Food and Agriculture Organization of the United Nations

Rome, 2022

Information Note

The importance of Ukraine and the Russian Federation for global agricultural markets and the risks associated with the current conflict

Executive Summary

1. Market structure, trade profiles and recent price trends

1.1 Market shares

- 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 they both play leading supply roles in global markets of foodstuffs and fertilisers, where exportable supplies are often concentrated in a handful of countries. This concentration could expose these markets to increased vulnerability to shocks and volatility.
- In 2021, either the Russia Federation or Ukraine (or both) ranked amongst the top three global exporters of wheat, maize, rapeseed, sunflower seeds and sunflower oil, while the Russian Federation also stood as the world's top exporter of nitrogen fertilizers and the second leading supplier of both potassic and phosphorous fertilizers.

1.2 Trade profiles

- Many countries that are highly dependent on imported foodstuffs and fertilizers, including several that fall into the Least Developed Country (LDC) and Low-Income Food-Deficit Country (LIFDC) groups, rely on Ukrainian and Russian food supplies to meet their consumption needs. Many of these countries, already prior to the conflict, had been grappling with the negative effects of high international food and fertilizer prices.

2 Risk analysis: Assessing the risks emanating from the conflict

2.1 Trade risk

- In Ukraine, the recent escalation of conflict has already led to port closures, the suspension of oilseeds crushing operations and the introduction of export licensing requirements for some crops, all of which could take a toll on the country's exports of grains and vegetable oils in the months ahead. It also uncertain whether Ukraine will be able to harvest its crops during protracted conflict. Much uncertainty also surrounds Russian export prospects going forward, given sales difficulties that may arise as a result of economic sanctions imposed on the country.

2.2 Price risk

- FAO's simulations gauging the potential impacts of a sudden and steep reduction in grain and sunflower seed exports by the two countries indicate that these shortfalls could only be partially compensated by alternative origins during the 2022/23 marketing season. The capacity of many of these origins to boost output and shipments may be limited by high production input costs. Worryingly, the resulting global supply gap could push up international food and feed prices by 8 to 22 percent above their already elevated levels.
- If the conflict keeps crude oil prices at high levels and prolongs the two countries' reduced global export participation beyond the 2022/23 season, a considerable supply gap would remain in global grain and sunflower seed markets, even as alternative producing countries expand their output in response to the higher prices. This would keep international prices elevated well above baseline levels.

2.3 Logistical risks

- In Ukraine, there are also concerns that the conflict may result in damages to inland transport infrastructure and seaports, as well as storage and processing infrastructure. This is all the more so given the limited capacity of alternatives, such as rail transport for seaports or smaller processing facilities for modern oilseeds crushing facilities, to compensate for their lack of operation.
- More generally, apprehensions also exist regarding increasing insurance premia for vessels destined to berth in the Black Sea region, as these could exacerbate the already elevated costs of maritime transportation, compounding further on the final costs of internationally sourced food paid by importers.

2.4 Production risks

- Although early production prospects for 2022/23 winter crops are favourable in both Ukraine and the Russian Federation, in Ukraine, the conflict may prevent farmers from attending to their fields, harvesting and marketing of their crops, while disruptions to essential public services could also negatively affect agricultural activities.
- FAO's preliminary assessment suggests that, as a result of the conflict, between 20 and 30 percent of the areas under winter cereals, maize and sunflower seed in Ukraine will either not be planted or remain unharvested during the 2022/23 season, with the yields of these crops also likely to be adversely affected.
- In the case of the Russian Federation, although no major disruption to crops already in the ground appears imminent, uncertainties exist over the impact that the international sanctions imposed on the country will have on food exports. Over the medium term, the loss of export markets that they may entail could depress farmer incomes, thereby negatively affecting future production decisions.

2.5 Humanitarian risks

- The conflict is set to increase humanitarian needs in Ukraine, while deepening those of millions of people that prior to its escalation were already displaced or requiring assistance due to the more than eight-year conflict in the eastern part of the country. By directly constraining agricultural production, limiting economic activity, and raising prices, the conflict will further undercut the purchasing power of local populations, with consequent increases in food insecurity and malnutrition.
- Humanitarian needs in neighbouring countries, where displaced populations are seeking refuge, are also set to increase.
- Globally, if the conflict results in a sudden and prolonged reduction in food exports by Ukraine and the Russian Federation, it could exert additional upward pressure on international food commodity prices to the

detriment of economically vulnerable countries, in particular. FAO's simulations suggest that under such a scenario, the global number of undernourished people could increase by 8 to 13 million people in 2022/23, with the most pronounced increases taking place in Asia-Pacific, followed by sub-Saharan Africa, and the Near East and North Africa.

2.6 Energy risks

- The Russian Federation is also a key player in the global energy market. As a highly energy-intensive industry, especially in developed regions, agriculture will inevitably be affected by the sharp increase in energy prices that has accompanied the conflict.
- Agriculture absorbs high amounts of energy directly, through fuel, gas and electricity use, and indirectly, by using agri-chemicals such as fertilisers, pesticides and lubricants.
- With prices of fertilizers and other energy-intensive products rising as a consequence of the conflict, overall input prices are expected to experience a considerable boost. The higher prices of these inputs will first translate into higher production costs and eventually into higher food prices. They could also lead to lower input use levels, depressing yields and outputs in the 2022/23 crop season, and giving further upside risk to the state of global food security in the coming years.
- Higher energy prices also make agricultural feedstocks (especially maize, sugar and oilseeds/vegetable oils) competitive for the production of bio-energy and, given the large size of the energy market relative to the food market, this could pull food prices up to its energy parity equivalent.

2.7 Exchange rate, debt, and growth risks

- The Ukrainian Hryvnia reached a record low against the US dollar in early March 2022, with likely repercussions for Ukrainian agriculture, boosting its export competitiveness and weighing on its ability to import. Although their extent remains unclear at this stage, conflict-induced damages to the country's productive capacities and infrastructure are expected to entail very high recovery and reconstruction costs.
- The economic sanctions imposed on the Russian Federation have also led to a significant depreciation of the Russian Rouble. Although this should make Russian exports of agricultural commodities more affordable, a lasting Rouble depreciation would negatively affect investment and productivity growth prospects in the country.
- Weakening economic activity and a depreciated Rouble are also expected to have serious effects on countries in Central Asia through the reduction of remittance flows, as for many of these countries remittances constitute a significant part of gross domestic product (GDP).
- Agriculture is the economic backbone of many developing countries, the majority of which rely on the US dollar for their borrowing needs. As such, a lasting appreciation of the USD vis-à-vis other currencies may have negative significant economic consequences for these countries, including for their agrifood sectors. Moreover, the potential reduction of GDP growth in several parts of the world will affect the global demand for agrifood products with negative consequences for global food security, while also likely reducing the availability of funds for development, in particular if military expenses increase globally.

3. Policy recommendations

- In order to prevent or limit the conflict's detrimental impacts on the food and agricultural sectors of Ukraine and the Russian Federation, every effort should be made to keep international trade in food and fertilizers open to meet domestic and global demand. Supply chains should be kept fully operational, including the protection of standing crops, livestock, food processing infrastructure, and all logistical systems.
- In order to absorb conflict-induced shocks and remain resilient, countries that depend on food imports from Ukraine and the Russian Federation should diversify the sources of their food supplies by relying on other exporting countries, on existing food stocks or by enhancing the diversity of their domestic production bases.
- The food security impacts of the conflict on vulnerable groups necessitates timely monitoring and well-targeted social protection interventions to alleviate the hardship caused by the conflict and to foster a recovery from it. To assist the internally displaced, refugees, and groups directly affected by the conflict, the reach of Ukraine's national social protection system should be expanded by registering additional population groups within the Unified Social Information System.
- In countries hosting refugees, access to existing social protection systems and job opportunities should also be eased by lifting legal access barriers and, where needed, by increasing the capacity of host countries' social protection systems to absorb additional caseloads.
- Countries affected by potential disruptions ensuing from the conflict must carefully weigh measures they put in place against their potentially detrimental effect on international markets including over the longer term. Particularly, export restrictions must be avoided; they exacerbate price volatility, limit the buffer capacity of the global market, and have negative impacts over the medium term.
- Market transparency and policy dialogue should be strengthened as they play key roles when agricultural commodity markets are under uncertainty and disruptions need to be minimised to ensure that international markets continue to function properly and trade in food and agricultural products to flow smoothly.

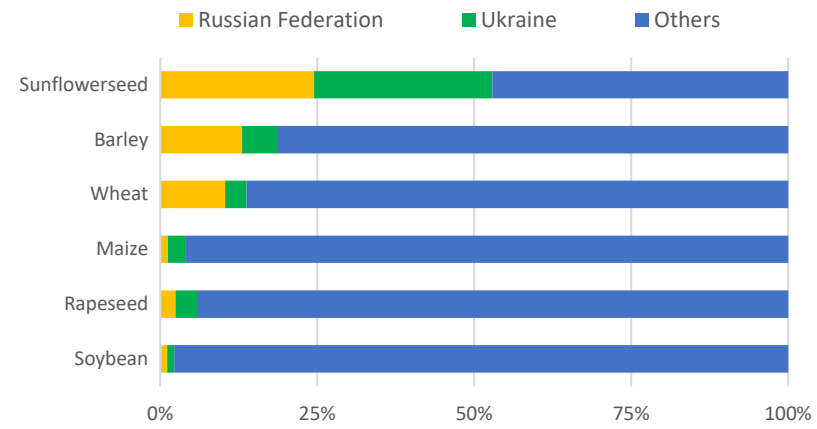
Information Note

The importance of Ukraine and the Russian Federation for global agricultural markets and the risks associated with the current conflict

2. Market structure and trade profiles[1]

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. Combined, the two countries, on average and respectively, accounted for 19, 14 and 4 percent of global output of these crops between 2016/17 and 2020/21. In the oilseed complex, their contribution to global production was particularly important for sunflower oil, with just over half of world output originating, on average, in the two countries during this period. Their average shares in global rapeseed and soybean production are comparatively more limited, standing at 6 and 2 percent, respectively.

Figure 1: Share in global production of selected crops
(2016/17-2020/21 Avg.)



Source: FAO XCBS system

1.1 Market shares

The critical role that the Russian Federation and Ukraine play in global agriculture is all the more evident from an international trade perspective (see figures 2 to 5 and tables 1 and 2). Both countries are net exporters of agricultural products, and they both play leading roles in supplying global markets in foodstuffs, for which exportable supplies are often concentrated in a handful of countries, exposing these markets to increased risks of vulnerability to shocks and volatility. For instance, in the wheat and meslin sector, where the top seven exporters combined accounted for 79 percent of international trade in 2021, the Russian Federation stands out as the top

[1] Information update as of 8 March 2022.

global wheat exporter, shipping a total of 32.9 million tonnes of wheat and meslin (in product weight), or the equivalent of 18 percent of global shipments (see figure 6). Ukraine stood as the fifth largest wheat exporter in 2021, exporting 20 million tonnes of wheat and meslin and with a 10 percent global market share.

The prominence of the two countries in the world trade arena is similarly noteworthy in global markets of maize, barley and rapeseed, and even more so in the sunflower oil sector, where their substantial production bases endowed them with a combined world export market share of close to 64 percent. The high export concentration that characterises food commodity markets is also mirrored by the fertilizer sector, where the Russian Federation plays a leading supplier role. In 2021, the Russian Federation ranked as the top exporter of nitrogen (N) fertilizers and the second leading supplier of both potassic (K) and phosphorous (P) fertilizers, as shown in figures 12 to 14.

2.2 Trade profiles

Both 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 exhibited 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 wheat imports of many countries situated in North Africa and Western and Central Asia are highly concentrated towards supplies from the Russian Federation and Ukraine. Overall, almost 50 nations are dependent on both countries for over 30 percent of their wheat import needs.

The very high likelihood of disruptions to Ukraine's grain and oilseed harvests, combined with the threat of trade restrictions on Russia's exports of cereals and other basic foodstuffs (as reflected in either record or near-record benchmark price quotations – see next section) would jeopardise the food security of many countries around the world, and of discern, to many economically vulnerable countries.

As for fertilisers, the reliance at the global level on Russian N, P and K, is less pronounced with some 25 countries having a dependency rate of 30 percent or more. As shown in figure 16, Ukraine does not feature heavily as a dependent fertiliser exporter, with the exception of purchases by Benin and a handful of countries in the European Union (EU). Many countries located in Eastern Europe and Central Asia have an import dependency of well over 50 percent on Russian fertilisers, for all three ingredients. Again, with the prospect of a trade embargo on Russia's exports, or a self-imposed export restriction, the global fertiliser market would be subject to considerable disruptions. This prospect is already reflected in record urea (N) benchmark fertiliser quotations.

Record (natural) gas – the main source of fuel for N-fertilizer production – could render once-unprofitable investment in energy production commercially viable, such as fracking installations in the United States of America. This would eventually ease international fertiliser prices, but the term of supply response is not expected to be quick, and fertiliser shortages could extend to crops this year and in to the next.

The upshot is that countries that are highly dependent on the Russian Federation and Ukraine for essential food and fertiliser supplies will need to prepare contingency plans to source from other countries, in the expectation that these countries can exact a rapid supply response.

Figure 2: Agricultural imports of the Russia Federation in 2021

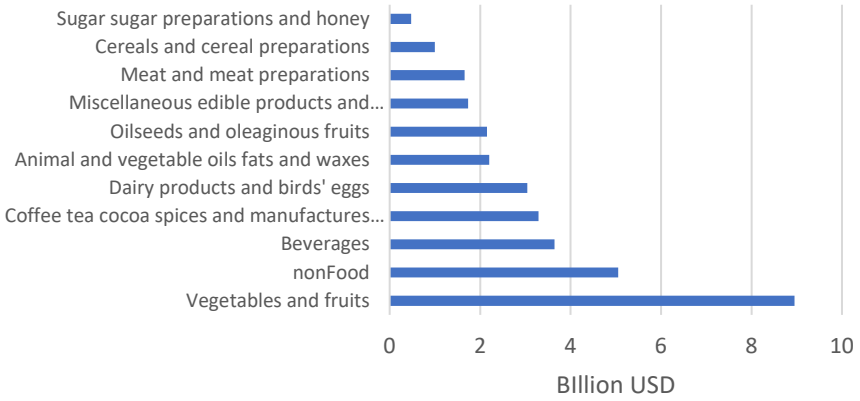


Figure 3: Agricultural imports of Ukraine in 2021

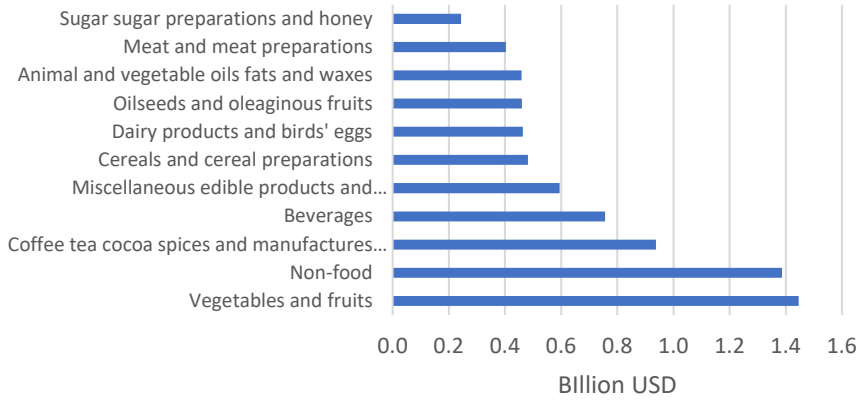


Figure 4: Agricultural exports of the Russia Federation in 2021

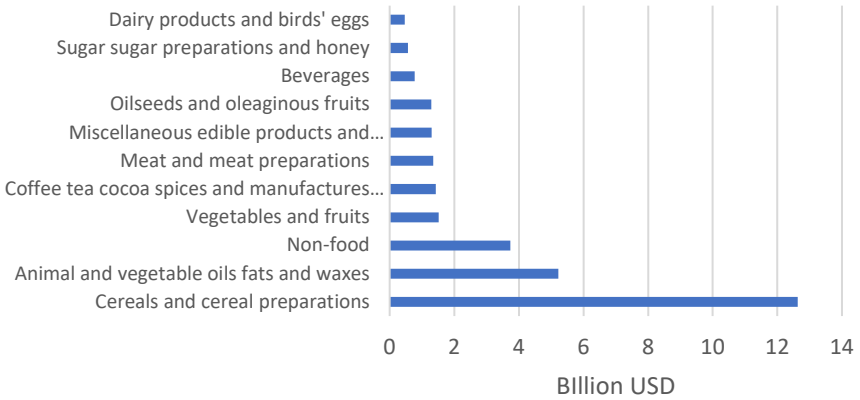
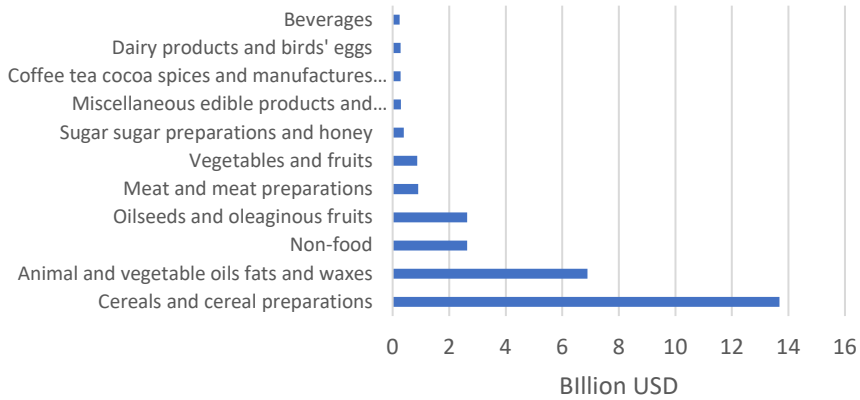


Figure 5: Agricultural exports of Ukraine in 2021



Source: Trade Data Monitor (TDM), FAO calculations

Table 1: Russian Federation: exports of selected commodities (thousands of metric tonnes)

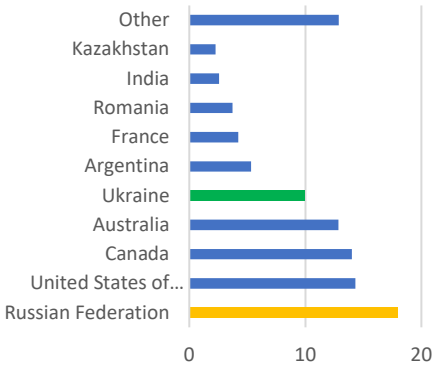
Commodity	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Wheat	2020	2,101	1,576	3,361	4,765	605	214	2,337	4,671	5,015	4,643	4,290	4,867	38,445
	2021	3,083	4,537	1,150	802	458	2,228	1,882	5,221	4,581	2,834	3,190	2,951	32,917
Barley	2020	469	239	307	863	135	140	712	593	885	721	394	549	6,007
	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

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

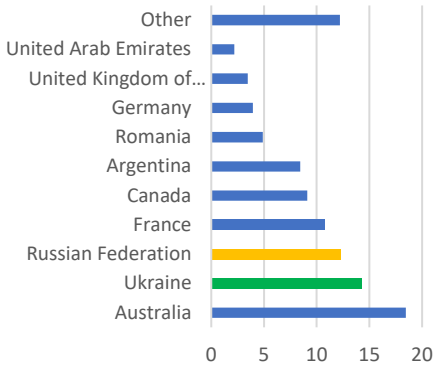
Source: Trade Data Monitor

Figure 6: Top 10 exporters of Wheat



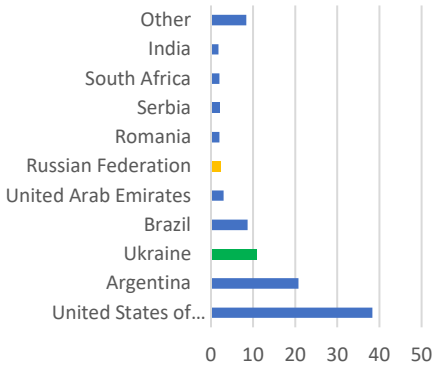
% share in global exports in 2021

Figure 7: Top 10 exporters of Barley



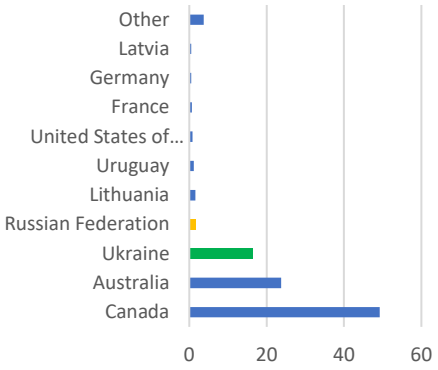
% share in global exports in 2021

Figure 8: Top 10 exporters of Maize



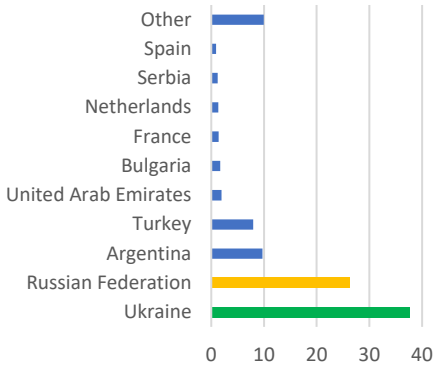
% share in global exports in 2021

Figure 9: Top 10 exporters of Rape seeds



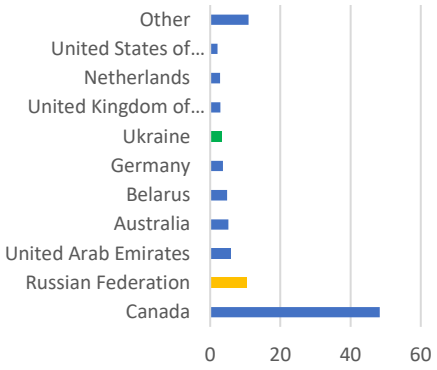
% share in global exports in 2021

Figure 10: Top 10 exporters of Sunflower seeds oil



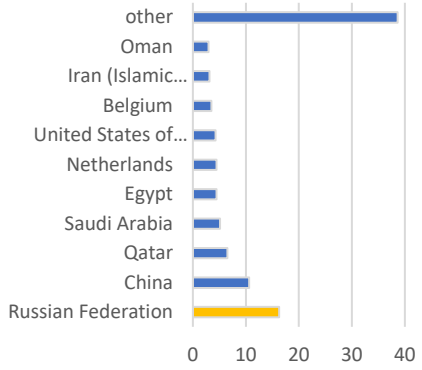
% share in global exports in 2021

Figure 11: Top 10 exporters of Rape seeds oil



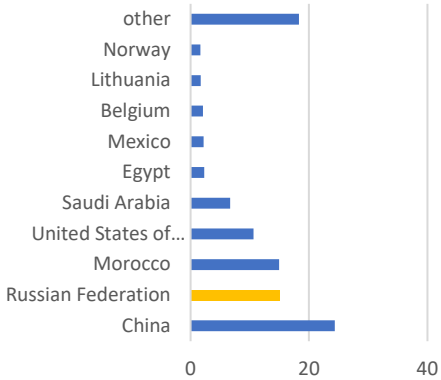
% share in global exports in 2021

Figure 12: Top 10 exporters of N-Fertilizer



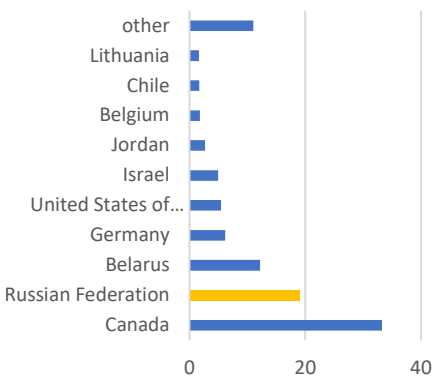
% share in global exports in 2021

Figure 13: Top 10 exporters of P-Fertilizer



% share in global exports in 2021

Figure 14: Top 10 exporters of K-Fertilizer



% share in global exports in 2021

Source: Trade Data Monitor (TDM), FAO calculations

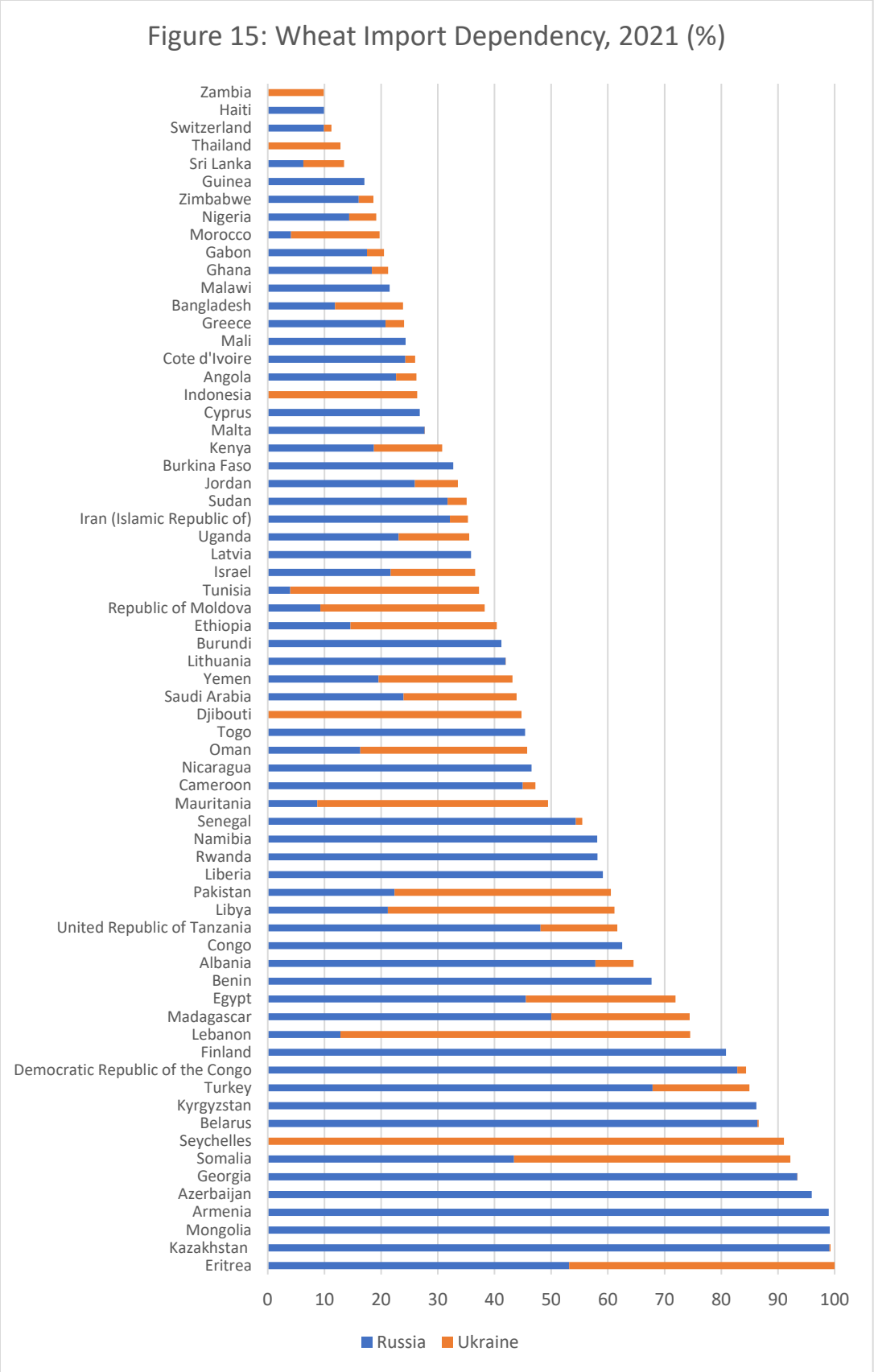
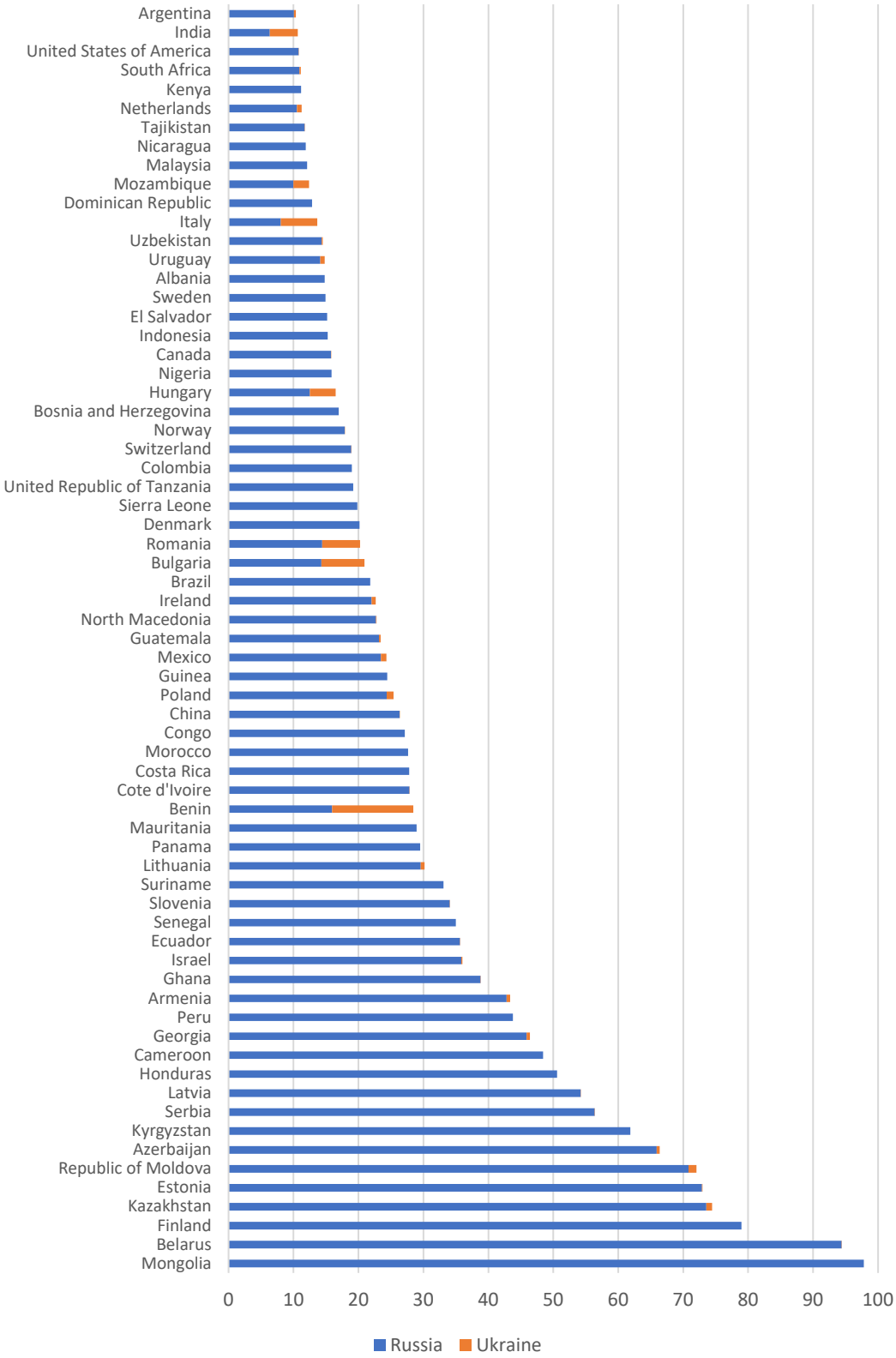


Figure 15: Wheat Import Dependency, 2021 (%)
Zambia
Haiti
Switzerland
Thailand
Sri Lanka
Guinea
Zimbabwe
Nigeria
Morocco
Gabon
Ghana
Malawi
Bangladesh
Greece
Mali
Cote d'Ivoire
Angola
Indonesia
Cyprus
Malta
Kenya
Burkina Faso
Jordan
Sudan
Iran (Islamic Republic of)
Uganda
Latvia
Israel
Tunisia
Republic of Moldova
Ethiopia
Burundi
Lithuania
Yemen
Saudi Arabia
Djibouti
Togo
Oman
Nicaragua
Cameroon
Mauritania
Senegal
Namibia
Rwanda
Liberia
Pakistan
Libya
United Republic of Tanzania
Congo
Albania
Benin
Egypt
Madagascar
Lebanon
Finland
Democratic Republic of the Congo
Turkey
Kyrgyzstan
Belarus
Seychelles
Somalia
Georgia
Azerbaijan
Armenia
Mongolia
Kazakhstan
Eritrea
0
10
20
30
40
50
60
70
80
90
100
Russia
Ukraine

Figure 16: Fertiliser Import Dependency, 2021 (%)



2.3 Recent trends in international prices of basic foodstuffs and agricultural inputs

As measured by the FAO Food Price Index (FFPI), international export quotations of basic foodstuffs have seen near-uninterrupted increases since the second half of 2020 and, in nominal terms, in February 2022 they reached an all-time high. Although the prices of all the commodity groups[2] encompassed by the FFPI have registered gains since the latter part of 2020, the global cereal and vegetable oil markets, in which both Ukraine and the Russian Federation play significant roles, have been amongst those most affected. Over the course of 2021, international prices of wheat and barley rose 31 percent over their corresponding levels in 2020, each, 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 case of wheat, additional support stemmed from uncertainty regarding export measures put in place by selected suppliers in a bid to contain domestic inflationary pressure.

Figure 17: International grain price indices
(2014-16=100)

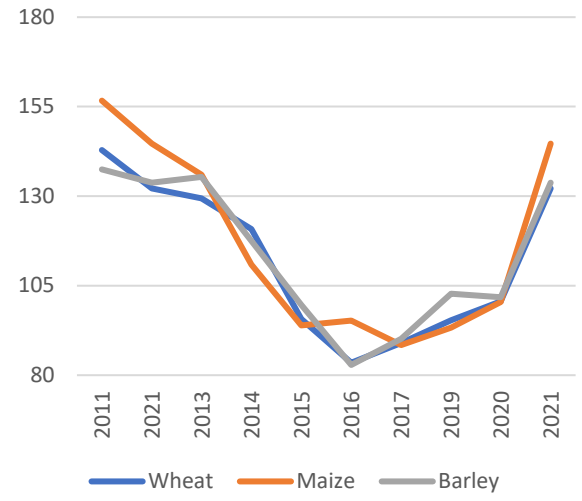
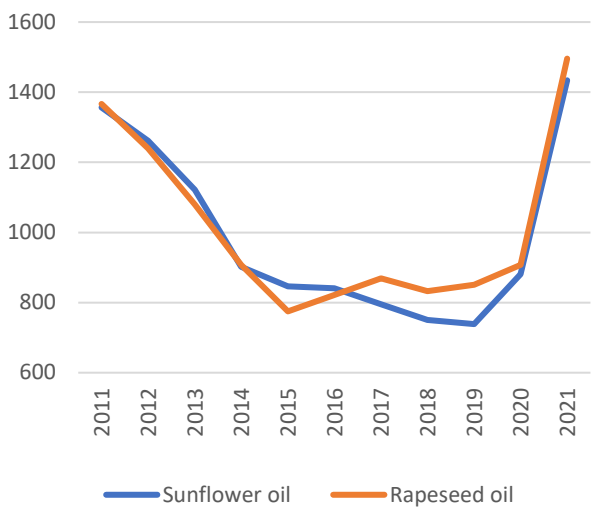


Figure 18 :International vegetable oil prices
(USD/tonne)



Source: FAO, International Grains Council (IGC), Oil World

During the first week of March 2022, U.S. wheat futures climbed past their record highs reached in 2008. The strength prevailing in wheat markets, that is also influencing maize quotations, which increased by 44 percent above their year-earlier levels in 2021, received a further boost from production uncertainties in South America, higher input and transport costs, as well as port disruptions. In the rapeseed oil and sunflowerseed oil sectors, annual price increases registered in 2021 were in the order of 65 and 63 percent, respectively, being spurred by protracted global supply tightness and robust demand, and in the case of rapeseed oil also from the biodiesel sector. Currently, sunflower oil is being traded at near-record highs. While sunflowerseed oil is highly substitutable with other vegetable oils, wheat is not. Wheat is a staple food for over 35 percent of the world's population, and the lack of substitutability and dietary diversity will likely compound the pressure on wheat prices.

International benchmark prices of fertilizers have similarly risen throughout 2021, with many quotations reaching all-time highs. The most notable increases were registered for nitrogen fertilizer. Despite some recent easing, the

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

prices of urea, a key N fertilizer, have more than trebled over the past 12 months, with prices of phosphorous fertilizer rising in tandem over the same period, while those of potash (K-fertilizer) remained less affected. Similar to 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 influencing fertilizer prices upwards. On the supply side, high and volatile energy prices have also been at play, especially for natural gas, which plays a pivotal in the production of N-fertilizer and whose prices underwent a sharp increase in 2021 due to a host of reasons, including weather-induced disruptions to renewable energy and coal production. Additional upward pressure on fertilizer prices has stemmed from disruptions and high transportation costs following the imposition of export restrictions and due to sharp increases in bulk and container freight rates caused by the COVID-19 pandemic.

Figure 19: International urea prices (2014-2016 = 100)

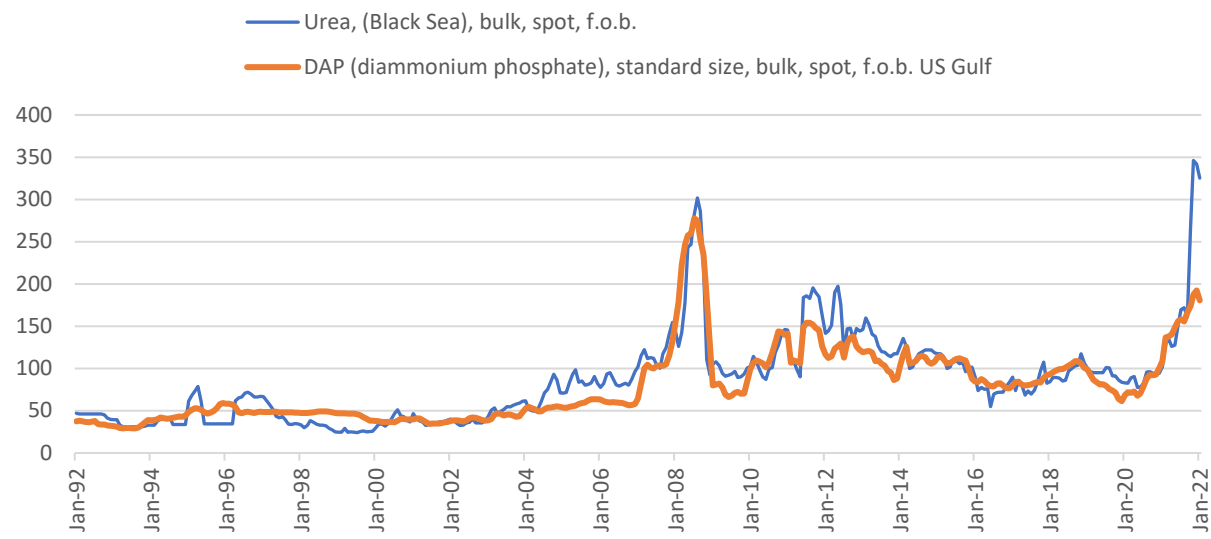
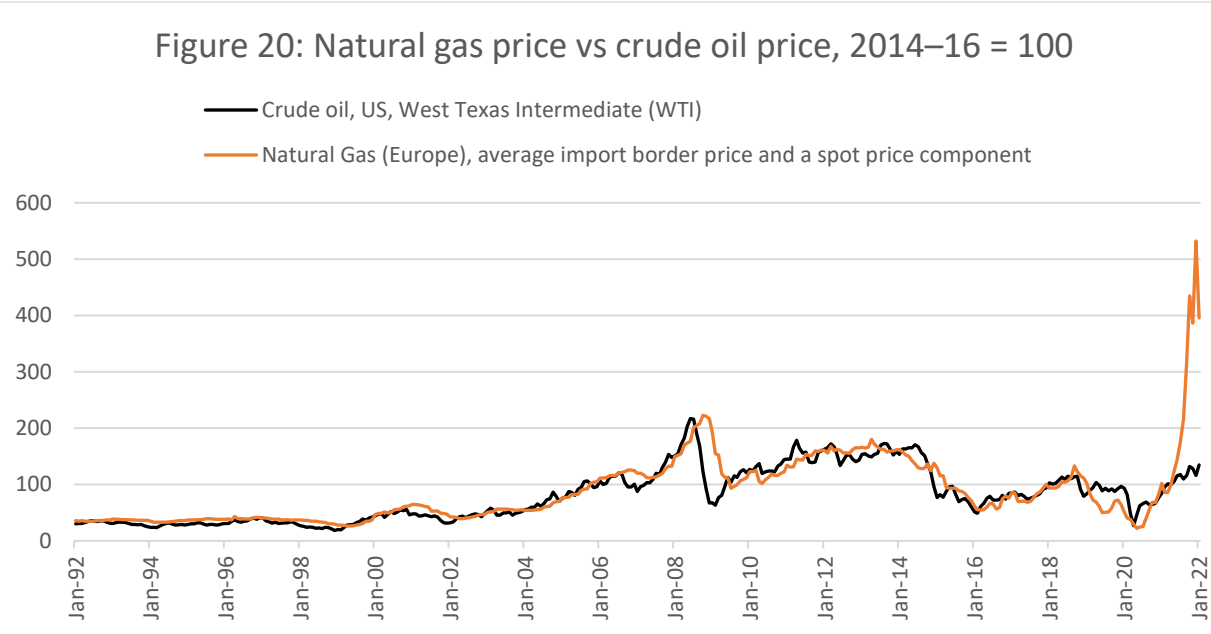


Figure 20: Natural gas price vs crude oil price, 2014–16 = 100



Source: Index Mundi

2. Risk analysis: Assessing the risks emanating from the conflict

2.1 Trade risks

Conflict-induced disruptions to food exports by the Russian Federation and Ukraine expose global food markets to heightened risks of tighter availabilities, unmet import demand and higher international food prices.

Based on FAO's forecasts for the ongoing 2021/22 season (July-June) before the conflict and on the pace of exports to date, between March and June 2022, Ukraine was expected to export approximately 6 million tonnes of wheat while the Russian Federation was estimated to ship 8 million tonnes. However, port closures in Ukraine and anticipated sales difficulties in the Russian Federation because of economic sanctions call into question whether these exports will actually be realized. While a sudden and steep reduction in shipments by the two countries could increase exports by alternate origins, such as the European Union (EU), and potentially Canada and the United States of America (USA), the potential for these exporters to fully make-up for lower shipments by Ukraine and the Russian Federation is foreseen to be limited. Indeed, wheat inventories are already especially tight in Canada and the USA following reduced harvests in 2021/22. Among other suppliers, Argentina's exports in 2021/22 will also likely remain limited by the Government efforts to control domestic inflation, while Australia has reached its maximum shipment capacity logistically. In such a setting of significantly reduced global export availabilities, other countries could enforce measures (formal or informal) to slow or restrict exports in order to protect domestic supplies and/or address domestic price inflation.

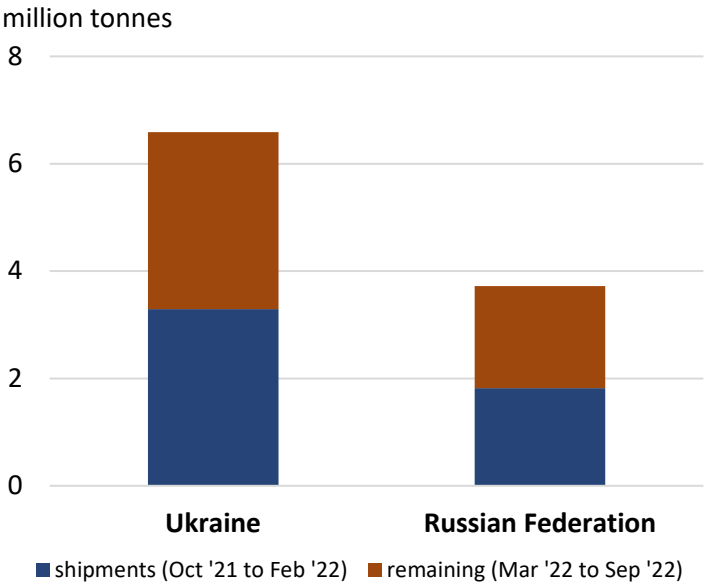
The resulting supply gaps for importers may be especially important for buyers in the Near East and North Africa and, given the importance of wheat as a food staple, they could result in some countries increasing imports now in order to secure supplies in fear that wheat markets will get tighter and prices rise further. This would put additional pressure on global supplies. Of the top global wheat importers, Egypt, Turkey, Bangladesh and the Islamic Republic of Iran source, on average (2016/17 – 2020/21), 60 percent or more of their wheat imports from Ukraine and the Russian Federation. Based on 2021/22 import forecasts and actual imports for the first half of the marketing year, Egypt, Turkey, Bangladesh and the Islamic Republic of Iran have roughly 6.6, 4.0, 3.7, and 1.7 million tonnes, respectively, of outstanding imports for the second half of 2021/22 marketing season. Lebanon, Tunisia, Yemen, Libya and Pakistan also rely heavily on Ukraine and the Russian Federation for their wheat imports, sourcing on average (2016/17-2020/21) roughly half of their wheat purchases from Ukraine and the Russian Federation.

As for maize, based on FAO's forecasts before the conflict and on export data, for the remainder of the 2021/22 season, Ukraine and the Russian Federation were expected to export approximately 14 million tonnes and 2.5 million tonnes of maize, respectively. As in the case of wheat flows, it is unlikely that these exports, or at least the large majority, will be realized. While Russia's maize exports do not make up a significant portion of global maize trade, Ukraine's expected maize exports in 2021/22 were forecast to make up 18 percent of the 2021/22 global trade in the grain, which would have made the country the world's third largest maize exporter.

Maize supply gaps for importers could be especially relevant for China and the EU (Ukraine's primary maize export destination), as well as also for Egypt and Turkey, which on average (2016/17 – 2020/21) source roughly one third of their maize imports from Ukraine. Based on 2021/22 import forecasts and imports for the first half of the marketing year, China, the EU, Egypt and Turkey have roughly 11.5, 3.7, 4.6, and 1.6 million tonnes, respectively, of outstanding imports for the second half of 2021/22. These countries will need to meet their import needs from other suppliers.

Shifts in demand to other major maize exporters, including Argentina, Brazil and the USA, are expected to occur. While Argentina's export levels for 2021/22 may remain limited by the Government's efforts to control domestic inflation, increased exports could be expected from Brazil and the USA. It is likely that Brazil and the USA will only be able to partially meet the unfilled 14 million tonnes of maize exports from Ukraine in 2021/22. The global maize 2021/22 trade forecast may potentially be reduced, based on expectations that the export loss from Ukraine may not be fully compensated for by other exporters, and high prices may deter importers from importing maize for feed and instead shifting to other cheaper feed options.

Figure 21: FAO forecasts of sunflower oil exports for 2021/22

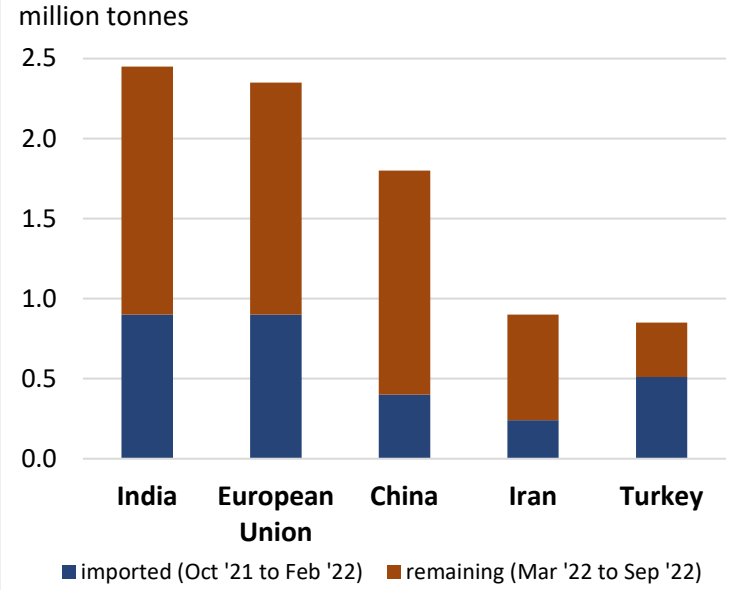


As regards sunflowerseed oil, prior to the escalation of the conflict, improved supply situations would have enabled Ukraine and the Russian Federation to raise their exports of the product in 2021/22 (October-September) to 6.6 and 3.7 million tonnes, respectively. FAO estimates that about half of these volumes were already shipped by the countries between October 2021 and February 2022, leaving a balance of 3.3 and 1.9 million tonnes to be respectively exported by Ukraine and the Russian Federation in the remaining seven months of the 2021/22 marketing year, were FAO's forecasts to be realized. However, much uncertainty surrounds current export prospects. In Ukraine, shipments of sunflowerseed oil have come to a virtual halt due to conflict-induced logistic bottlenecks at port facilities and the suspension of crushing operations across the country. In addition, as of 5 March 2022, Ukrainian sunflowerseed oil exports were also subject to licensing requirements. Yet, details as to how these export licenses will be issued are yet to emerge. In the case of the Russian Federation, questions also exist on the potential impact of the financial sanctions on sunflowerseed oil exports.

Given the significant export shares of Ukraine and the Russian Federation in the global sunflowerseed oil market, any disruption to their shipments would have notable implications for major sunflower oil importers, namely India, the European Union, China, the Islamic Republic of Iran and Turkey. FAO estimates that, combined, these major sunflower oil importing countries still require inflows to the tune of 5.4 million tonnes between March and September 2022. Should these import requirements not be fulfilled through Ukrainian and Russian supplies, these importing countries would have to shift to other suppliers of sunflowerseed oil or to other vegetable oils. This

implies that the impacts of the conflict could go beyond the sunflowerseed oil sector, with spillover effects onto other vegetable oils, such as palm, soy, and rapeseed oils. Recent international vegetable oil price developments suggest that global markets are already reacting to the conflict along these lines, with sunflowerseed oil quotations from Argentina, the world's third largest exporter, rising sharply since late February, in tandem with a marked increase in international palm oil quotations.

Figure 22: FAO forecasts of sunflower oil imports for 2021/22



As for rapeseed and derived products, although Ukraine stands out as the world's third largest rapeseed exporter, its share in global rapeseed trade is more limited, suggesting that there could be greater room for alternate suppliers, such as Canada and Australia, to compensate for potential reductions in Ukrainian rapeseed exports. In addition, as Ukraine's shipments were heavily front-loaded, the country's export programme for the 2021/22 marketing season (July/June) was essentially completed before the conflict escalated. While this would imply that the scope for immediate disruptions to global rapeseed trade would be more limited, it remains to be seen whether Ukrainian rapeseed shipments in the forthcoming 2022/23 marketing season would remain unaffected. On the other hand, in the global rapeseed oil market, where the Russian Federation accounts for 10 percent of world trade outflows, much like sunflowerseed oil shipments, uncertainties exist regarding the potential impact of the sanctions imposed on the country.

2.2 Price risks

2.2.1 Gauging the possible effects of trade risks on world market prices in the short term t(2022/23 marketing year)

To assess the potential impact on international food prices caused by a conflict-induced reduction in cereal and vegetable oil exports from Ukraine and the Russian Federation, simulations were undertaken using the Aglink-Cosimo modelling system. Two scenarios were simulated to account for a range of conceivable export developments during the 2022/23 marketing year, namely:

1) A moderate shock: under which wheat and maize exports from Ukraine and the Russian Federation, combined, underwent a 10 million tonne reduction each, while their exports of other coarse grains were reduced by 2.5 million tonnes and those of other oilseeds by 1.5 million tonnes;[3] and
2) A severe shock, entailing a 25 million tonne reduction in their combined exports of wheat and of maize in 2022/23, alongside a 5 million tonne decrease in their shipments of other coarse grains and a 3 million tonne cut to those of other oilseeds.

Both scenarios were anchored on the assumption that reference crude oil prices would reach USD 100 per barrel in 2022/23, up from an initial baseline value of USD 75 per barrel. On this basis, the global market model calculated new global market equilibriums, projecting international prices, global production, consumption and trade volumes for cereals, oilseeds, meat, dairy products, sugar, cotton and biofuels. The results of these two scenarios, illustrated in figure 23, indicate deviations of international reference prices from the baseline, which itself already pointed to international prices of critical food commodities remaining close to their elevated levels of 2021, with the exception of other oilseeds, whose prices were seen alleviating more decisively from their exceptionally high levels of 2021. These results indicate that:

a) The global reference price of fertilizer would undergo a 13 percent increase in 2022/23, relative to its already elevated baseline level, in response to the more expensive production inputs implied by the higher crude oil price, but also by the higher crop prices. This increase would influence production costs for 2022/23 growing seasons.
b) In this input price context, the capacity of alternate origins to boost output and exports to compensate for reduced Russian and Ukrainian shipments could be only partial and would vary depending on the magnitude of the market shock and the relative elasticities of supply and demand. Under the moderate shock scenario, this would result in global trade volumes of wheat contracting by 8 million tonnes, as only an additional 2 million tonnes would by supplied by alternative exporters. For maize, the world trade reduction would amount to 7 million tonnes. Under the more severe scenario, global trade volumes would fall by 16 million tonnes for wheat and by 12 million tonnes for maize.
c) International prices of the four commodities with important Ukrainian and Russian export shares would rise in response to reduced export supplies, with their rate of increase is determined by the magnitude of the shock, supply elasticities of alternative suppliers and the commodities' relative demand elasticities. Compared to their already elevated baseline values, wheat price would increase by 8.7 percent under the moderate scenario and by 21.5 percent under the severe shock. For maize, the increase would be to the tune of 8.2 percent in the moderate case and of 19.5 percent in the severe scenario. For other coarse grains, prices would rise by 7 to 19.9 percent, and by 10.5 to 17.9 percent for other oilseeds (figure 23).
d) Market impacts would also be felt in related sectors. For instance, a reduction in exportable supplies for oilseeds (mainly sunflower) would push prices of other oilseeds up. A cut in feed wheat and maize availabilities would similarly bolster prices of feed products. Combined, these factors would drive livestock prices up, with the more feed-intensive poultry and pork sectors directly affected the most.

2.2.2 Gauging the possible effects of trade risks on world market prices in the medium term

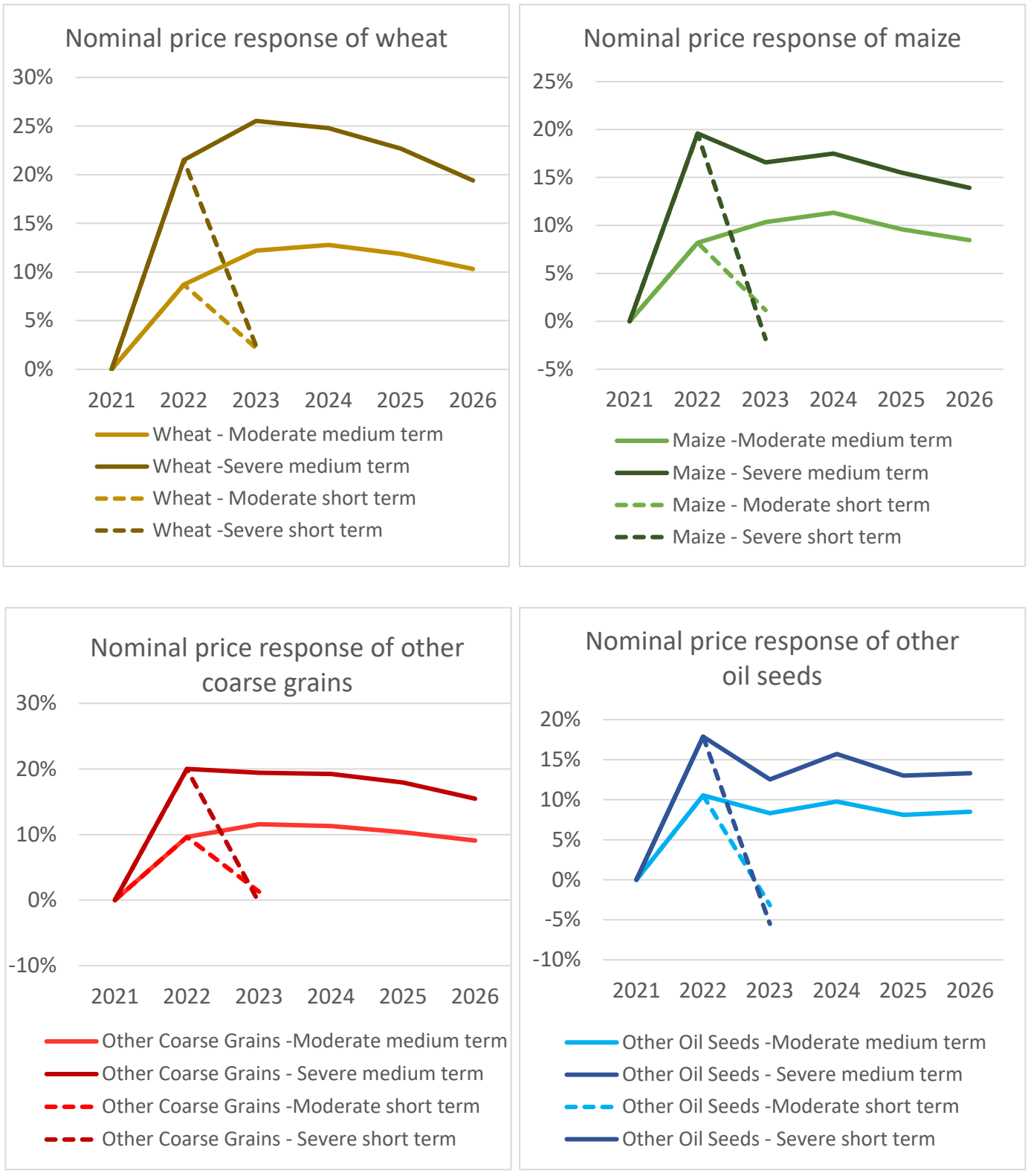
Because of the numerous uncertainties that surround the conflict itself, including its duration and scale, and given its potential to inflict lasting damages to productive assets and ancillary infrastructure, two separate scenarios

[3] Other coarse grains include barley, oats, rye and sorghum, whereas other oilseeds encompass rapeseed, sunflower and ground nuts.

were simulated to assess the impact of reduced Ukrainian and Russian export participation for five seasons, until marketing year 2026/27. These scenarios were developed under the assumption that reference crude oil prices would remain on an upward trajectory to reach USD 108 per barrel in 2026/27. The magnitude of reductions in the Ukrainian and Russian grain and vegetable oil exports were kept in line with those used by the scenarios developed for the 2022/23 marketing year. The results of this scenario analysis are as follows:

a) Continued gains in crude oil prices would keep the global reference price of fertilizer on the rise over the next five marketing years, contrary to expected trends under the projection's baseline, which foresaw oil and fertiliser prices easing over this period. As a result, the 2026/27 export price would stand 25 percent above the originally foreseen baseline value.
b) Even as alternative producers would expand their output in response to the higher prices instigated by reduced Ukrainian and Russian food export participation, a considerable supply gap would remain in the global market. In the moderate scenario, this compensation rate or share of the global export shortfall covered by non-Russian and Ukrainian origins over the next five seasons would range between 30 and 52 percent for maize and between 19 and 48 percent for wheat. Under a severe scenario, the compensation rate would range from 47 to 67 percent for maize and from 30 to 57 percent, in the case of wheat.
c) International prices of the four commodities with important Ukrainian and Russian export shares would remain elevated in response to the overall reduced export supplies. Compared with their baseline values, by 2026/27, wheat prices would rise by 10 percent under the moderate scenario and by 19 percent under the severe shock. Similarly, the simulation's projected maize price would be 8.5 percent and 14 percent above the base in 2026/27.
d) In related sectors, livestock prices would range 3 – 6 percent above baseline levels in 2026/27 in the moderate scenario and 5 – 10 percent under the severe shock.

Figure 23. World price responses to scenarios: Crops



2.3 Logistical risks

On the logistical front, an immediate source of concern regards the impact of the ongoing conflict on transport infrastructure. This includes inland infrastructure (mostly railways) carrying food exports to seaports along the Black Sea, such as Novorossiysk, Taman and Tuapse, which service shipments by the Russian Federations and to Odessa and Mykolaiv ports, Ukraine's main bulk grain ports. To date, whereas Russian Black Sea ports remain in function, Ukraine is already reported to have suspended all commercial shipping operations across its ports, while private grain operators have deferred activities to safeguard the safety of their employees. Ukraine's loss of national maritime shipping capacity cannot be compensated by other means of transport, even if internal civilian road and rail infrastructure were to remain unaffected by the conflict. For instance, grain shipments by railway would be constrained by a lack of rail carriages and, even if railway cars availability were to improve, deliveries from Baltic ports via Ukraine's western borders with Poland would still require that railcars' chassis be changed at the border due to the use of conflicting gauges in both countries.

More broadly, although civil maritime vessels (including those for food shipments) can still transit through the Turkish Straits (Dardanelles and the Bosporus), apprehensions exist regarding increasing insurance premiums for vessels destined to berth in the Black Sea region. These could exacerbate the already elevated costs of marine transportation, compounding further on the final costs of internationally sourced food paid by importers. This is all the more so since the Turkish Straits are a critical international grain trade juncture. A fifth of world wheat exports and a sixth of global maize shipments are estimated to pass through them, much of which originating in the Russian Federation, Ukraine and Kazakhstan.[4] The impact of these disruptions could be most directly felt by importers in Near East and North Africa region. The reliance of these countries on grains originating in the Russian Federation and Ukraine is also associated to the lower shipping costs entailed by their physical proximity to the Black Sea basin.

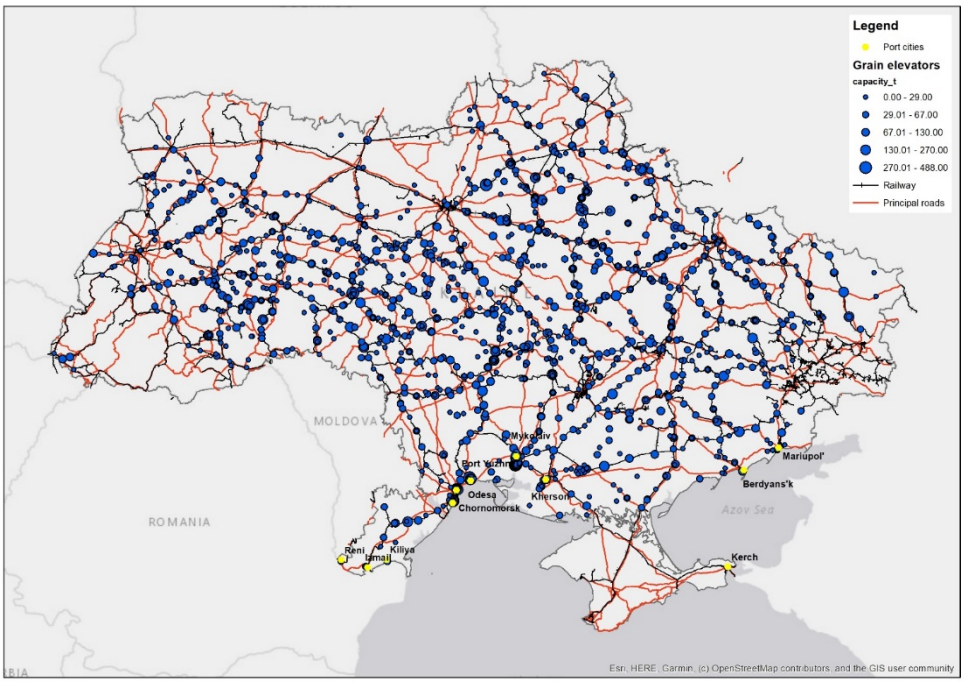
For supplies already at hand, any prolonged halt to exports markets would require greater reliance on storage facilities, especially silos. Assuming storage infrastructure remains sufficiently staffed and is not damaged, grains can be stored under favourable conditions for multiple seasons. However, the storability of raw oilseeds is usually shorter and, to achieve the highest oil yield, oilseeds must be crushed shortly after harvesting. Ukraine has 1 378 grain elevators across the country with a total capacity of over 57 million tonnes,[5] sufficient to store on average over 80 percent of the total cereal production. Ukraine has an excess capacity to crush seeds into oil, consisting of the most modern and cost-efficient facilities strategically located near logistical hubs, i.e. large railway stations and seaports, and smaller regional processing facilities that do not operate for the whole season due to a lack of raw materials needing to be crushed.[6] Although grain elevators and oil crushing facilities are spread across the country, their concentration and carrying capacity are higher closer to important transportation points and ports, thus increasing their risk of being damaged in conflict. Similarly, there is a high likelihood that modern oil crushing facilities will be damaged in the conflict. In such a setting, although the excess capacity of smaller regional processing facilities could balance losses, many of the smaller facilities do not have the technology to switch between oilseeds.

[4] https://www.chathamhouse.org/sites/default/files/publications/research/2017-06-27-chokepoints-vulnerabilities-global-food-trade-bailey-wellesley-final.pdf

[5] https://elevatorist.com/karta-elevatorov-ukrainy

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

Figure 24: Grain elevators in Ukraine



Source: Elevatorist.com

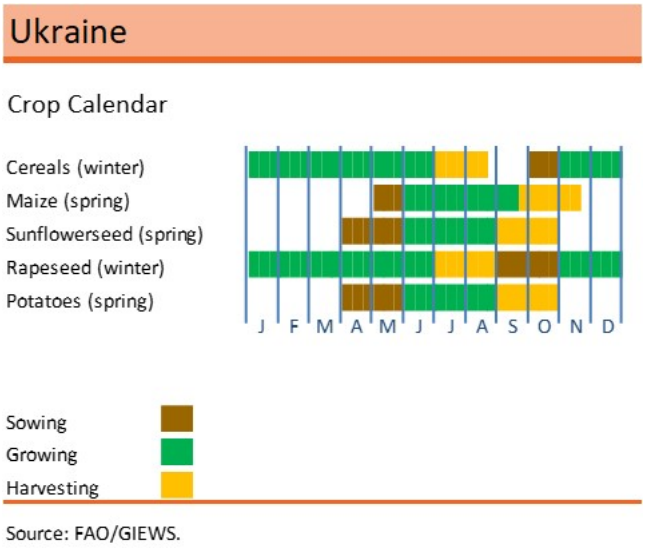
2.4 Production risks

Winter cereal crops in the Russian Federation and Ukraine are currently dormant and will be ready for harvest from June onwards. The dormancy period usually ends by early April, depending on average temperatures. Although drier-than-average conditions in some regions in October 2021 delayed plantings, an above-average area was sown with winter wheat in both countries. Adequate rains have supported the establishment of these winter crops since their planting, with the accumulation of well-distributed snow cover also expected to protect plants from freezing temperatures and to secure soil moisture reserves for the spring period.

Although early production prospects for winter crops are favourable in both Ukraine and the Russian Federation, the escalation of conflict casts uncertainty over prospects for these crops and of successive sown spring crops. In particular, it raises concerns that conflict could trigger population displacements, damage to civil infrastructure and restrictions to the movements of people and goods, which could prevent farmers from attending to their fields, harvesting and marketing of their crops. This is further to disruptions to essential public services such as provision of water, energy, transport, markets, and banking[7].

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

Broad mobilization of military reserves could also decrease the number of agricultural labourers and workers along the supply chains, although steps have been taken to ensure agricultural operations are sufficiently staffed. To these effects, as of early March 2022, the Government of Ukraine introduced policies granting a deferment from conscription during mobilization based on submission of a list of critical employees in order to enable them to carry out spring and summer fieldwork in a timely manner.



Source: FAO/GIEWS.

Upcoming agricultural operations for winter crops include broadcasting fertilizer as well as eventual treatments against fungal diseases and applications of growth regulators. Fertilizer application is normally carried out in late March as soon as it is the land is dry enough to carry the weight of the machinery, while spraying takes place a few weeks later. Land preparation for spring crops should be underway for sowing that commences from April.

Despite high fertilizer prices, it is likely that large and industrial farmers secured fertilizers necessary for the upcoming months ahead of time. However, a lack access to fields could prevent producers from applying fertilizers. Nitrogenous fertilizers (such as urea and ammonium nitrate) can also be directed to other uses such as explosives. Similarly, farmers could have stocked-up on pesticides, crop protection materials, as well as other inputs, although it cannot be ruled out that market disruptions could have prevented producers from purchasing adequate supplies.

In Ukraine, Vinnytsya, Donetsk, Zaporizhzhya, Kirovohrad, Mykolaiv, Kherson and Khrakiv regions delivered half of total wheat production in 2020. Furthermore, Vinnytsya, Zhytomyr, Kyiv, Poltava, Sumy, Khmelnytskyi, Cherkasy and Chernihiv regions produced 70 percent of the total maize volume harvested, while 60 percent of sunflower seeds were produced by Chernihiv, Kharkiv, Sumy, Poltava, Mykolaiv, Luhansk. Kirovohrad, Zaporizhzhya, Dnipro and Vinnytsya regions.[8]

Overlapping the most productive agricultural areas of Ukraine with possible scenarios of the territorial spread of the conflict, FAO estimates that 20 percent of winter planted areas will not be harvested as a result of direct destruction, constrained access or lack of economic resources. In addition, yields in other regions are expected to decline by 10 percent due to delayed or missed application of fertilizers, an inability to control eventual pests and diseases, delayed harvesting, greater postharvest losses due to labor force shortages or due to lack of storage infrastructure.

[8] ukrstat.gov.ua

Sunflower and spring cereals, including maize, will be planted from April onwards in both countries, while the 2022/23 rapeseed sowing season will not open until September 2022. For both maize and sunflower seed, FAO estimates that 30 percent less area will be planted in spring 2022, while yields elsewhere will decline by 20 percent from average levels. The maize crop is usually more fertilizer-intensive than the wheat crop. Most of the sunflower seed is exported as oil and given the risk of deteriorating export infrastructure and crushing plants, farmers – particularly those cultivating smaller extensions – might choose to plant crops that are more directly relevant to local food security, such as potatoes.

Livestock and poultry rearing as well as production of high value crops, such as fruits and vegetables, could also be constrained in Ukraine.

In the short term, no major impacts are expected on agricultural production in the Russian Federation. Assuming normal weather prevails through the remainder of the season, eventual yield reductions for cereals, where most of the inputs are domestically sourced, will likely be negligible. Given their comparatively greater use of imported inputs, some more visible impacts could pertain to animal production and higher value products. Looking further ahead, international sanctions imposed in response to the conflict could directly or indirectly imply economic losses for the Russian agricultural sector. Indeed, farmer incomes in the country risk being depressed by the loss of export markets due to constrained access to financial services needed to complete international transactions. Should these risks materialize, and alternative arrangements not emerge or be expanded to service trade needs of basic foodstuffs, such disruptions could negatively influence future production decisions.

2.5 Humanitarian risks

2.5.1 Possible effects of the conflict on domestic food security

Conflict interrupts regular economic and livelihood activities, and constrains 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 have already been experiencing elevated levels of food price inflation, although in both cases local prices remain considerably below the peaks (over 50 percent in Ukraine, slightly below 25 percent in Russian Federation) registered in 2015, as the conflict in the eastern part of the country took toll on economic activities. The latest readings of annual food price inflation in January 2022 stood at 14 percent in Ukraine, and 11 percent in the Russian Federation. Similar increases are likely now. A decrease in the purchasing power of local populations would deteriorate access to staple foods, with consequent increases in food insecurity levels.

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 ongoing conflict will increase humanitarian needs within Ukraine as well as in neighbouring countries where displaced populations are seeking refuge. While the evolving situation remains unpredictable, the prevalence and severity of domestic food insecurity will depend on the length and scale of the conflict. Urban areas are likely to be more affected, as rural dwellers typically cultivate at least some land to supplement household diets.

According to the Ukraine Flash Appeal 2022 issued by the United Nations, given the scale and direction of the ongoing hostilities, 18 million people are projected to be affected, including up to 6.7 million projected to be newly internally displaced. Currently, western parts of the country are reporting large numbers of internally displaced

people, which are putting a strain on local resources. More than 2 million people, mostly women and children, have crossed western borders in less than two weeks since the escalation, and the numbers are increasing. Early reports indicate that a large share of refugees have private host accommodations set up in their destination countries. However, as the wave of refugees without pre-arranged hosts strengthens, their humanitarian needs will increase.

2.5.2 Gauging the possible effects of the conflict on international food security

The 2021 edition of the report on the State of Food Security and Nutrition in the World (SOFI), released in July 2021, estimated that world hunger increased in 2020, under the shadow of the COVID-19 pandemic. After remaining virtually unchanged for five years, the prevalence of undernourishment (PoU) increased by 1.5 percentage points in just one year to reach around 9.9 percent, thus heightening the challenge of achieving the Zero Hunger target by 2030. The SOFI report also indicated that between 720 and 811 million people in the world faced hunger in 2020.

Against this background, the escalation of conflict 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 conflict's potential negative impact on food security, both domestically and internationally. Much uncertainty remains regarding the conflict itself, its intensity, geographical scope, and duration. However, given its potential to disrupt agricultural activities significantly in such significant global suppliers, international markets of foodstuffs and agricultural inputs are not expected to remain immune to its effects. Domestically, the 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. Globally, were it to result in a sudden and prolonged reduction in food exports by either country, it could exert additional upward pressure on international food commodity prices to the detriment of low-income food-deficit countries (LIFDCs), in particular.

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.[9]

Although agricultural commodities of different origins are substitutable to a large extent, sourcing from different origins will also increase shipping and transactions costs for many substantial importers, particularly in countries or regions that traditionally rely on Black Sea supplies due to their geographical proximity. While some net food importers are concomitantly exporters of other commodities and may thus 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 them to maintain a certain degree of fiscal balance. In addition to increasing countries' food import bills, high international food commodity prices will make sourcing of food assistance to those most in need across the globe more expensive.

Beyond countries' fiscal positions, high food prices negatively impact populations with lower incomes (including pensioners) in both developed and developing countries, as these groups spend a larger share of their incomes

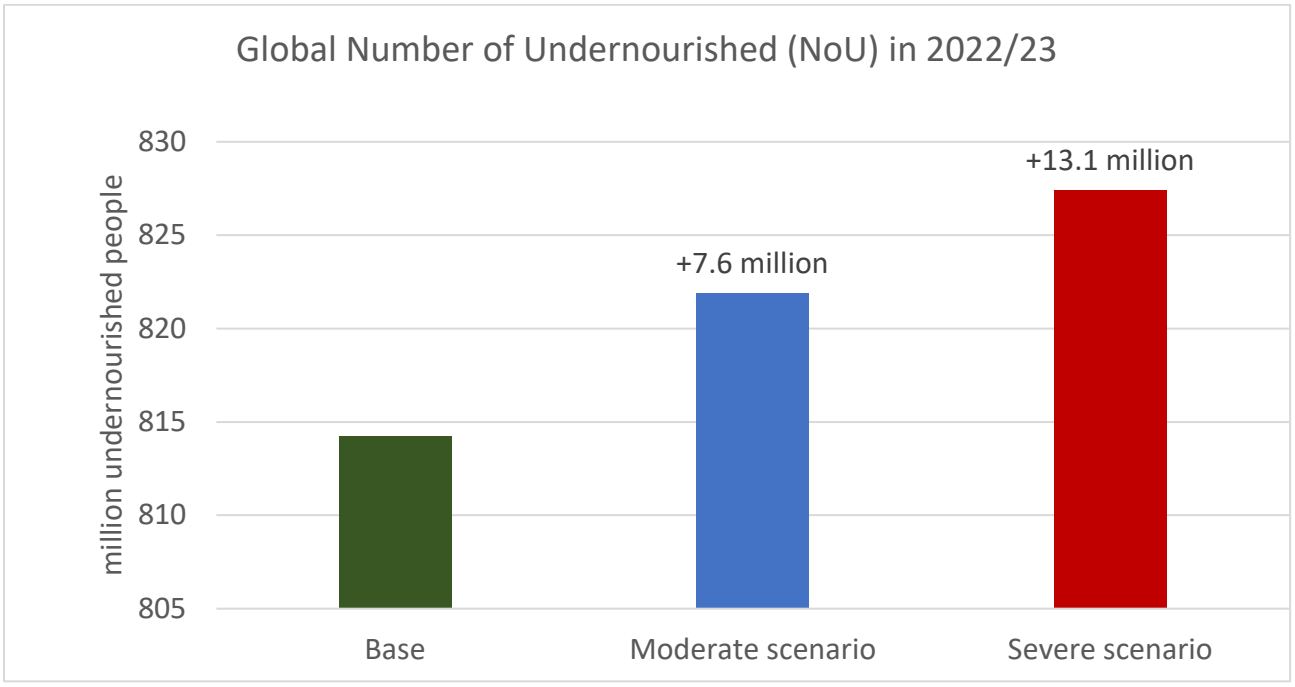
[9] https://interfax.com.ua/news/economic/808490.html

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, purchasing less nutritious but cheaper alternatives, etc.

Globally, in terms of impacts on food security, under the moderate shock scenario, the number of undernourished people would increase by 7.6 million people, while this level would rise to 13.1 million people under the more severe shock setting (figure 25). From a regional perspective and with respect to the projected baseline levels in 2022, the most pronounced increase in the number of people undernourished would take place in the Asia-Pacific region (up 4.2 to 6.4 million), followed by Sub-Saharan Africa (up 2.6 to 5.1 million) and the Near East and North Africa (up 0.4 to 0.96 million) .

If conflict-related factors prolong the countries' export reduction into the 2026/27 marketing year and keep reference crude oil prices elevated, international food prices would stay above their baseline level. Compared to the baseline estimate, this would raise the number of undernourished by 8.1 million people in a moderate shock setting and by 11.2 million in a severe scenario. From a regional perspective, the most pronounced increase in the number of people undernourished would remain in the Asia-Pacific region, followed by sub-Saharan Africa and the Near East and North Africa (figure 26).

Figure 25 a, b: Global Number of Undernourished



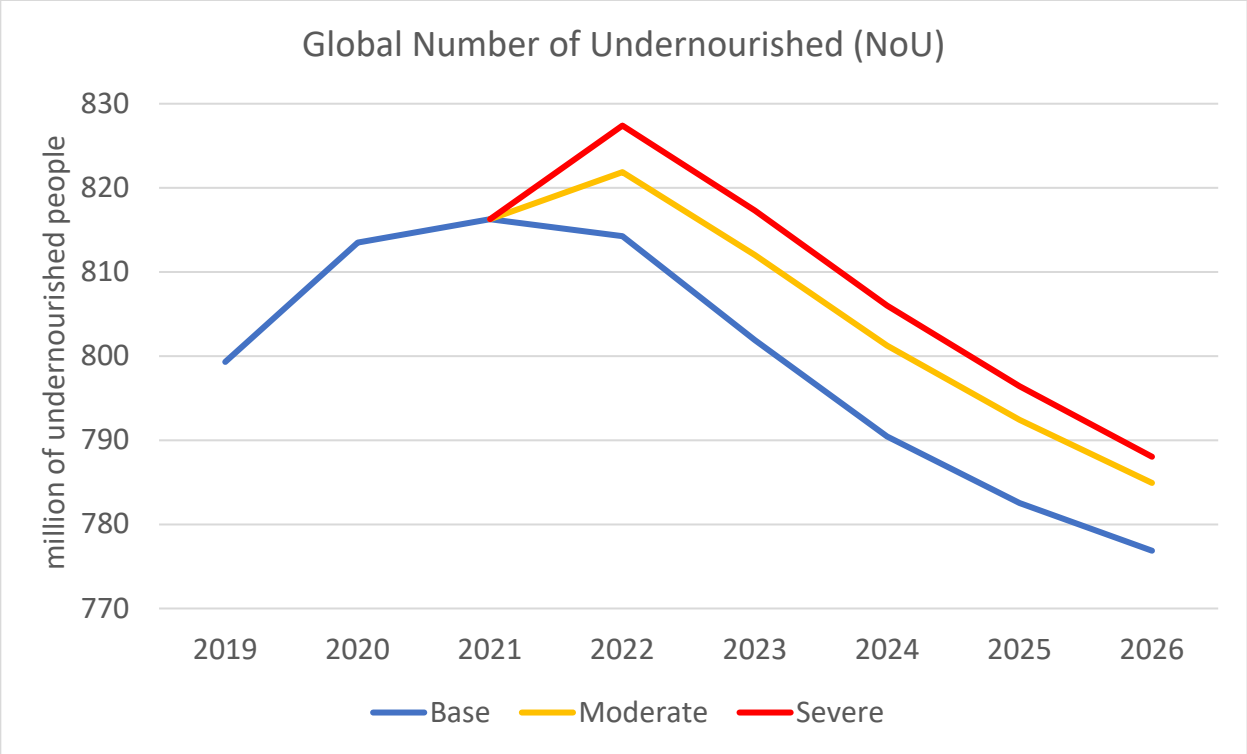
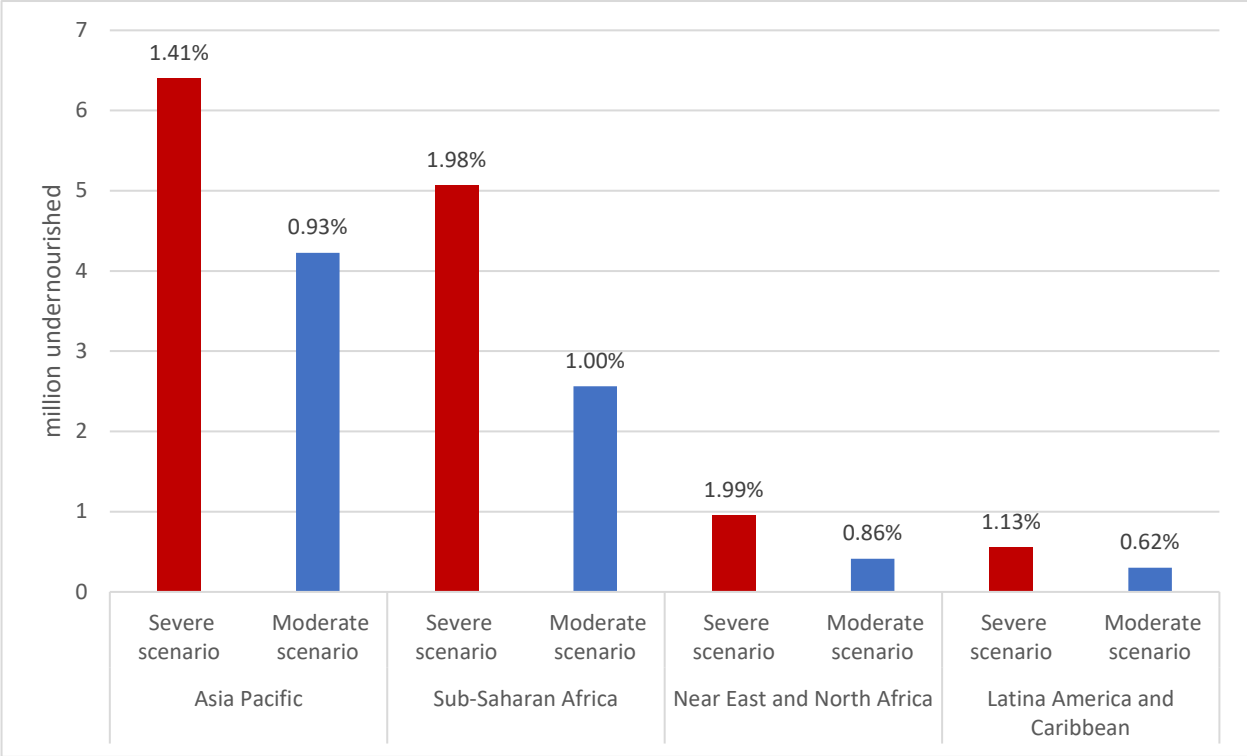
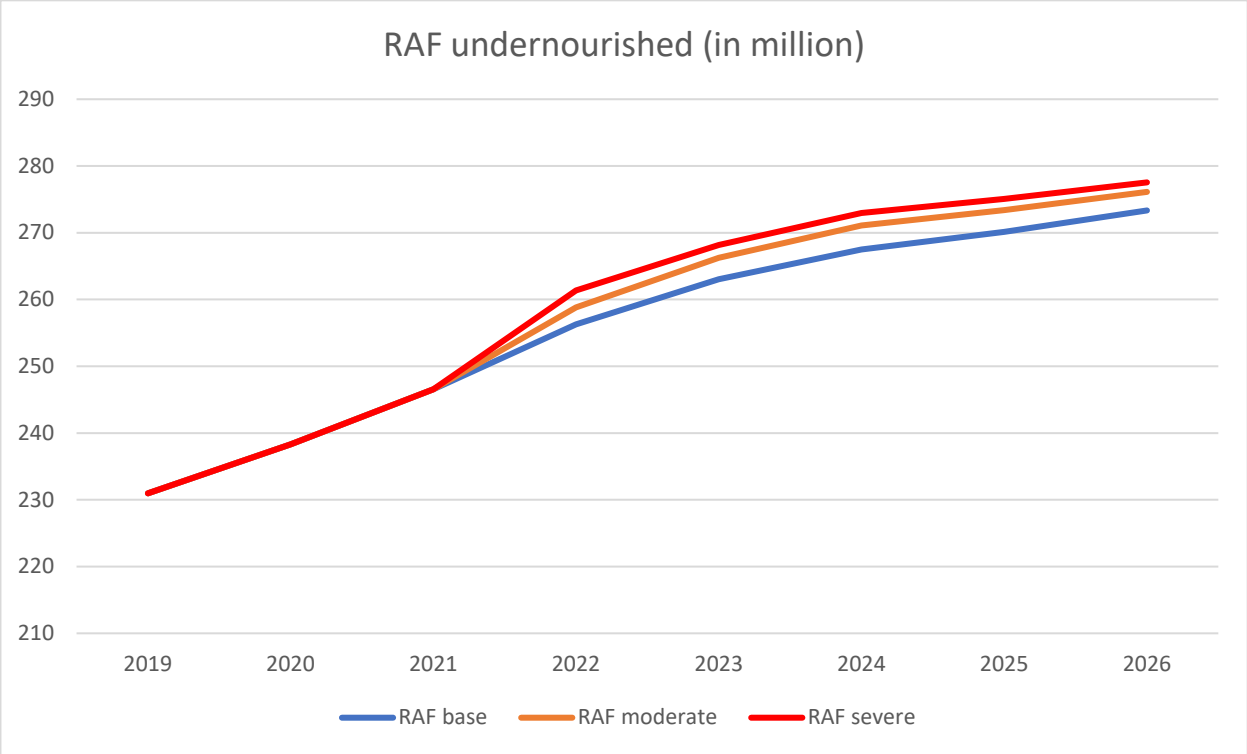
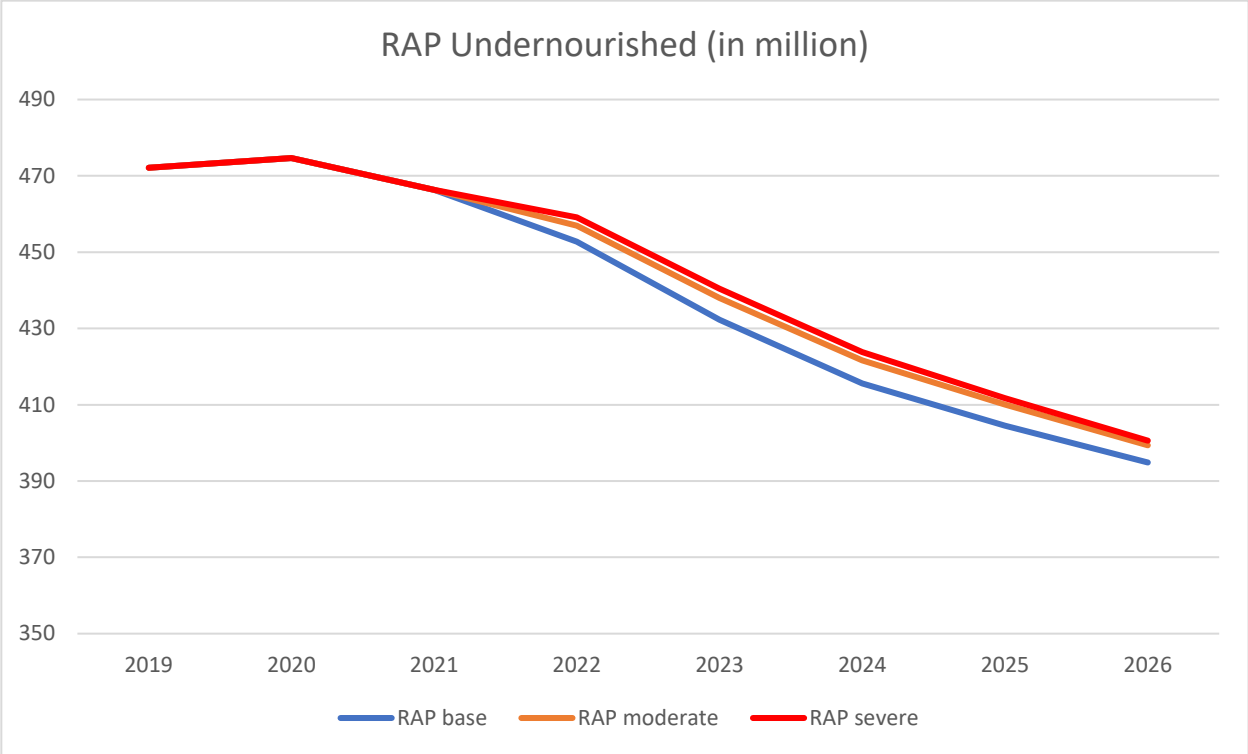
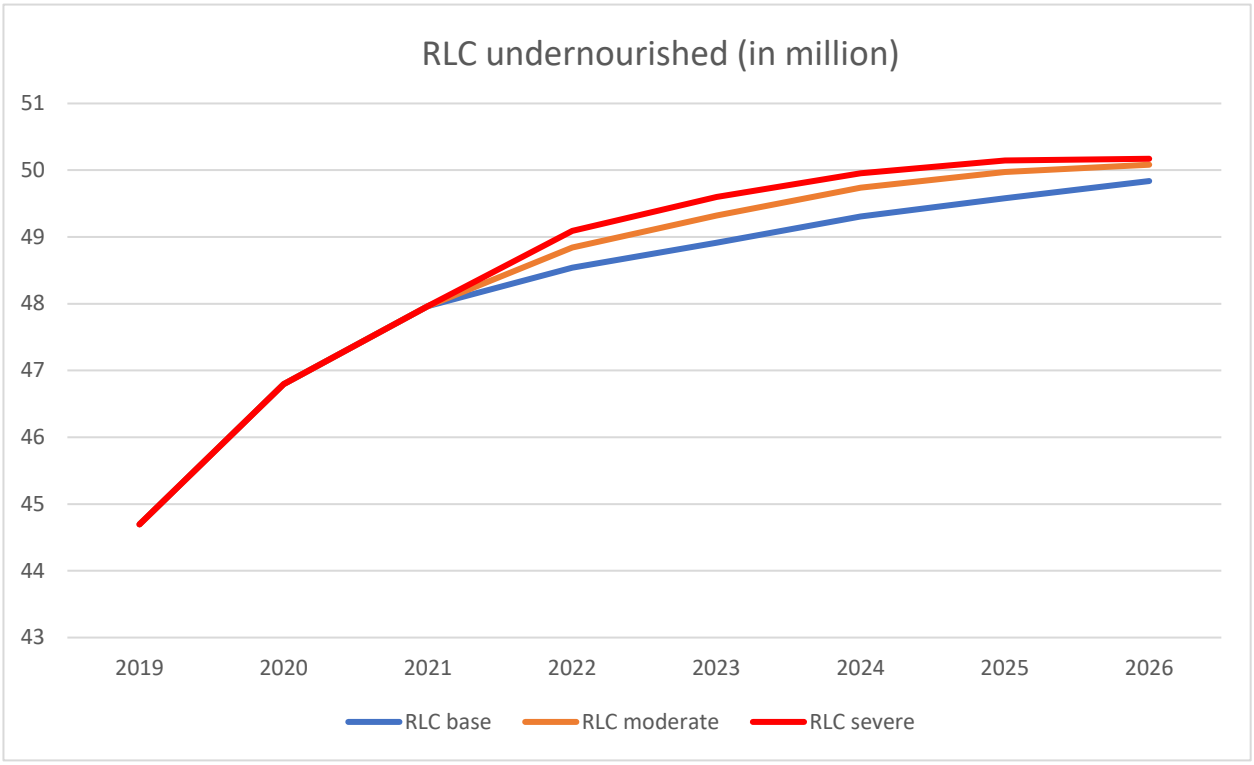


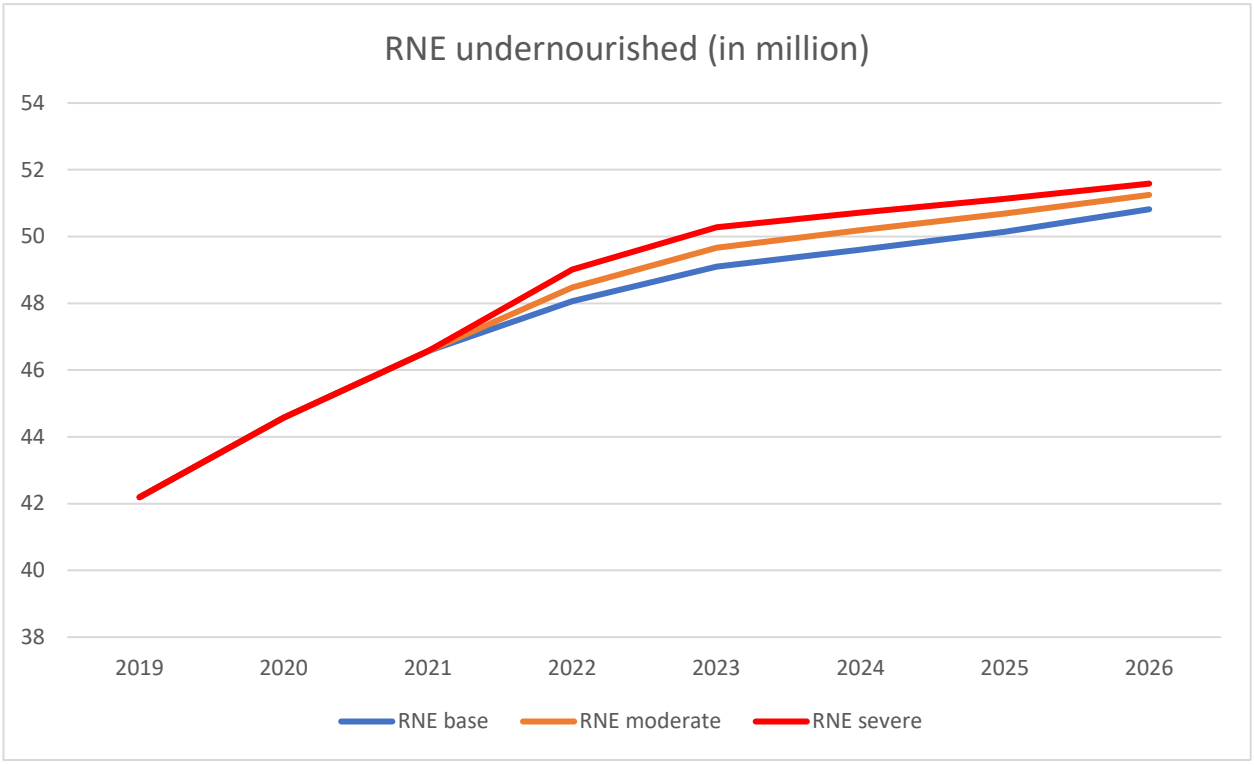
Figure 26 a, b, c, d: Regional increase in the Number of Undernourished in 2022/23




RAF undernourished (in million)
290
280
270
260
250
240
230
220
210
2019
2020
2021
2022
2023
2024
2025
2026
RAF base
RAF moderate
RAF severe


RAP Undernourished (in million)
490
470
450
430
410
390
370
350
2019
2020
2021
2022
2023
2024
2025
2026
RAP base
RAP moderate
RAP severe


RLC undernourished (in million)
51
50
49
48
47
46
45
44
43
2019
2020
2021
2022
2023
2024
2025
2026
RLC base
RLC moderate
RLC severe


RNE undernourished (in million)
54
52
50
48
46
44
42
40
38
2019
2020
2021
2022
2023
2024
2025
2026
RNE base
RNE moderate
RNE severe

2.6 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, 11 and 10 percent of global exports. Russian energy exports are particularly important for the European Union, which imports, respectively, 46, 25 and 31 percent of its coal, oil and gas imports from the Russian Federation. As a highly energy-intensive industry, especially in developed regions, agriculture will inevitably be affected by the sharp increase in energy prices that has accompanied the conflict (Figure 27 a, b and c).

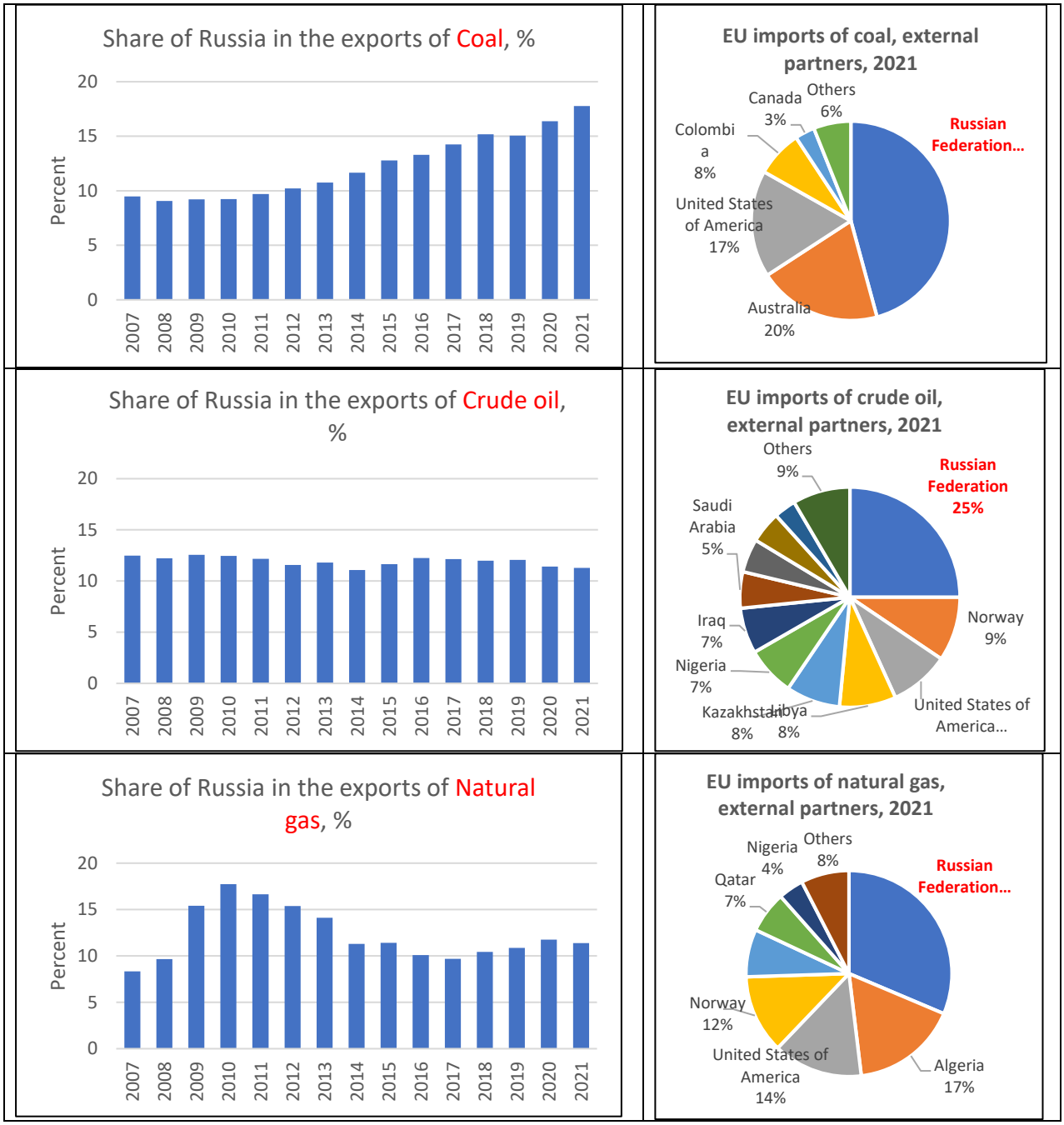


Figure 27 a, b and c: EU Imports of energy by country of origin

Agriculture is absorbing high amounts of energy either directly through fuel, gas and electricity use or, indirectly, using agri-chemicals such as fertilisers, 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 the 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, producing so-called "green ammonia". 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.

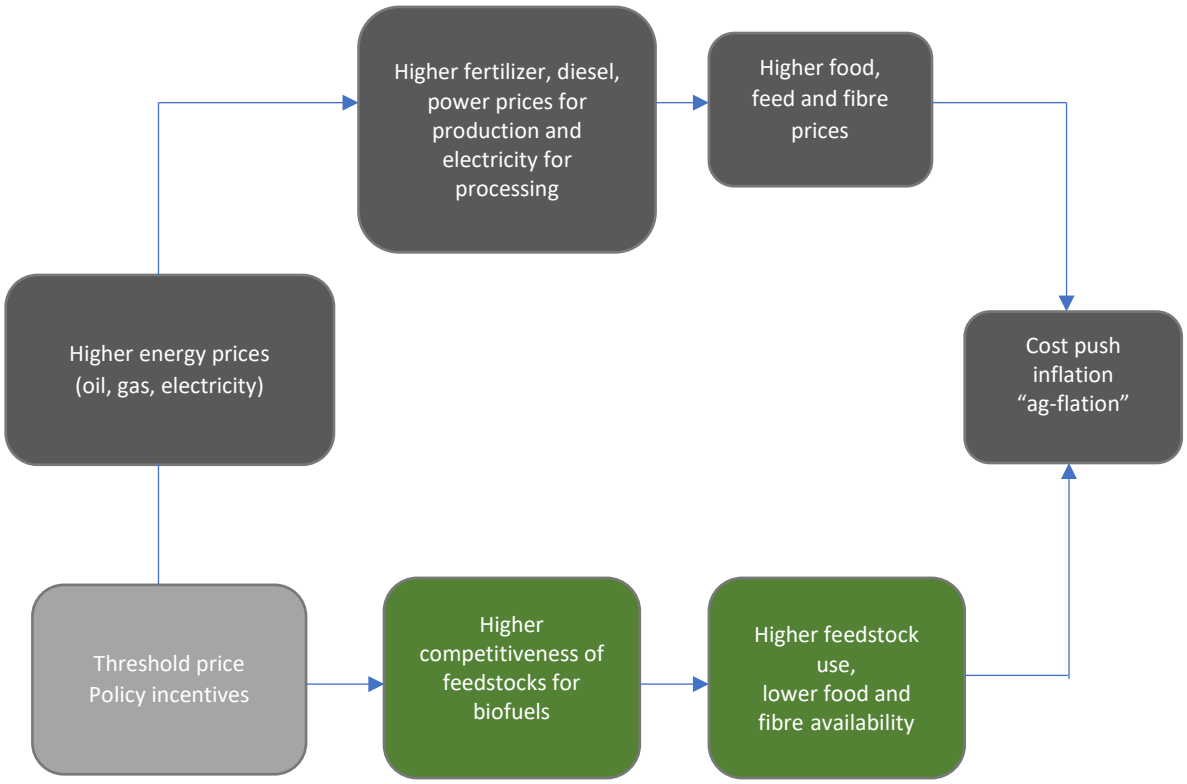
Energy is also required to manufacture feed ingredients, such as the crushing of oilseeds to produce oil meals and the milling of grains to manufacture feedstuffs (pellets, flours, and compound materials). When it comes to food processing, the price of energy features heavily in the cost schedule.

Globally, the 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 higher production costs and eventually into higher food prices.

How the current crisis affects the nexus between energy and agricultural markets

The lessons from the global food price crisis in 2007/08 showed that under scarcity, the diversion of food crops to non-food uses can drive up food prices markedly. To understand better the impact pathways of energy costs on food prices, Figure 28 provides a schematic illustration of the linkages and "pass throughs" 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 18: Energy and food markets, tightly linked through input and output markets



Price transmission through the input side

With prices for fertilizers and other energy-intensive products to rise as a consequence of the conflict, 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 have been so pronounced that they exceeded the price increases for outputs by a considerable margin. The result was a sharp decline in the *affordability*[10] of fertilizers, which was particularly 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 (Figure 29 to 32), where sharply higher fertilizer prices resulted in a precipitous decline in affordability levels. Lower levels of affordability in turn will almost inevitably result in lower input use and, as a consequence, lower yields and compromised qualities in the next cropping season (e.g., lower protein levels in milling wheat).

[10] Here simply defined as the ratio of output to input prices

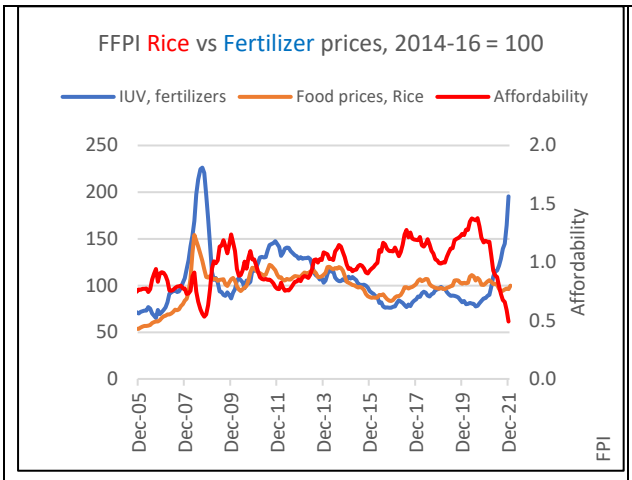


Figure 29: rice vs fertilizer prices

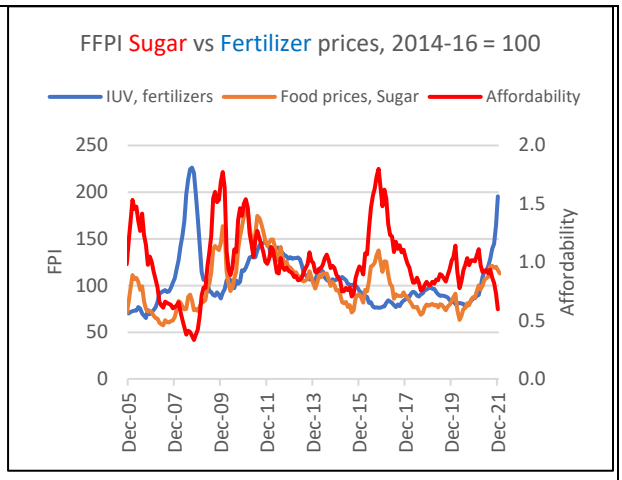


Figure 30: Sugar vs fertilizer prices

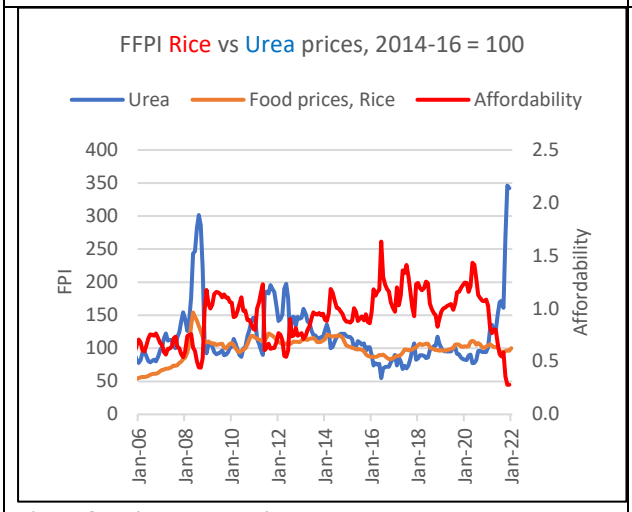


Figure 31: Rice vs urea prices

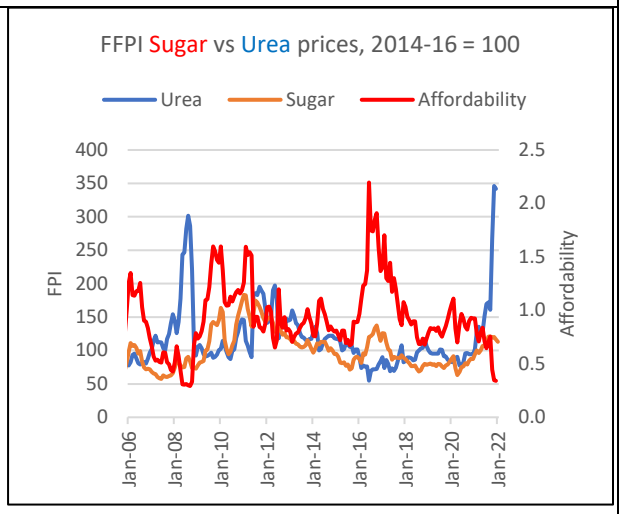


Figure 32: sugar vs urea prices

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 incentivised quantities are largely independent of 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 its energy parity equivalent. The food price rise is capped again where agricultural feedstocks become so expensive that they can no longer compete in the energy market.

The current conflict: will rising energy prices accelerate rising food prices?

Energy prices, notably those for natural gas and crude oil prices have seen swift and substantial increases, largely caused by the conflict. With crude oil prices exceeding USD 126/bbl on 8 March 2022, an increasing number of feedstocks could again become competitive as inputs into the energy sector and do so for increasing quantities. This will add upwards 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 33 through 36 illustrate the various price relationships. Figure 33 and figure 34 depict the dependency of fertilizer prices on energy prices while Figure 35 and figure 36 capture the link between energy prices and food prices. As far as the price relationship between gas and urea prices are concerned, 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 price 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.

As far as the impacts of the conflict are concerned, the most recent gas price hike is not yet priced into the urea market, which suggests that urea prices would have to rise again to re-establish positive upgrading margins. Simply put, urea and hence fertilizer prices can only go up, if gas prices remain at their current levels. This will cause lower yields and lower qualities in the 2022/23 crop season, giving further risk to the state of global food security in the coming years.

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, i.e., 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.

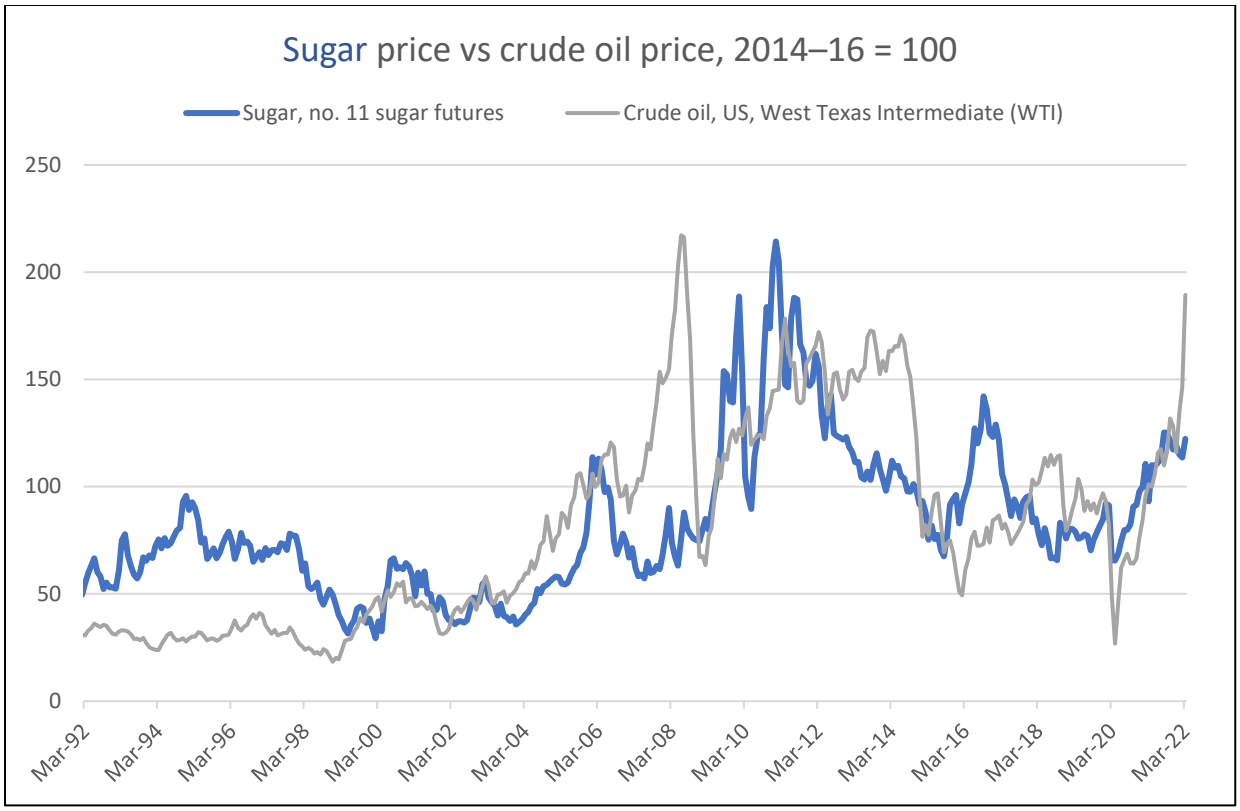


Figure 33: The recent rise in energy prices creates space for sugar prices to rise

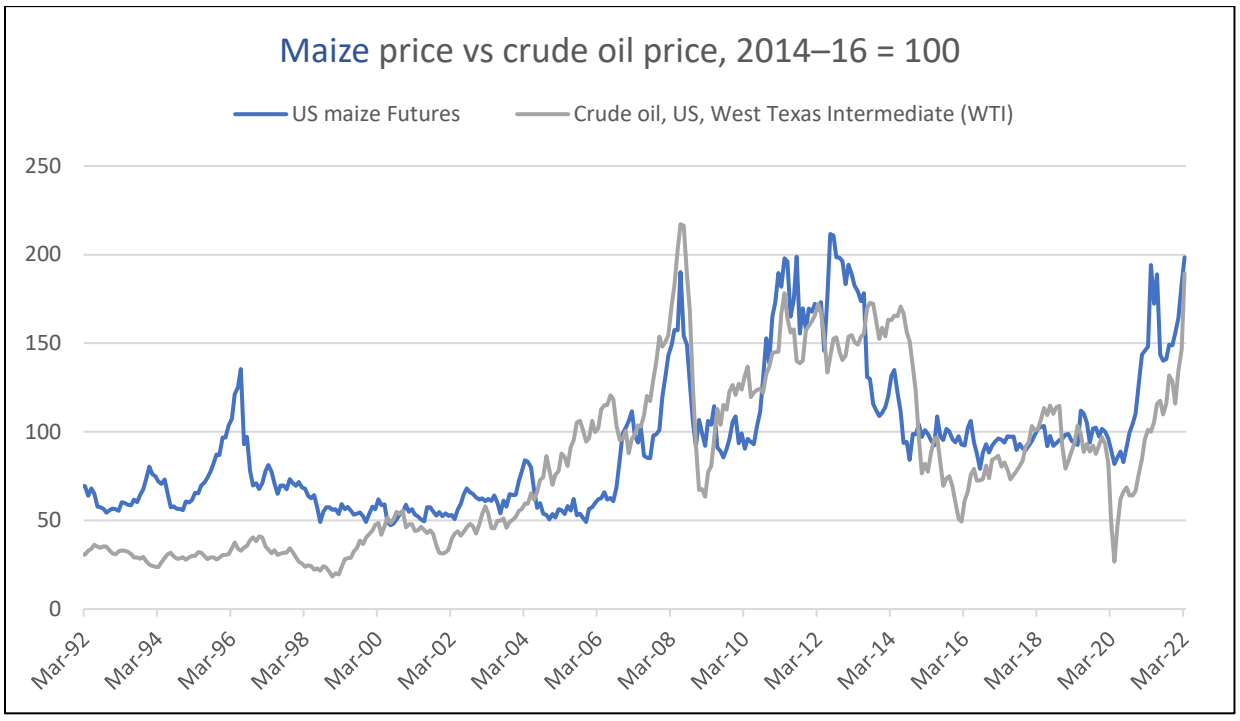


Figure 34: Maize prices move in sync with crude oil prices

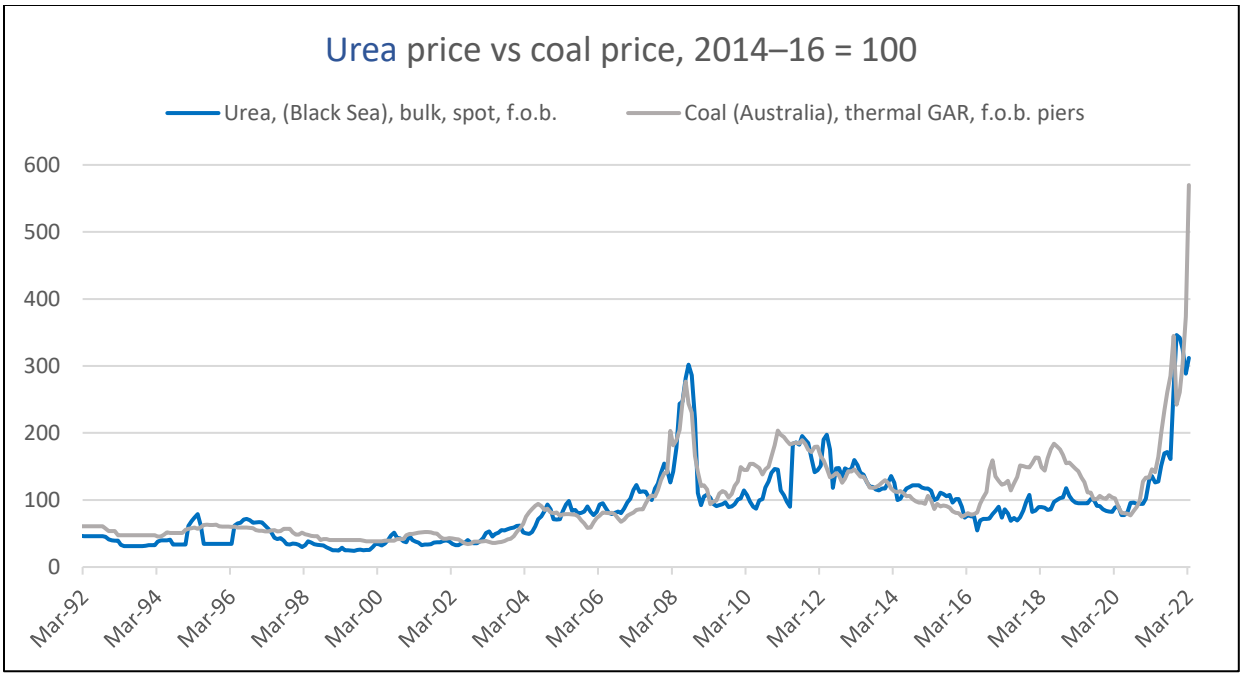


Figure 35: Upgrading margins have become negative even for coal-fired urea plants

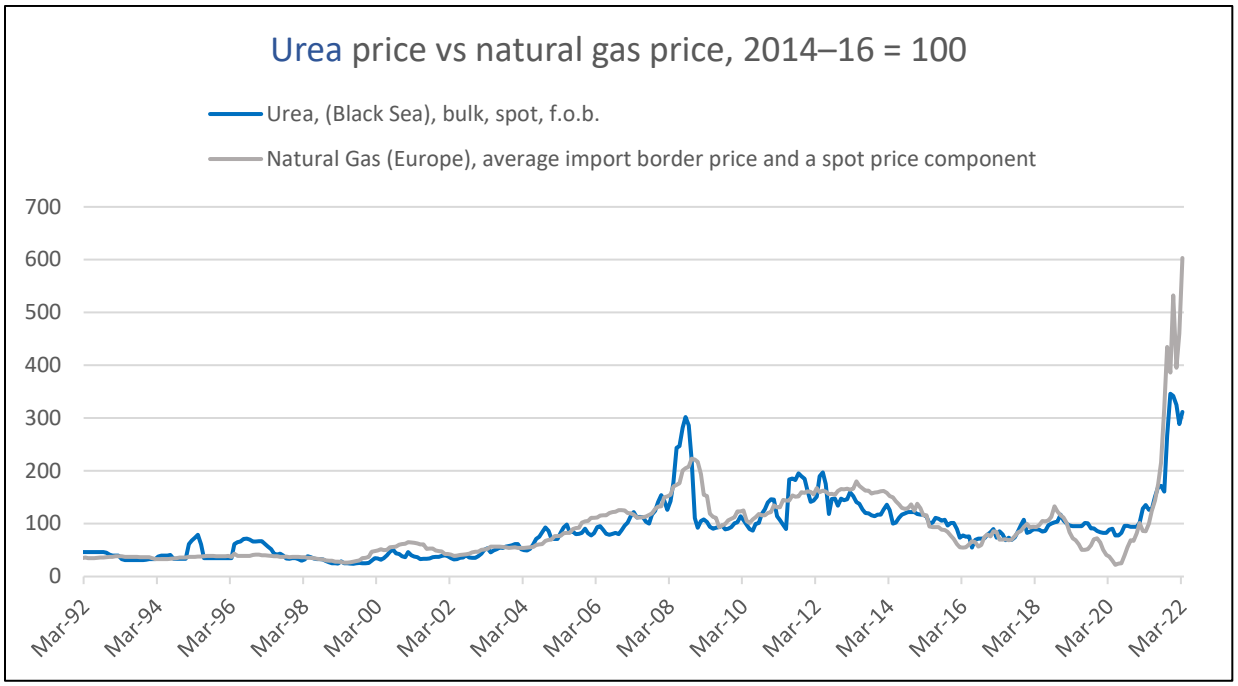


Figure 36: conflict-induced gas price rises have resulted in negative upgrading margins for urea

2.7 Exchange rate, debt and growth risks

The economic sanctions imposed on the Russian Federation, in particular those targeting the country's banking sector, have led to a significant depreciation of the Russian Rouble. As data collected by the IMF indicate, the Rouble hit a record low vis-à-vis the US dollar at the beginning of March. Despite the response of the Russian Central Bank, which among other actions, more than doubled its benchmark interest rate to 20 percent, the

Rouble remained almost 20 percent weaker than in the first half of February. While the depreciation of the Russian Rouble could make Russian exports of agricultural commodities cheaper, a lasting depreciation will negatively affect investment prospects in the sector and therefore productivity growth, both due to the increased interest rates, which make borrowing expensive, and the elevated cost for imported machinery and other capital necessary for agricultural production.

The Ukrainian Hryvnia, also reached a record low in early March 2022. The repercussions for Ukrainian agriculture, including the impact on its export competitiveness and ability to import, cannot be assessed at this stage, as the extent of the damage on the country's productive capacities and infrastructure is still unclear. However, it is expected that the cost of recovery and reconstruction will be very high. The strong depreciation of the Russian Rouble and the contraction of the Russian economy, together with the disruptions of Ukraine's economy, will have significant implications for food and agriculture demand in the countries of conflict, as the purchasing power of households will be reduced while domestic agrifood prices will likely increase.

The weakening of the economic activity in the Russian Federation and the depreciation of the Rouble against the US dollar is also expected to have serious effects on countries in Central Asia, through the reduction of remittance flows. For many of these countries, remittances from the Russian Federation constitute a significant part of their GDP. For example, estimates by the Knowledge Partnership on Migration and Development (KNOMAD)[11] suggest that in the Kyrgyz Republic remittance flows in 2020 constituted 31.2 percent to the country's GDP with almost 83 percent of flows coming from Russia. The corresponding numbers for Tajikistan are estimated to be 26.7 percent and 58 percent, respectively. KNOMAD estimates a decrease in remittances in 2022 as high as 33 percent for the Kyrgyz Republic and 22 percent for Tajikistan. Considering that international migration has become an integral tendency in the region's rural societies[12], more analysis is required on the remittance flows towards rural areas of the countries in the region.

Agriculture is the backbone of the economy in many developing countries around the globe, while the majority of them rely on the US dollar for their borrowing needs. As such, a lasting appreciation of the latter vis-à-vis many currencies may have significant consequences on these countries, including on their agrifood sectors. Moreover, the potential reduction of GDP growth in several parts of the world will affect the global demand for agrifood products with negative consequences on global food security. According to the World Bank, the effort to cushion the impact of the COVID-19 pandemic resulted in an increase of the debt burden of the world's low-income countries by 12 percent in 2020 to a new record, while the combined low- and middle-income countries external debt stocks in 2020 increased by 5.3 percent.[13] The deployment of funds by multilateral creditors, such as the World Bank and the IMF[14], can play an important role in offsetting the impact of the appreciated US dollar on the agricultural sector of developing countries.

A lasting security crisis will also create new geopolitical dynamics, both within the region and possibly transcending borders. Lower GDP growth will likely reduce the availability of funds for development, in particular if military expenses increase globally, but mostly in Europe, a region that is closer to the conflict area. An IMF staff statement highlighted that the crisis is creating an adverse shock to both inflation and economic activity, amid already

[11] https://www.knomad.org/sites/default/files/2022-03/KNOMAD_Policy%20Brief%2017_Ukraine-Implcations%20for%20Migration%20and%20Remittance%20flows_March%204_2022.pdf
[12] https://www.fao.org/in-action/fsn-caucasus-asia/news/news-detail/en/c/1162602/
[13] https://openknowledge.worldbank.org/handle/10986/36289
[14] Three IMF facilities allow for significant financing and more concessional terms: the Rapid Credit Facility (RCF), the Standby Credit Facility (SCF), and the Extended Credit Facility (ECF)

elevated price pressures. In this regard, fiscal policy and foreign assistance will need to support the most vulnerable households and to help offset rising living costs as the crisis will create complex policy trade-offs, further complicating the policy landscape as the world economy recovers from the pandemic.[15]

3. Summary and Possible recommendations

The recent escalation of conflict 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 its potential negative impact on food security, both domestically and internationally. Domestically, the 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. Globally, were it to result in a sudden and prolonged reduction in food exports by either country, the conflict could exert additional upward pressure on international food commodity prices to the detriment of low-income food-deficit countries (LIFDCs), in particular. Simulations undertaken to assess the possible ramifications if that reduction were to take place, confirm such apprehensions. The simulations suggest that this scenario could lead to further increases in international prices of the foods most traded by the countries, including spillover effects into other food sectors, as well as an increase in the global number of undernourished people. In order to avert this set of circumstances from materializing, it would be advisable to:

1. **Keep trade in food and fertilizers open** by preventing the conflict 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. In order to ensure that supply chains continue to function properly or are in a position to resume operations swiftly, such efforts should include steps to protect productive assets, including standing crops, livestock, inputs and machinery, from damages or any conflict-induced disruption, but 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. **Diversification of food supply** for countries that directly rely on food imports from Ukraine and the Russian Federation will be key to help them absorb shocks and remain resilient amid the conflict. One possibility is to diversify through other international trade sources, since countries that import foods from many different trade partners are less vulnerable to specific shocks in one place. Another possibility is to rely on existing food stocks and enhance the diversity of domestic production to ensure the supply of food necessary for healthy diets. (See box 1 in Appendix).
3. **Support vulnerable groups, including internally displaced people.** In line with the FAO Ukraine Rapid Response Plan, March-May 2022[16], such efforts should include:

   3.1. Support for internally displaced people, refugees and those directly affected by the conflict

   Until the start of the conflict, Ukraine's social protection system was reaching 30 percent of the population and 77 percent of the poorest quintile.[17] The government of Ukraine has stated that despite the

[15] https://www.imf.org/en/News/Articles/2022/03/05/pr2261-imf-staff-statement-on-the-economic-impact-of-war-in-ukraine
[16] https://www.fao.org/3/cb8935en/cb8935en.pdf
[17] ASPIRE: The Atlas of Social Protection Indicators of Resilience an Equity. The World Bank. Accessed on 9 March 2022. Available at https://www.worldbank.org/en/data/datatopics/aspire

disruptions caused by the ongoing hostilities, it will continue to provide social protection support (cash benefits and subsidies) to its population, in accordance with information contained in the Unified Social Information System. Payments will be made electronically to beneficiaries' bank accounts[18]. In addition, the Federation of Trade Unions of Ukraine (FPSU) and the Confederation of Free Trade Unions of Ukraine (KVPU) have joined in efforts to provide for people's basic needs by providing food and shelter.

The population in need of social protection support is larger than that reached by the national system and reaching them is difficult due to security risks and mobility – within and beyond national borders. The social protection response can come through the national system and, for those that have crossed international borders, though the social protection systems of host countries. More specifically:

a. Expanding the reach of Ukraine's national social protection system by registering additional population groups within the Unified Social Information System and helping ensure that people without bank accounts are able to access cash payments. Thanks to their neutrality, agencies such as the United Nations and the International Red Cross have a role to play in physically providing access to cash payments to people in those parts of the country in which national social protection bodies are unable to function. This is particularly the case in rural areas where fewer people are likely to have a bank account and are therefore unable to access payments provided through the national system.

b. Easing access to social protection systems and jobs within host countries so that refugees can access them, something that as non-citizens they would otherwise be unable to do. This involves lifting legal barriers to access and, where the refugee caseload is high, increasing the capacities of host countries' social protection systems to absorb additional caseloads. With respect to lifting legal barriers, on 3 March 2022, the European Union's Council of Ministers approved the "Temporary Protection Device in the event of mass influx of displaced persons". This ensures immediate access to housing and medical assistance to all foreign nationals with legal residence in Ukraine, thereby exempting them from the standard lengthy asylum application. EU Member States have taken similar measures.[19] For instance, Polish authorities are providing accommodation, food and education and are facilitating access to jobs by refugees by eliminating the previous legal restrictions applied to refugees. Similarly, Italy is providing Ukrainian refugees with immediate access to the national social welfare system and jobs.

c. The Turkish response to the Syrian refugee crisis in 2016 offers an example of how a host country's social protection system can be enabled to absorb spikes in refugee caseloads. To manage the influx of Syrian refugees, the Government of Turkey, with financial support from the EU, developed a dedicated social safety net for refugees and asylum seekers. This was integrated within the national social protection system managed by Ministry of Family and Social Policy. Thanks to this integration, program participants were able to access different types of benefits through one single registration process and one single payment system (the 'Kizilaykart').

d. The capacity of a host country's social protection system to expand coverage to assist refugees and asylum seekers depends on factors linked to the system itself and to the unfolding crisis. The former include: the host country's legal framework and social security regulations, which may restrict access to non-citizens; the availability of financial resources needed for the expansion; and the system's

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

[19] EU countries have adopted a Cohesion's Action for Refugees in Europe (CARE), allowing Member States and regions to provide emergency support to people fleeing from Russia's invasion of Ukraine. CARE is introducing the necessary flexibility to allow a swift reallocation of available European funding to such emergency support, particularly for food and basic material assistance, as well as support in finding jobs, starting or continuing education, and accessing childcare. https://ec.europa.eu/social/main.jsp?langId=en&catId=86&newsId=10190&furtherNews=yes)

capacity to deal with a surge in caseload. The latter depends, among other things, upon the scale of population movements and the expected duration of displacement, as well as the kind of accommodation where refugees are hosted (camps or other).

e. Despite these challenges, channelling humanitarian assistance through established national social protection systems and, in protracted situations, integrating the refugee population in such systems will: avoid dependency on ad-hoc costly humanitarian infrastructures; promote more efficient and effective delivery of social protection benefits; strengthen social protection systems themselves; and reduce potential tensions between hosting and hosted communities by boosting household income and consumption in the short term and by promoting integration and reducing inequalities in the medium run.

3.2. Support for vulnerable groups:

a. Monitoring prices and food security outcomes of groups that were already vulnerable before the conflict escalation, as well as groups pushed into hunger and poverty by deteriorating economic conditions resulting from the conflict and the respective increase in prices, in both urban and rural areas.
b. Providing timely and well-targeted social protection interventions to alleviate the hardship caused by the conflict on affected local populations and to foster a recovery from it. In doing so, due consideration should be given to the fact that high prices of food and energy are regressive on poor consumers (since a larger share of their disposable income is spent on these necessities), as they may entail a reduction in quantities and/or qualities of food consumed, thereby leading to more hunger and malnutrition, or less money for other necessities such as health and education. Curtailing such important expenditures could send communities into a vicious cycle of deepening and entrenching food insecurity and poverty, with potentially irreversible effects. More specifically, possible responses include:

- Increasing the monetary value of transfers provided through already existing cash transfer programs. The increase should be commensurate with the increases in consumption and production costs.[20] Similarly, the value of food and agricultural input subsidies can be increased to offset increased costs in a temporary basis.

- Expanding the coverage of existing social protection programs or introducing new programs to reach poor and vulnerable populations that are currently not accessing social protection. Countries in the region did this in response to COVID-19 as well as in response to conflicts (e.g. Libya, Syria and Yemen).

- Using the existing delivery mechanisms (institutional coordination entities, registries, payment modalities) of national social protection systems to implement humanitarian assistance programs. This facilitates the swift implementation of these programs and coordination between social protection and humanitarian responses. Moreover, investments delivered through humanitarian assistance programs can contribute to strengthening the capacities of national social protection systems.

- Due to existing food subsidies, the current increase of global food prices does not seem to have affected other Near East and North African countries, such as Morocco, where subsidies remain in place. However, many of these schemes have been reformed in the last 20 years, in places like Egypt,

[20] In 2016, to inform responses by Lesotho's and Zambia's national social protection programmes to increases in food prices caused by droughts, FAO estimated the required increase in the value of transfers provided through national cash transfer programmes to offset increases in the costs of food (For more information see this link for Lesotho and this link for Zambia)

Mauritania, Algeria or Sudan, to set up national social safety net programs targeting the poorest. These programs are essential to mitigate the impacts of potential shocks.

4. **Avoid ad hoc policy reactions**. Measures put place in countries affected by potential disruptions ensuing from the conflict must be carefully weighed against their potentially detrimental effect on international markets and over the longer 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 must be always avoided.

5. **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 G-20's 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 (RRF), AMIS also provides a unique platform for policy dialogue and coordination among members (which include the Russian Federation and Ukraine), which are necessary to minimize disruptions and ensure that international markets continue to function properly and trade to flow efficiently to meet global demand and safeguard food security.

Appendix

Box 1: dietary sourcing flexibility index (DSFI)

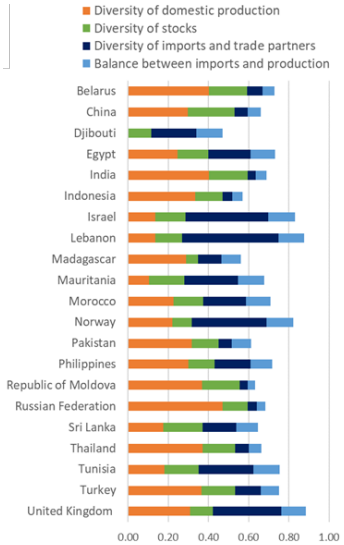
To measure countries' absorptive capacity to shocks, FAO developed an indicator – the **dietary sourcing flexibility index (DSFI)** – to measure the diversity of food supply in terms of sourcing channels and food commodities. A high value indicates multiple possible sourcing pathways and thus a high 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 conflict. 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 agri-food systems more resilient to shocks and stresses. Rome.

Supply disruptions following the Ukraine–Russia conflict 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 conflict 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.