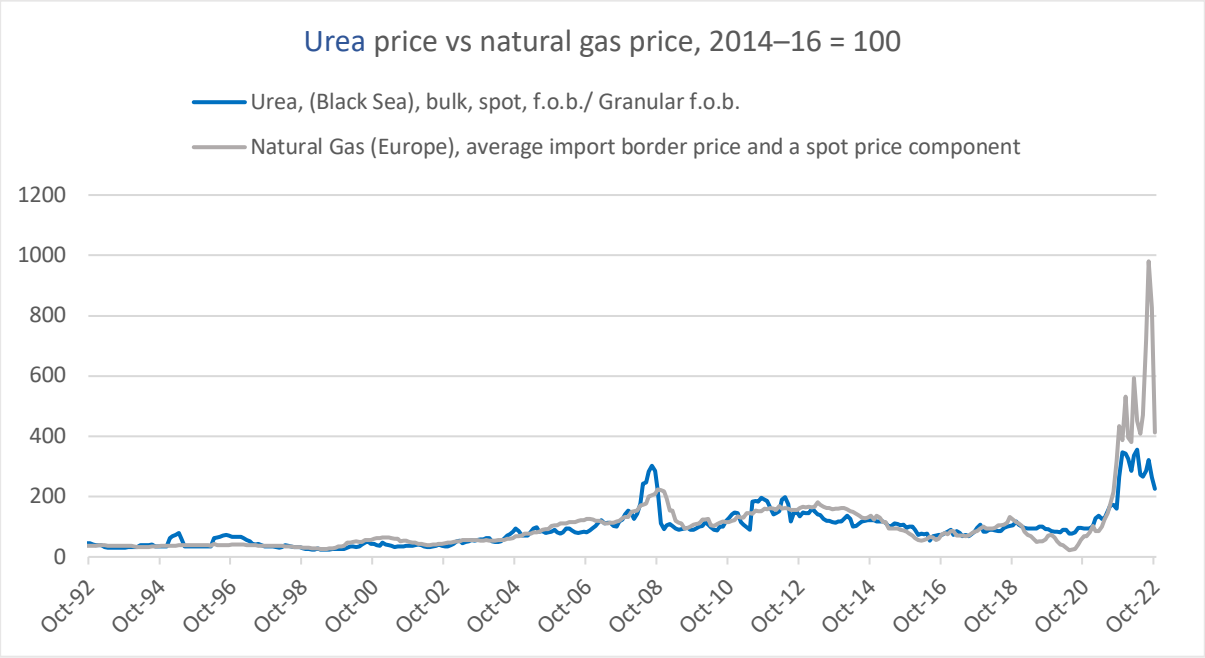
Source: Index Mundi

Figure 33
Upgrading margin have become negative even for coal-fired urea plants



Source: Index Mundi

Figure 34
War-induced gas price increases resulted in negative upgrading margins for urea



Source: Index Mundi

2.6 Macroeconomic risks

The war in Ukraine has aggravated the macroeconomic challenges the world is facing. It has contributed to elevating the world food and energy prices and created a lot of additional uncertainty, further aggravating food security globally, and particularly for lower-income countries and vulnerable populations.

On 11 October 2022, the International Monetary Fund (IMF) released its latest World Economic Outlook[28], highlighting that global economic activity is experiencing a sharp slowdown and that inflation has risen to levels that have not been reported in several decades. The war in Ukraine, the global cost-of-living crisis, the tightening financial conditions in most regions, and the COVID-19 pandemic are considered to be driving these developments.

The report projects global growth to slow down from an estimated 6 percent in 2021 to 3.2 percent in 2022 and even further to 2.7 percent in 2023. It is noted that in January 2022, IMF had projected a growth rate of 4.4 percent for 2022 and 3.8 percent for 2023. The growth rate of advanced economies is projected to reduce from an estimated 5.2 percent in 2021 to 1.1 percent in 2023, mainly driven by the very low growth rate in the United States of America and the Euro Area (1.0 percent and 0.5 percent projected growth rate in 2023 respectively). In emerging markets and developing economies the growth rate is projected to reach 3.7 percent both in 2022 and 2023 from an estimated 6.6 percent in 2021. The report projects negative growth rate for the Russian Federation, at the level of -3.4 percent for 2022 and -2.3 percent for 2023. At the same time, global inflation is forecast to rise from 4.7 percent in 2021 to 8.8 percent in 2022, before it declines again to 4.1 in 2024. According to the report, upside inflation surprises have been most widespread among advanced economies, with greater variability in emerging market and developing economies.

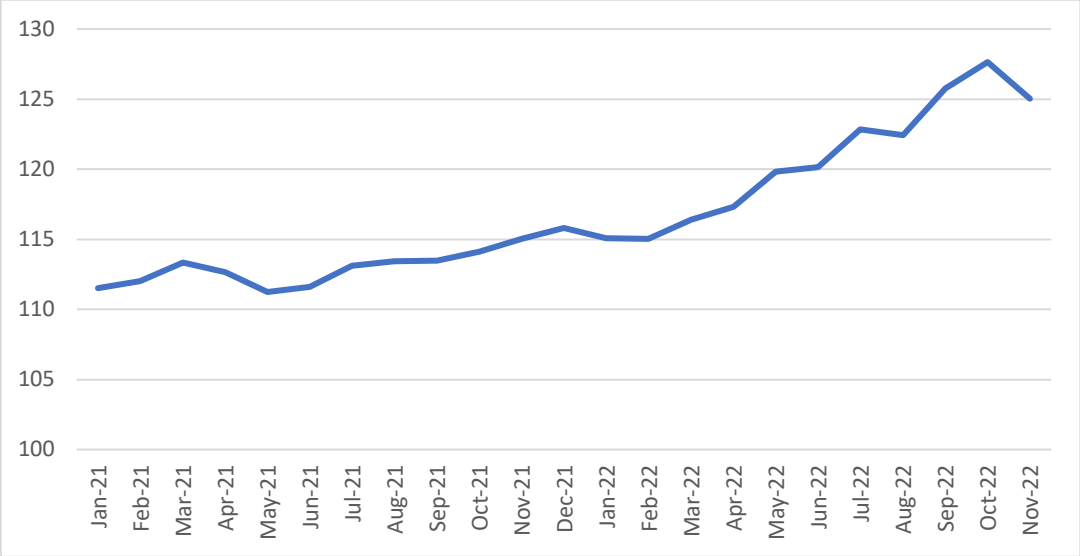
Food price inflation constitutes an important component of the soaring overall inflation rates. For instance, according to national sources, in October 2022, food prices increased 15.5 percent year-on-year in the Euro Area, 10.9 percent in the United States of America, 7.0 percent in China, 7.0 percent in India, and 6.76 percent in Indonesia. In many parts of the world, food inflation has reached record highs.

The drop in GDP growth in several parts of the world, combined with the elevated prices, may affect global demand for agrifood products, with negative consequences for global food security and nutrition. Lower economic growth will also likely reduce the availability of funds for development, especially if global military expenses continue to increase.

As Figure 35 shows, the United States dollar has sharply strengthened since May 2021. The Nominal Broad Dollar[29] Index reached in October its highest level since 2006. This adds to the financial burden of many countries.

[28] https://www.imf.org/en/Publications/WEO/Issues/2022/10/11/world-economic-outlook-october-2022
[29] The Nominal Broad Dollar Index is being calculated by the US Federal Reserve Bank and it measures changes in the value of the US Dollar against the currencies most used for US imports and exports, rather than rather than against all currencies.

Figure 35
National Broad Dollar Index (January 2006=100)



Source: US Federal Reserve (https://www.federalreserve.gov/releases/h10/summary/jrxwtfb_nm.htm)

Increases in interest rates by the US Federal Bank, aiming to stabilize inflation, and the war in Ukraine have been important drivers behind the United States dollar appreciation. In particular, the surge of gas prices caused by the war has significantly lowered the terms-of-trade of advanced economies, mainly the European Union, resulting in the appreciation of the United States dollar against their currencies. At the same time, many emerging economies were ahead in the global monetary tightening cycle, as such exchange-rate pressures for the average emerging market economy have been less severe. Moreover, commodity exporting emerging economies, such as Brazil and Mexico, experienced a positive terms-of-trade shock[30] (Table 3).

Given the dominance of the United States dollar in international trade, its appreciation may have significant implications for many countries, in particular net importers of food and/or agricultural inputs. As mentioned earlier in this note (section 1.4) global food import bills are expected to reach record levels in 2022, while agricultural import bills are expected to increase by 48 percent compared to their 2021 levels.

Agriculture is the backbone of the economy in many developing countries, the majority of which rely on the United States dollar for their borrowing needs. As such, a lasting appreciation of the United States dollar in relation to other currencies may have significant economic consequences for these countries, including for their agrifood sectors. As the world experienced a second wave of the COVID-19 pandemic in 2021, the World Bank preliminary estimates included in the second edition of the 2022 Debt Report[31] indicate that the economic and social impacts of the pandemic added around USD 550 billion to the external debt obligations of low- and middle-income countries in 2021. As a consequence, the external debt stock of low- and middle-income countries rose by 6.9 percent in 2021 to USD 9.3 trillion.

The deployment of funds by multilateral creditors, such as the World Bank and the International Monetary Fund (IMF) can play an important role in offsetting the impact of the triple burden of high food prices, high agricultural inputs prices, and increased debt on the agricultural sector of developing countries. FAO has proposed the establishment of a Food Import Financing Facility to support countries to shoulder the soaring costs of food imports and improve access to food at country level. In this regard, FAO welcomes the decision by the IMF Executive Board to approve a Food Shock Window to provide access to emergency financing for countries facing balance-of-payment problems related to the global food crisis.

[30] https://www.imf.org/en/Blogs/Articles/2022/10/14/how-countries-should-respond-to-the-strong-dollar
[31] https://thedocs.worldbank.org/en/doc/6e72b0ded996306fa01f5db7a0c38b19-0050052021/related/2022-Debt-Report-Edition-II.pdf

3. Summary and policy recommendations

The war in Ukraine has fully engulfed two of the most important agricultural commodity producers and exporters at a time of already high and volatile international food and input prices. This has raised significant concerns over its potential adverse impacts on food security, both domestically and internationally. With the outbreak of the conflict, it was anticipated that the war would directly affect agricultural production in both countries, which coupled with the impact on economic activity and rising prices, could undercut the purchasing power of local populations. Globally, because of the impacts on food exports by these two countries, the war exerted additional upward pressure on international food commodity prices to the detriment of low-income food-deficit countries (LIFDCs), in particular. From the beginning of the war, and with the objective to minimize the negative impacts on world markets and global food security, FAO has put forward a set of policy recommendations.

1) **Keep trade in food and fertilizers open**

   Open markets and trade helps prevent the war from negatively affecting productive and marketing activities in both countries in order to enable them to meet domestic production and consumption needs, while also satisfying global demands. To ensure that supply chains continue to function properly or resume operations swiftly, such efforts should include steps to protect productive assets, including standing crops, livestock, inputs and machinery, from damages or any war-induced disruption. This must also extend to food processing infrastructure, such as grain mills and oilseed crushing facilities, as well as ancillary storage, transportation and distribution systems.

2) **Find new and more diverse food supplies**

   Countries that rely heavily on world markets and food imports to meet their consumption needs should diversify their food import sources and identify various exporters for their purchases to absorb shocks and remain resilient. By resorting to various sources of supply, countries become less vulnerable to place-specific shocks. Greater resilience can also be achieved by relying on existing food stocks and by enhancing the diversity of domestic production to ensure the supply of food that is nutritious and necessary for healthy diets (see box 1 in Appendix).

3) **Avoid ad hoc policy reactions**

   Measures put place in countries affected by potential disruptions ensuing from the war must be carefully weighed against their potentially damaging effects on international markets in both the short and long term. For instance, while reductions in import tariffs and/or the use of export restrictions could help improve availability in domestic markets in the short term, they would inevitably add to the upward price pressure on international markets and exacerbate the situation globally. Ad hoc policy measures and trade policies must always be avoided.

4) **Strengthen market transparency and dialogue**

   Global market transparency plays a key role when agricultural commodity markets are under uncertainty and need to adjust to shocks affecting supply and demand. Initiatives like the Agricultural Market Information System (AMIS) strive to increase such transparency through the provision of objective, timely and up-to-date market assessments that enable informed policy decisions. Through its Rapid Response Forum, AMIS also provides a unique platform for policy dialogue and coordination among members, which include the Russian Federation and Ukraine. Policy dialogue and coordination are necessary to minimize disruptions and ensure that international markets continue to function properly and that trade flows efficiently to meet global demand and safeguard food security.

5) **Support internally displaced people, refugees and those directly affected by the war in Ukraine**

Until the start of the war, Ukraine's social protection system was covering 73 percent of the population with at least one benefit.[32] After the escalation of the conflict in February 2022, the social protection system has remained largely functioning. The government of Ukraine has continued to make payments to beneficiaries' bank accounts[33]regardless of their ability to actually claim the benefit, by setting up a system of centralised accrual for those living in Russian-controlled territories[34]. The population in need of social protection support remains large and reaching them is difficult due to security risks and mobility – within and beyond national borders. To maintain and further strengthen the delivery of assistance through the national social protection system in Ukraine and in neighboring countries, the following steps should be taken: i) maintain efforts by external development and humanitarian actors to piggyback on social registries including Ukraine's Unified Social Information System to route humanitarian aid to vulnerable population groups; ii) ensure access to payments for people without bank accounts and for citizens living in Russian-controlled territories; iii) continue to ensure access to social protection systems and decent jobs within host countries for refugees; iv) assess how existing social protection programmes or new ones are actually reaching the poor and most vulnerable women and men, girls and boys, taking into account their specificities; v) build policy links between the social protection system and local agricultural sector in the countries receiving refuges and with relevant sectors mandated to work with socio-economic integration; and vi) in Ukraine, align social protection programmes with short-term jobs and skills development programmes to help develop and rehabilitate destroyed production assets.

6) Support the most vulnerable groups by:

It is critical to provide the necessary support to the most vulnerable population groups through various actions: i) identifying and addressing the specific needs of women, men, girls and boys in vulnerable situations and from different marginalized and vulnerable groups; ii) setting up advisory and financial services targeted to women and youth to support their business opportunities in value chains that are still operational, and increase their resilience capacities; iii) monitoring prices and food security outcomes of groups that were already vulnerable before the war, as well as groups pushed into hunger and poverty by deteriorating economic conditions resulting from the war and the respective increase in prices, in both urban and rural areas; iii) linking monitoring and early warning to anticipatory action to avert forecast deteriorations and mitigate the impacts of the war and other shocks on vulnerable people; and iv) providing timely, gender-responsive and well-targeted social protection interventions to alleviate the hardship caused by the war on affected local populations and to foster a recovery from it, taking into account the specific needs of men and women belonging to different age, socio-economic and ethnic groups.

7) Ensure prevention and control of animal diseases in line with One Health approach

The FAO Emergency Management Centre (EMC) is committed to facilitate the coordination of emergencies affecting animal health with severe impacts on food security and livelihoods, in line with the One Health approach and in accordance with existing global mechanisms, such as the FAO-WOAH Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs). Due to the critical and volatile situation in Ukraine, which is highly unpredictable and most likely to endure for a long time, an incident coordination group (ICG) was established. The overall objective of the ICG is to coordinate and harmonize the activities of the various stakeholders and partners to identify and address critical needs, while considering the national and regional impacts of animal health threats, as well as their impact on food security, livelihoods and trade. Up to 25 November 2022, four ICG meetings were held with the participation of FAO Emergency Centre for Transboundary Animal Diseases (ECTAD), Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES), Office of Emergencies and Resilience Global Programme Support Team (OER), FAO regional and national offices, WOAH global and regional Preparedness and Resilience Department, Regional Activities Department and Regional and Sub-Regional representatives and GF-TADs Europe, National authorities (acting CVO Ukraine), EU, USAID, WHO, IAEA, EFSA, FVE and other partners.

[32] ILO. 2022. Social Protection Platform. In: *World Social Protection Database, based on SSI; ISSA/SSA, Social Security Programs Throughout the World; ILOSTAT, ECLAC, IMF, WHO, WB, UNDP, UNICEF, completed with national data sources.* Cited 26 September 2022. https://www.social-protection.org/gimi/gess/ShowCountryProfile.action?iso=UA

[33] https://www.msp.gov.ua/news/21511.html

[34] Ministry of Social Policy of Ukraine. (msp.gov.ua)

4. FAO Policy proposals

As a response to the challenges described, FAO has developed a number of concrete policy proposals to address the global food security situation and the risks associated with the war.

1) **Rapid Response Plan for Ukraine.** The focus of this plan has been threefold. First, to maintain food production by providing cash and inputs for cereal crop production in October, and the spring vegetable and potato production, as well as livestock production and health inputs and services. Second, to support agrifood supply chains, value chains and markets by engaging government and the private sector to provide technical support services to household level and smallholder producers through public-private partnerships. Finally, to coordinate the Food Security and Livelihoods Cluster, in particular through continued assessments of food security, markets and value chains.

2) **Establishing a Food Import Financing Facility (FIFF).** FAO has developed a proposal[35] for a financing facility to help poor net food importing countries access international food markets, which would act as an ideal companion to the Black Sea Grain Initiative. The facility would be limited to net food importers in the low-income and lower-middle income group of the World Bank classification, providing them with credit to purchase food on global markets. Beneficiary countries would commit to investing in sustainable agricultural productivity, thereby reducing their future food import needs (an automatic stabilizer). The facility has already been stress-tested. The endogenous – or distortionary – world market price effects would not exceed a maximum of 15-20 percent, even at its maximum use level of USD 25.3 billion. However, the FIFF would guarantee the food security for up to 15 million people[36], thus negating any need for households to curtail expenditures on other essential goods and services, such as health and education. The approval of a "Food Shock Window" by the International Monetary Fund (IMF), which is in line with the FIFF proposed by FAO, presents an important and welcome step towards easing the burden of higher imported food expenditures among LICs.

3) **Strengthening social protection for food security and nutrition** across all countries affected by the ripple effects. The war in Ukraine that began on 24 February has not only created an unprecedented humanitarian crisis, but a looming increase in food insecurity in countries both close and far from the war. Humanitarian responses should, where possible, be channeled through social protection systems to better reach the most vulnerable. These interventions are needed to cushion the negative impact of these developments on the food security and nutritional status of Ukrainians affected by the war, particularly ahead of the winter season, as well as of nutritionally vulnerable groups in food-importing countries, particularly in North, East and West Africa, as well as countries in West and Central Asia traditionally dependent on remittances from Russia. Given the multiple ramifications of the war, FAO has identified three main ways in which social protection can help address the current crisis and its aftermath. They consist of measures geared toward: i) Enhancing the capacity of Ukraine's social protection system to respond to the crisis and help rebuild rural/agricultural livelihoods after the war; ii) Strengthening social protection systems in neighbouring host countries to cater to the needs of refugees from Ukraine and support the socio-economic integration in the host communities, in coordination with agricultural sector actors; and iii) Responding to increases in food and fertilizer prices in net food-importing countries and the reduction of remittances in Central Asia. All these interventions must be gender-responsive and ensure that older people and people living with disabilities have access to appropriate assistance.

4) **Assessing investment needs in Ukraine's agricultural reconstruction and recovery** and work with International Financial Institutions. While the war in Ukraine is ongoing and its outcome remains unclear, the damage to the country's agrifood sector is already of an unprecedented scale. With the war-induced damage to the agriculture sector in Ukraine estimated at USD 2.2 billion (excluding irrigation and water, forestry and fisheries) and the aggregate losses totaling USD 28.3 billion (as of 1 June 2022[37]), the total reconstruction and recovery needs from the public sector were estimated at USD 18.7 billion over a ten-year period. This estimate

[35] For further materials re the FIFF, see e.g., a short note for decision makers, available at: https://www.fao.org/3/cb9444en/cb9444en.pdf, and technical background paper, available at: https://www.fao.org/3/cb9445en/cb9445en.pdf

[36] This estimate is derived from the initial estimates of price and undernourishment effects caused by a supply shock to the tune of USD 25 billion.

[37] https://documents1.worldbank.org/curated/en/099445209072239810/pdf/P1788430483791063 0b9c6040ac12428d5c.pdf

includes USD 10.04 billion, or about 54 percent of the total needs, in the first post-war years for the reconstruction (building back better) of physical assets and the provision of direct support to farmers through a combination of grants, soft-term credit lines and credit guarantees to relaunch agricultural production, while also injecting liquidity into the banking system to recover past nonperforming loans (a result of the war) and stimulate new agricultural lending. The priority medium-term and longer-run needs (up to and beyond five years) amounting to USD 8.7 billion or 46 percent of the total needs with the emphasis on the following areas: completing the reconstruction of the incurred war damage; scaling up direct support to farmers and banks (through liquidity support) during several production seasons to help agricultural production rebound; scaling up investment in agricultural public institutions for delivery of agricultural services. While it is early to consider developing investment plans, considering the extent of the war and its impact on a complex food system such as the one in Ukraine, a post-war recovery plan for Ukrainian agriculture will also need to account for future domestic demand, export market access and food processing, storage and logistics.

5) **Addressing animal health.** The war has caused disruptions to the normal animal health services, surveillance and control, resulting in delayed recognition of, and response to, important animal diseases. Large numbers of abandoned animals might contribute to transmission and spread of the disease. The most significant disease risks pertain to African swine fever (ASF), highly pathogenic avian influenza (HPAI), rabies and leptospirosis as well as food borne zoonotic diseases (i.e. brucellosis, salmonellosis). The initiative aims to address the risk of disease spread in Ukraine and neighbouring countries, which needs to be re-evaluated to apply coordinated and targeted, risk based control measures. Recommended actions include the establishment of a multi-disciplinary panel of experts to work on risk evaluation and monitoring of the situation jointly with the Government of Ukraine, setting up a system of collection information on the problems and issues related to animal production and health, enhancing disease reporting and detection through appropriate surveillance methods, evaluating the risk of transmission and spread of diseases into neighbouring countries, activating early warning systems applying the One health approach, provision of vaccine against rabies and related equipment, and a risk communication campaign to all stakeholders and the general public on risk of emergence and spread of transboundary diseases including zoonosis.

6) **Assessing food insecurity in 2023 at national and sub-national levels** in 50 countries vulnerable to the effect of the Ukraine-Russia crisis. While it has become clear that the consequences of the ongoing war are potentially far-reaching, there is an urgent need for evidence to assess the potential impacts on food security. Detailed information about the situation in different geographic areas and populations groups at the sub-national level is key to guiding countries to take effective action. To fill this information gap and guide interventions, FAO proposes a programme of work that will contribute to assessing the impact of the Ukraine-Russia crisis on the access to food of people living in the countries that are particularly vulnerable to the likely consequences of the war. The objective would be to assess food insecurity in 2023 at national and sub-national levels through the Food Insecurity Experience Scale (FIES) measurement system in 50 countries vulnerable to the crisis. The overall goal of the programme is producing and strengthening food security statistics to inform monitoring frameworks, classification systems, and monitoring and evaluation (M&E) assessments to guide policies and interventions. In terms of activities, the work would focus on the following aspects: i) data collection; ii) data analysis and technical support; and iii) dissemination and communication of results to guide actions.

7) Promoting efficient use of fertilizers. Farmers can use fertilizers more efficiently to deal with the rapid increases in fertilizer prices. **FAO proposes the use of soil nutrient maps** to achieve this end. Ethiopian producers have successfully used soil maps to identify the best blending of N, P and K fertilizers for their plots, cutting the use of fertilizers while optimizing yields. This approach should be adopted by all countries. Detailed information on the soil profile and its spatial distribution is essential for promoting sustainable agriculture, with precise inputs in quantity, space and time. In particular, accurate and updated soil attributes allow for better and more efficient fertility management, benefiting crop productivity and sustainability and at the same time reduce the quantity of fertilizers being used. The proposed initiative looks to establish a self-sustaining, government-managed national soil database to become a public good to be used by public policies, private sector and farmers. The goal is to publish the country's total land mass for which soil information is available. It also aimed to provide accurate soil management information system and advice to smallholder farmers to enhance efficiency and crop productivity and yields. FAO has also developed a **Fertilizer Trade Tracker**, an online tool

which allows countries to gauge remaining import needs and/or unrealized export availabilities for the current crop and calendar year. The estimates distinguish between the main nutrients (N, P and K), and the results are updated on a monthly basis. In response to rising import prices and growing difficulties in accessing international fertilizer markets, FAO has developed a methodology to prioritize the allocation of international fertilizer supplies to African countries.

8) **Reduce Food Loss and Waste (FLW).** We must reduce food loss and waste. Currently the high amounts of food loss and waste could feed around 1.26 billion people per year, and results in a huge negative impact on the environment. If we reduce food loss and waste by 50%, there would be sufficient fruits and vegetables available in the food supply to cover the recommended amount of 400 grams per person per day and as a result increase the resilience of our agrifood systems. This proposal has therefore the overarching objective to create the evidence base using the methodology developed by the FAO for measuring and monitoring progress against SDG target 12.3 and formulate recommendations for policy- and decision-making in line with the SOFA 2019 guiding principle to find solutions for reducing food loss and waste. The expected impact is that countries take informed decisions on loss and waste reduction interventions to structurally reduce the level of food losses and waste of key commodities and ultimately improve the efficiency of their main supply chains as well as the food security of selected population groups, and to create new jobs opportunities while resolving this problem.

APPENDIX

Box 1: Dietary sourcing flexibility index (DSFI)

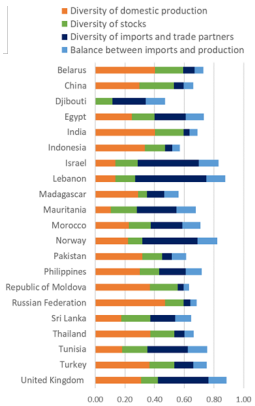
To measure a country's absorptive capacity to shocks, FAO developed the dietary sourcing flexibility index (DSFI), which measures the diversity of food supply in terms of sourcing channels and food commodities. A high value indicates multiple possible sourcing pathways and thus a high capacity to absorb shocks and ensure food availability to consumers. It also highlights the role of international trade in enhancing absorptive capacity in the face of domestic and external disruptions.

The DSFI is composed of different components that contribute to food supply diversity: domestic supply (i.e., domestic production and stocks) and imports. An additional component reflects the balance between domestic supply and imports, whereby the closer we are to a 50/50 split between the two, the larger the balance contributing to the total DSFI value. Figure 1 illustrates, for selected countries that import large amounts of maize and wheat from Russia and Ukraine, the DSFI for all food items (measured for kilocalories). The horizontal axis indicates the contributions of the above-mentioned components to the total value of the DSFI.

Despite all depending on Russia and Ukraine for grain supply, Figure B.1 (on the left hand side) shows that countries diversify their sources of food in different ways, with some appearing more able to absorb disruptions triggered by the war. For instance, Israel, Lebanon, Norway and the United Kingdom all rely heavily on imports (between one-third and 60 percent of all kilocalories are imported) but, at the same time, with high diversification across trade partners and commodities (illustrated by the large size of both blue bars). These countries may therefore be less affected since their DSFI scores are high and balanced between different components, indicating that they have multiple options to replace the reduction in imports from Ukraine and Russia. Conversely, countries like Indonesia, Madagascar, Pakistan and the Republic of Moldova are among those with lowest diversity of imports. In these countries, the flexibility of a food system is mostly determined by what is internally produced for the domestic market. Indeed, imports only represent between 4–23 percent of all kilocalories supplied to consumers, although imports of specific commodities and from specific trade partners – such as maize and wheat from Russia and Ukraine – still matter.

Thus, immediate disruptions must be absorbed through the diversification of domestic production and existing food stocks. In the longer term, engagement with new international trade partners – preferably with diverse agro-climatic and socio-political profiles – can further improve their resilience. Those with low diversity of food stocks (e.g., Madagascar) could also invest in stocks to improve their immediate capacity to respond to disruptions.

Figure B.1.
DSFI for kilocalories, all food items, 2016–2018 (left) and economic access to a healthy diet (right)



	Percentage of people unable to afford a healthy diet in 2019	Percentage of people at risk of not affording if purchasing power drops by one-third
Belarus	0.5	4.1
China	15.0	19.1
Djibouti	65.3	19.2
Egypt	85.3	9.6
India	70.7	17.0
Indonesia	65.9	18.9
Israel	1.2	2.0
Laos	80.8	11.2
Madagascar	96.5	2.2
Mauritania	67.5	20.7
Morocco	11.1	18.9
Norway	0.4	0.2
Pakistan	75.9	15.3
Philippines	64.5	18.2
Republic of Moldova	4.0	19.4
Russian Federation	2.3	8.0
Sri Lanka	48.9	24.7
Thailand	16.8	25.5
Tunisia	15.3	24.1
Turkey	8.5	11.4
United Kingdom	0.4	0.2

Source: FAO. 2021. The State of Food and Agriculture 2021. Making agrifood systems more resilient to shocks and stresses. Rome.

Supply disruptions following the Ukraine–Russia war will likely have an impact on food affordability, especially food that makes up a healthy diet, as prices increase and remain volatile. This can be particularly relevant for the poorer segments who spend most of their incomes on food. The Table contained in Figure B.1 analyses the extent to which countries face the challenge of unaffordability of healthy diets in normal times and/or the challenge of risking unaffordability in the face of a shock that raises food prices or reduces income. For countries like Egypt, India, Laos, Madagascar and Pakistan, more than 70 percent of the population already cannot access a healthy diet and are in dire need of greater affordability. Other countries have both a large share of the population who cannot afford a healthy diet but also large sectors at risk of not being able to afford one if their purchasing power drops by one-third (e.g., Mauritania, Sri Lanka, Thailand, Djibouti and Indonesia). These populations may be negatively affected by the impact of the war on food prices, both directly in terms of the impact on the world prices of wheat and maize, and indirectly for all food items through increasing energy prices.

INFORMATION NOTE

THE IMPORTANCE OF UKRAINE AND THE RUSSIAN FEDERATION FOR GLOBAL AGRICULTURAL MARKETS AND THE RISKS ASSOCIATED WITH THE WAR IN UKRAINE

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