The war in Ukraine and the risks it poses for global food commodity markets

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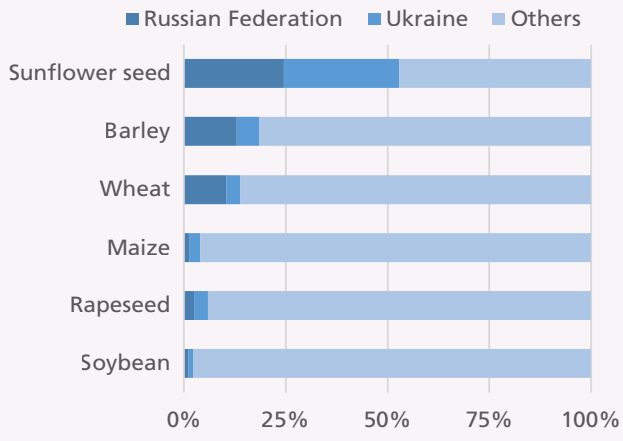
The current war in Ukraine is causing extensive loss of life, massive population displacement and significant food insecurity and malnutrition in the country. It is also damaging critical infrastructure and disrupting food supply chains and markets. Because the war is engaging two of the world's most important agricultural commodity market players, its effects are being felt internationally. This Special Feature highlights the most significant risks that the war poses to world food markets.[1]

Market structure and trade profiles

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. Between 2016/17 and 2020/21, the two countries together accounted for an average of 19, 14 and 4 percent of the global output of barley, wheat and maize, respectively (see Figure 1). In the oilseed complex, their contribution to the global production of sunflower seed was particularly important, with just over half of world output originating 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.

The Russian Federation and Ukraine also play leading roles in supplying global markets with the aforementioned foodstuffs, contributing to high export concentration and thus exposing these markets to increased vulnerability to shocks and volatility. Figure 2 illustrates the important supply role that the countries play in international food trade[2]. For example, in the global wheat market, where the top seven exporters combined accounted for 89 percent of international trade in 2021, the Russian Federation was the second largest global wheat exporter that year, while Ukraine ranked as the sixth largest wheat supplier. In the sunflower oil sector, their substantial production bases of sunflower seed endowed them with a combined world export market share of close to 72 percent in 2021, making the two countries the two largest world sunflower oil exporters.

Figure 1. Global production of selected crops, percentage share in total, 2016/17–2020/21 average



Source: FAO XCBS system

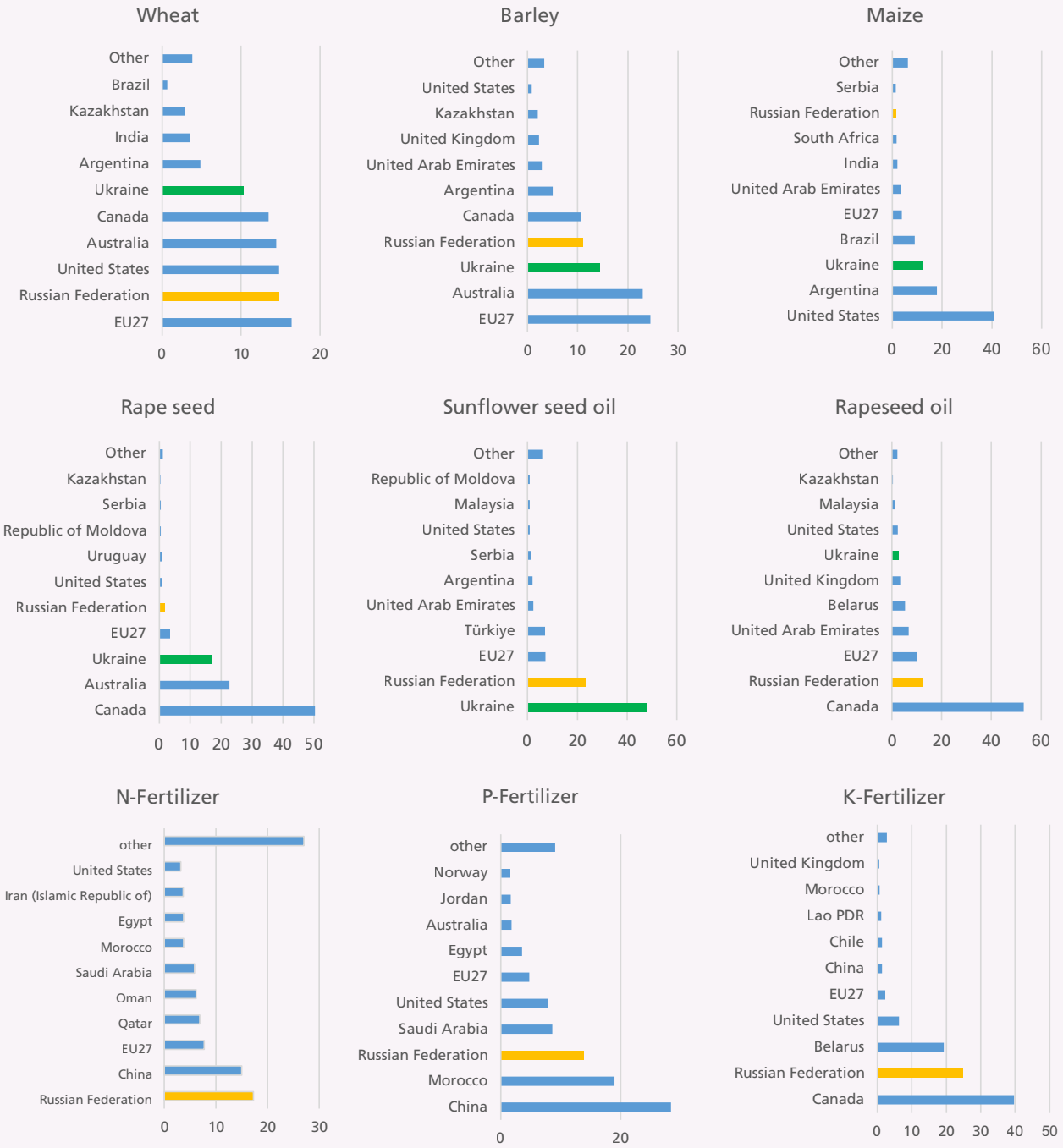
The high export concentration that characterizes food commodity markets is also prevalent in the fertilizer sector, where the Russian Federation plays a leading supplier role. In 2021, the Russian Federation ranked as the top exporter of nitrogen (N) fertilizers, the second leading supplier of potassic (K) fertilizers and the third for phosphorous (P) fertilizers (see Figure 2).

Many countries that are highly dependent on foodstuff and fertilizer imports rely on supplies from the Russian Federation and Ukraine, as shown in Figures 3 to 5. Many of these countries fall into the groups of Least Developed Countries (LDCs) and Low-Income and Food-Deficit Countries (LIFDCs). For example, Eritrea sourced almost

[1] Analyses of the impact of the war on food and agriculture that go beyond the topics covered by this Special Feature are examined in a series of FAO Briefing Notes, available at: https://www.fao.org/newsroom/briefing-notes/en. This feature draws from the briefing note titled "The importance of Ukraine and the Russian Federation for global agricultural markets and the risks associated with the current conflict", which benefited from extensive inputs by various analysts from the FAO Markets and Trade Division, the Animal Production and Health Division, and the Office of Emergencies and Resilience.

[2] Processed products are excluded from these estimates.

Figure 2. Top ten exporters of selected commodities, percentage share in world exports in 2021



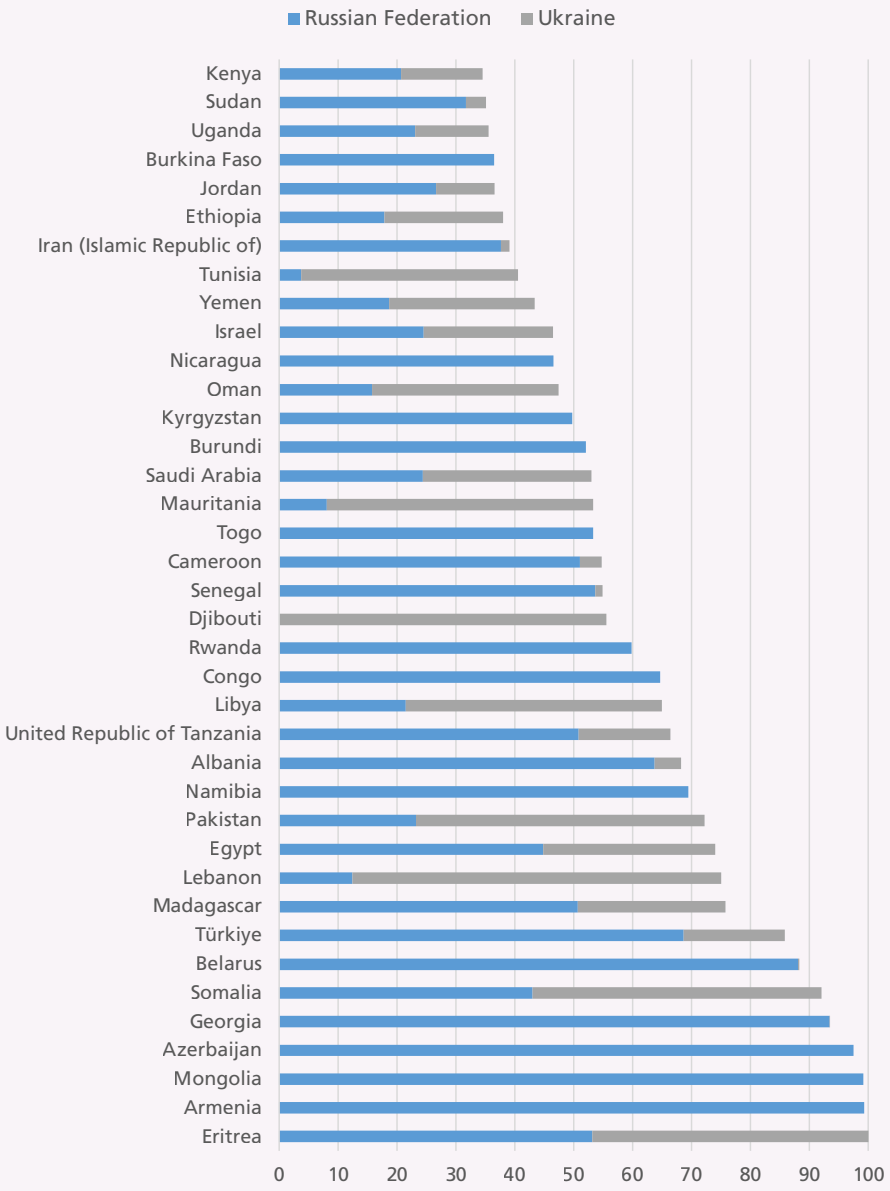
Source: Trade Data Monitor (TDM), authors' calculations.

the entirety of its wheat imports in 2021 from the Russian Federation (53 percent) and Ukraine (47 percent).

The wheat imports of many countries in North Africa and Western and Central Asia are highly concentrated towards supplies from the Russian Federation and Ukraine. Overall, more than 30 net importers of wheat depend on the two countries for over 30 percent of their annual wheat import needs.

As for fertilizers, Ukraine does not feature heavily as a prominent fertilizer exporter, with the exception of purchases by India. On the other hand, and although less than for wheat, global reliance on Russian N, P and K fertilizers is noteworthy. Some 15 net importers of fertilizers in Latin America, Europe and Asia have an import dependency of over 30 percent on Russian fertilizers, for all three types. Within these regions, Brazil, the European

Figure 3. Wheat import dependency: share of wheat imports from the Russian Federation and Ukraine in total wheat purchases by net importers in 2021 (%)



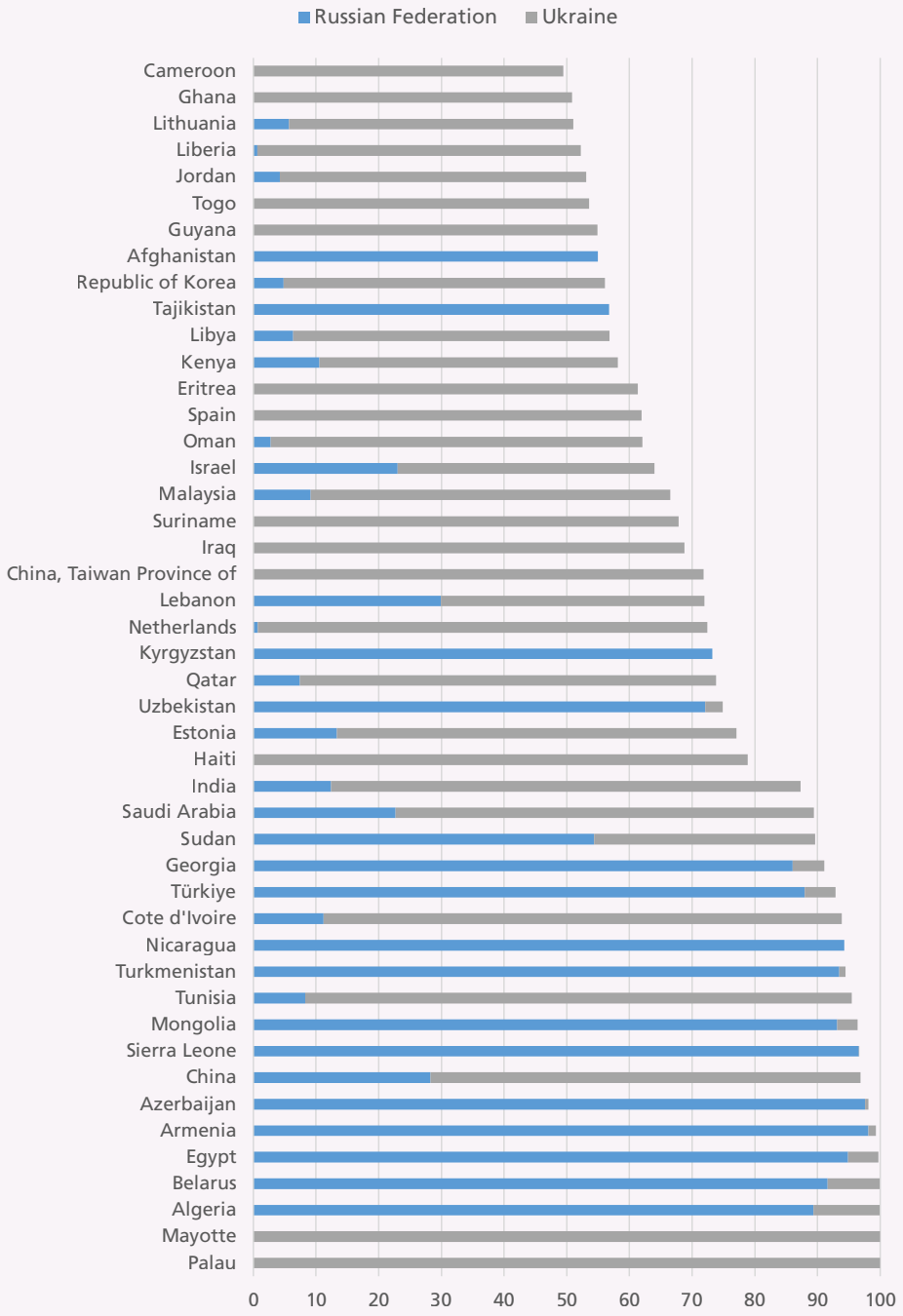
Source: Trade Data Monitor (TDM), authors' calculations.

Union (EU) and India account for the lion's share of Russian fertilizer exports in absolute terms, due to the larger area extensions they cultivate, but also higher fertilizer application levels. However, comparing fertilizer import levels with the amount of arable land to which fertilizer is applied (excluding pastures and meadows) reveals that many countries in Central and South America, Central Asia, and various non-EU members are much more dependent on Russian fertilizer imports than these larger agricultural market players (see Figure 5). Although Africa only accounts for 3–4 percent of global fertilizer consumption, many sub-Saharan countries are also heavily reliant on supplies from the Russian Federation.

Trade and logistical risks

The escalation of the war in late February came while Ukraine and the Russian Federation were in the midst of their 2021/22 marketing seasons. As such, it had immediate impacts on the countries' capacity to execute existing export contracts and to enter into new ones for crops already off the ground. This has been particularly the case in Ukraine, where the war has led to the cessation of all commercial shipping operations (owing to the closure of Ukraine's Black Sea ports), the temporary suspension of activities by private grain and crushing operators, damages to inland transport, storage and processing facilities and

Figure 4. Import dependency of sunflower oil: share of sunflower oil imports from the Russian Federation and Ukraine in total purchases by net importers in 2021 (%)

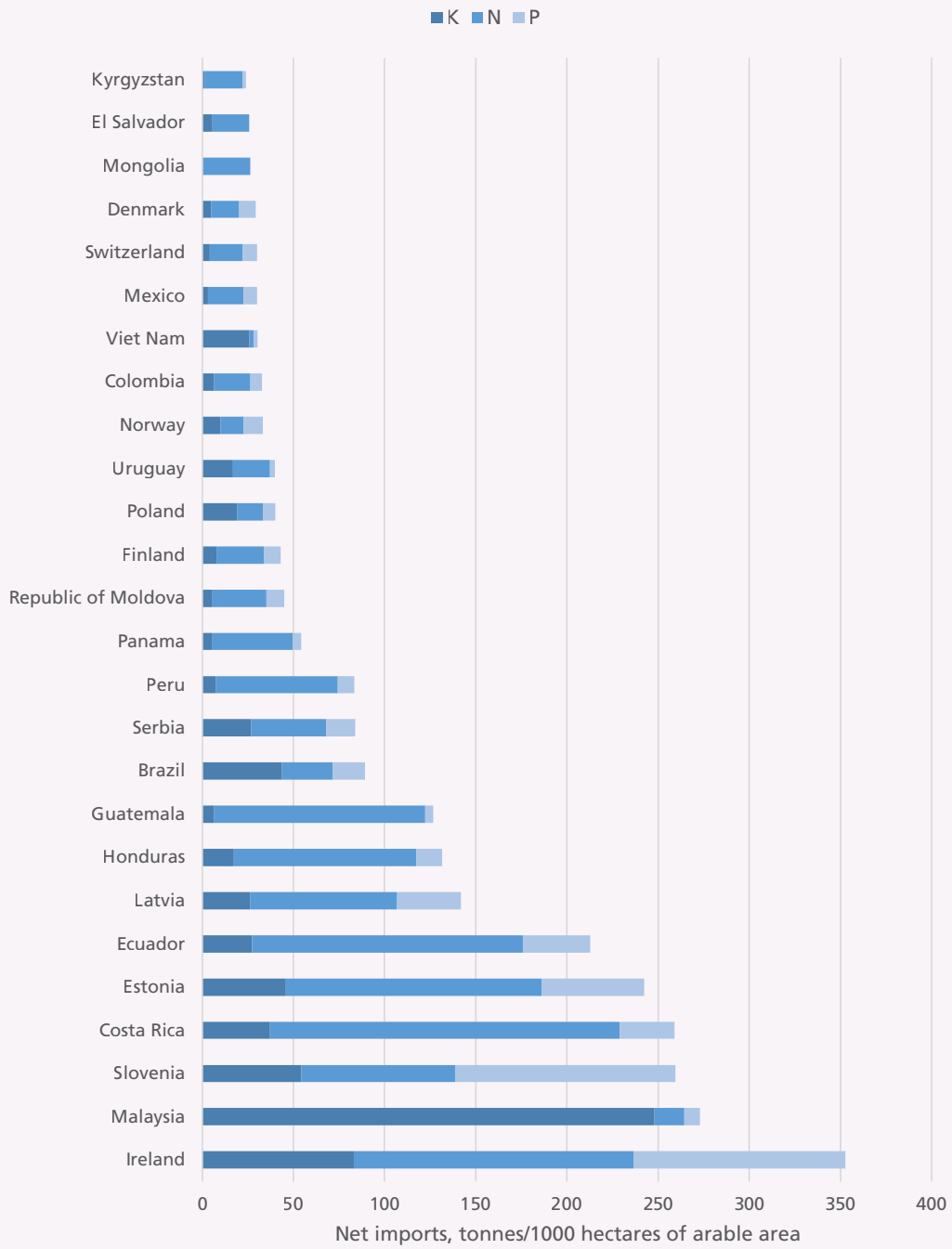


Source: Trade Data Monitor (TDM), authors' calculations.

the introduction of licensing requirements or outright bans on exports of some commodities. From an export perspective, the loss of Ukraine's maritime shipping capacity has been especially harmful; this normally handles close to 90 percent of the country's offshore sales. Efforts to boost food exports using alternatives, such as rail and road transport, are ongoing, but the capacity of these alternatives to fully compensate for port closures are constrained by infrastructural damages, as well as limited railway car availability and conflicting rail gauges at borders with neighbouring countries.

Official statistics on Russian food exports since the onset of the war are not available. Yet, reports suggest that these have progressed, notwithstanding concerns

Figure 5. Net imports of Russian fertilizers in metric tonnes per 1 000 hectares of arable in 2021 (net importers only)



Source: FAOSTAT, Trade Data Monitor (TDM), authors' calculations.

that they could be considerably depressed by economic sanctions imposed on the country in response to the war. Although these sanctions do not directly target the Russian food and fertilizer sectors, these concerns are rooted in the possible indirect effects that the sanctions targeting the banking sector could have on Russian agricultural exports by constraining access to the financial services needed to complete international transactions. A number of multinational agribusiness companies have also withdrawn from their export-oriented operations in the country and, while Russian Black Sea ports continue to function, there are apprehensions regarding increases in insurance premiums for vessels destined to berth in the Black Sea. On the policy front, while Russian exports of wheat and other

grains remain subject to the quotas and floating export taxes introduced prior to the war, Russian exports of various grains to members of the Eurasian Economic Union (EAEU) were prohibited in mid-March. Although this measure was rescinded soon after, in April, shipments of rapeseed and sunflower seeds were reportedly banned until August, with exports of sunflower oil and meal also made subject to quotas and licensing requirements until then.

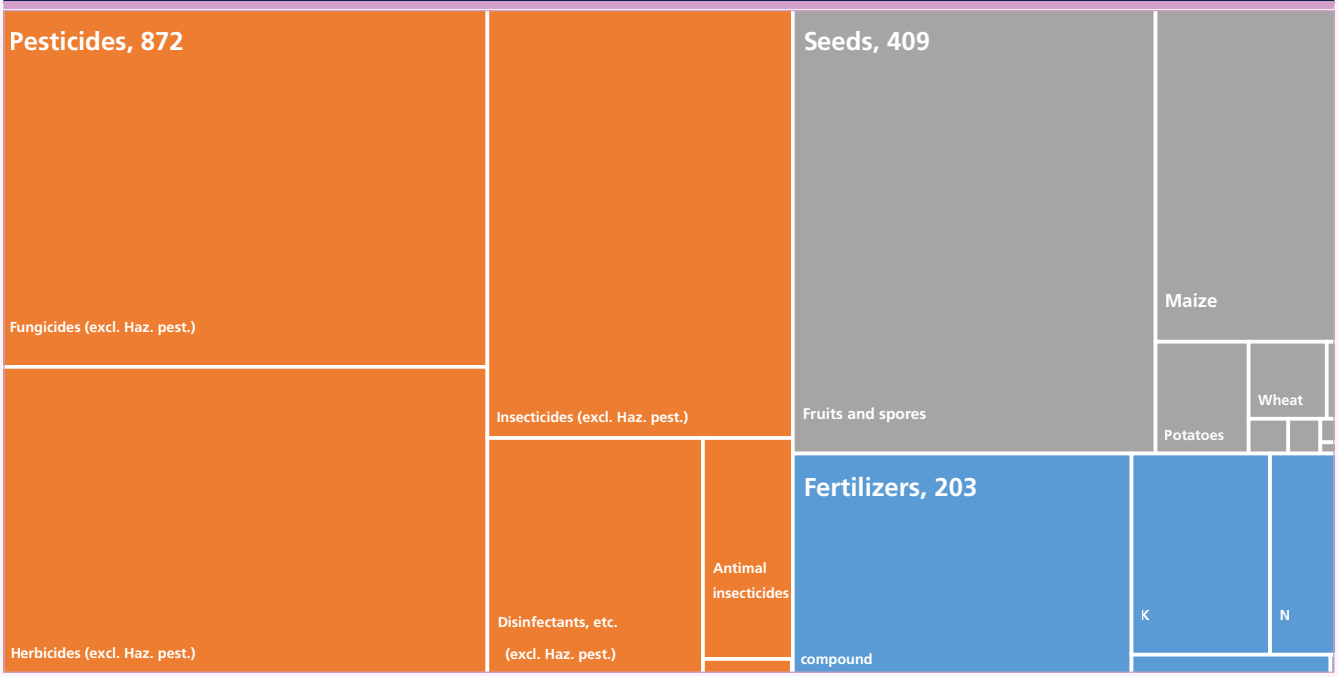
In both countries, any prolonged interruption in supplying international markets will require greater reliance on storage facilities, especially silos. Under favourable conditions, grains can be stored for multiple seasons. However, the storability of raw oilseeds is usually shorter and oilseeds must be crushed shortly after harvesting in order to achieve the highest possible oil yields. In Ukraine, grain elevators and oil crushing facilities are spread across the country. However, they are larger and more highly concentrated near important transportation points and ports, increasing the risk of this infrastructure being damaged in the war. If modern oil crushing facilities are damaged, the excess capacity of smaller regional processing facilities could balance the losses. However, many of the smaller crushing facilities do not have the technology to switch between oilseeds.

Production risks

Much uncertainty still surrounds the war itself, its intensity, geographical scope and duration. Yet, it is clear that the war has already inflicted immense damage on Ukraine's agricultural sector. This raises significant concerns regarding the country's capacity to continue producing and exporting food going forward. Production prospects for the 2022/23 season in the country are already downcast because of war-induced constraints in accessing basic productive inputs, such as agricultural land, labour and fuel, combined with the presence of unexploded ordnance on farmland. Damage to infrastructure and disruptions to transport and markets could result in additional supply losses at the post-harvest stage, further to driving changes in cropping patterns that favour domestically-consumed foodstuffs, such as grains and potatoes, over export-oriented crops, such as oilseeds and derived products. The war has also caused massive population displacement and the abandonment of animals, which, importantly, undermines Ukraine's capacity to control animal diseases. This is escalating the risk of disease proliferation, most notably of African swine fever (ASF), in Ukraine as well as in neighbouring countries.

Although no impacts on agricultural production appear imminent in the Russian Federation, international sanctions imposed on the country in response to the war could directly or indirectly inflict economic losses on Russian agriculture going forward. The incomes of Russian farmers risk being negatively impacted by the loss of export markets that could result from the sanctions. This could in turn drive farmers to curb their production of export-oriented crops. Moreover, although the Russian Federation is a net exporter

Figure 6. Russian imports of agricultural inputs in 2021, millions of USD



Source: Trade Data Monitor (TDM), authors' calculations.

of fertilizers, Russian agriculture is particularly dependent on imported seeds and pesticides, as depicted in Figure 6. In 2021, the Russian Federation purchased USD 872 million worth of herbicides, fungicides, insecticides and other pesticides, 58 percent of which came from the EU. Russian imports of -high-value- seeds (i.e. hybrid, genetically modified organisms (GMO) or certified seeds), amounted to another USD 409 million that year, with 68 percent originating in the EU. This high import dependency on the EU suggests that trade sanctions could take a hefty toll on Russian crop production. If such an eventuality materializes, the combined effects of lower seed and pesticide uses, such as reduction in plantings, yields and/or product quality, could affect the availability of many food crops, both for domestic use and, arguably, even more so for products destined for international markets.

Price risks

As relayed by the FAO Food Price Index, international food prices were already high before the war broke out. A host of factors contributed to their increase, including strong demand for food and animal feed; poor weather in key suppliers; uncertainties regarding export policies implemented by some major exporters; high internal transport and production costs (e.g. energy and fertilizers) in exporting countries; and disruptions to supply chains owing to COVID-19. The war has compounded the pressure on prices. It jolted export quotations of grain and vegetable oils to fresh peaks in March 2022, as concerns about shortfalls in Ukrainian and Russian exports arose at a time of tight supplies of grains (mostly wheat) in other major origins and of substitute vegetable oils, such as soy and palm oil. The prospect of high and protracted food prices also triggered the imposition of export restrictions on food products by numerous countries. Although quotations of some commodities have since lost their upward momentum, world food prices remain generally elevated.

This persistent overall price strength is being underpinned by the spillover effects of grain and vegetable oil price hikes being felt in other food sectors, together with weather uncertainties and persistently high input costs, especially for fuel and fertilizers. In countries that depend on imports to meet their consumption needs, the higher food costs caused by these disruptions imperil the food security of vulnerable consumers. This is particularly the case for groups that dedicate a larger share of their disposable incomes to food, since in order to cope with the food price hikes they reduce the quantity and/or quality of the food they consume. This leads to more hunger and malnutrition or to less money available for other necessities, such as health and education.

International benchmark prices for fertilizers also rose throughout 2021, with many quotations reaching all-time highs. The most notable increases were registered for nitrogen fertilizer. The end-of year prices of urea, a key nitrogen fertilizer, rose by more than three times since early 2021, with prices of phosphorous fertilizer rising in tandem over the same period. As for other commodity prices, these fertilizer price dynamics were determined by an interplay of supply and demand. On the demand side, the higher output (crop) prices registered in 2021 boosted the affordability of fertilizers, thereby pushing fertilizer prices upwards. On the supply side, high and volatile energy prices were also registered, especially for natural gas, which plays a pivotal role in the production of N fertilizer and the price of which 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 stemmed from supply disruptions and high transportation costs following the imposition of export restrictions on fertilizers and sharp increases in bulk and container freight rates caused by the COVID-19 pandemic.

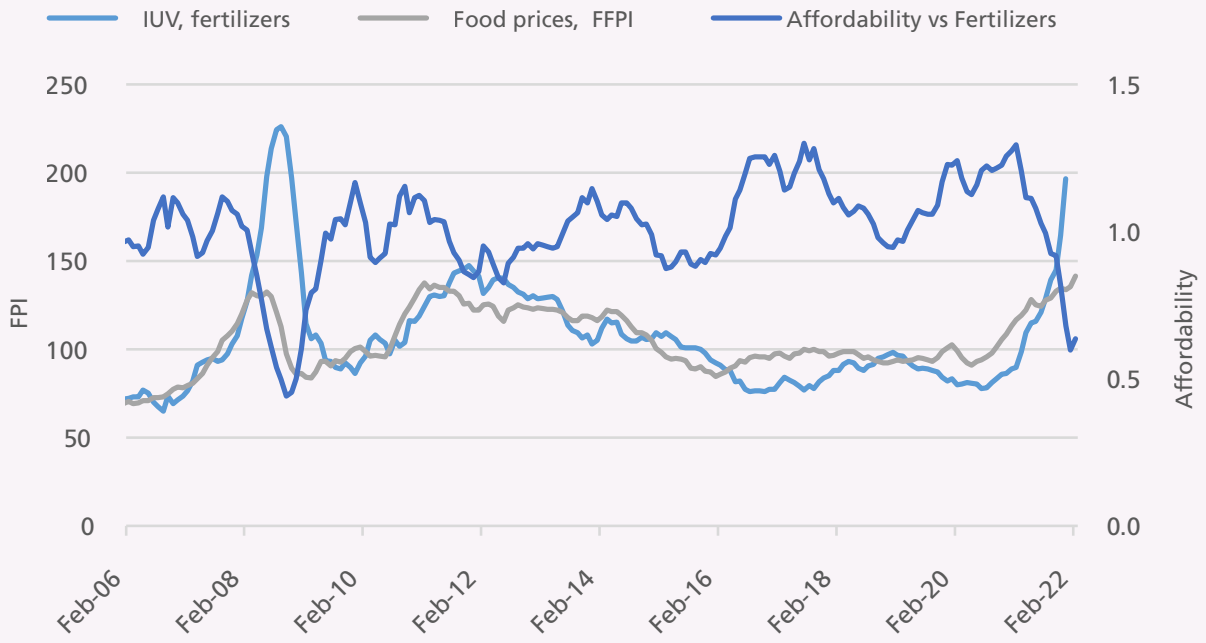
With the prospect of a likely trade embargo on exports from the Russian Federation or a self-imposed export restriction, the global fertilizer market has also seen prices pushed up by the war. For example, international quotations for urea (N), phosphate (P) and potassium (K) reached record highs in April 2022, especially potassium, which increased by over 150 percent since the beginning of the year. Generally, high fertilizer prices keep overall input prices elevated, resulting in lower affordability for farmers and ultimately lower use levels that is contingent on the level of output prices. However, the recent price increases for fertilizers were so pronounced that they exceeded the price increases for outputs by a considerable margin, as shown in Figure 7. The result was a sharp decline in the affordability[3] of fertilizers, particularly for agricultural products that have so far been spared by the otherwise widespread price increases. Lower levels of affordability in turn should almost inevitably result in lower input use and, as a consequence, lower yields and compromised quality (such as lower protein levels in milling wheat) in the next cropping season.

Energy risks

Agriculture absorbs high amounts of energy, both directly, through fuel, gas and electricity use, and indirectly, through the use of agrichemicals, such as pesticides, lubricants

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

Figure 7. Fertilizer affordability, FAO Food Price Index (FFPI) versus fertilizer prices, 2014–2016=100



Source: FAO Food Price Index (FFPI), Trade Data Monitor (TDM), authors' calculations.

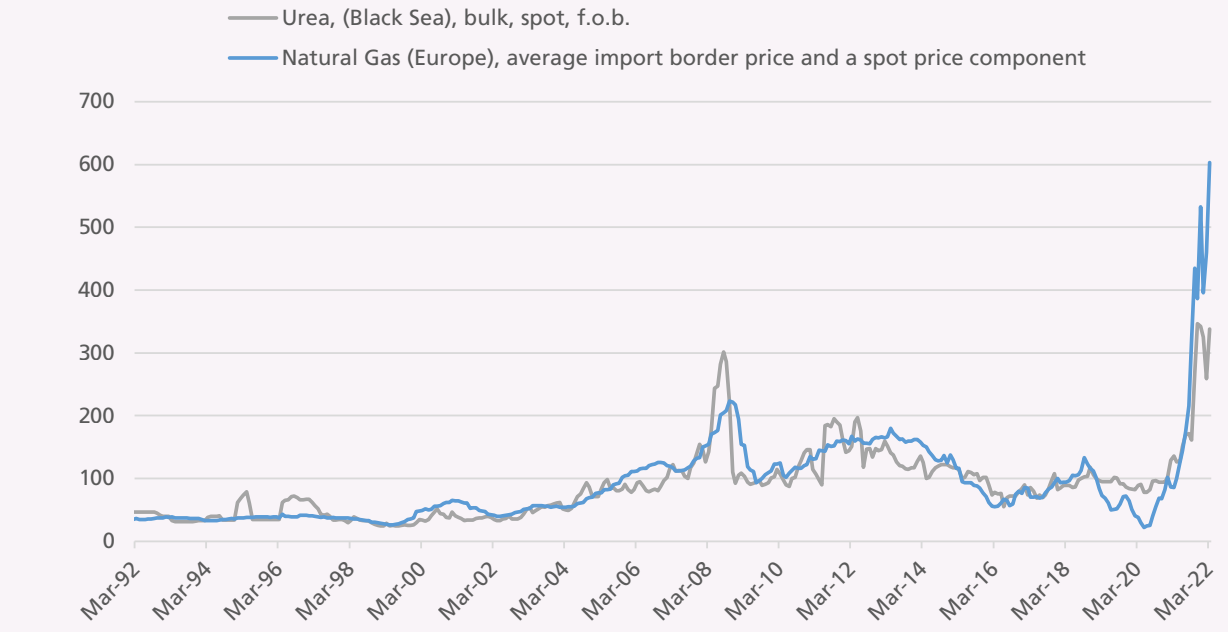
and fertilizers. Energy is also required to manufacture feed ingredients, such as by crushing oilseeds to produce oil meals and milling grains to manufacture feedstuffs (e.g. pellets, flours and compound materials). The Russian Federation is also a key player in the global energy market. Its shipments of coal, oil and gas account, respectively, for 18, 11 and 10 percent of global exports. Russian energy exports are particularly important for the EU, which sources, 46, 25 and 31 percent of its coal, oil and gas imports, respectively, from the Russian Federation.

Since N-fertilizer production relies on (natural) gas as its main source of fuel, prices of N-fertilizer, such as urea, normally track gas prices (see Figure 8). However, the close co-movement of gas and urea prices came to an abrupt halt in the fourth quarter of 2021 (Q4-2021), when prices for natural gas experienced a massive spike. The spike 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 their output considerably. Since then, and further exacerbated by the war, prices for natural gas have remained very volatile and upgrading margins have shifted back-and-forth from positive into negative territory.

Recently, however, the swift and substantial increases in energy prices triggered by the war's escalation in late February were followed by a notable relaxation in the European gas market during the second week of March 2022. Key quotations for natural gas declined by more than 50 percent from their peaks in just ten days, amid milder spring weather in Europe and rising liquefied natural gas imports by the EU. While this allowed the strength in urea prices to moderate, it is likely to re-establish positive upgrading margins for fertilizer producers. With gas prices still remaining at very high historical levels in Europe and the United States of America, there is limited scope for fertilizer prices to decline in 2022. Uncertainties also cloud the supply outlook for these commodities going forward, notably in EU members of Europe and Central Asia. On the one hand, high (natural) gas prices could make once-unprofitable investments in energy production, such as fracking installations in the United States, commercially viable, thus easing international fertilizer prices. At the same time, amid efforts to wean themselves off imported gas (especially from the Russian Federation), EU countries and companies could be inclined to shift from using natural gas for fertilizer production to using it for other outputs with higher marginal-value products. This could in turn have further implications for world fertilizer availability, as the EU is also among the leading global suppliers of fertilizers.

The sharp increase in energy prices that has accompanied the war could also impact agriculture through price linkages on 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,

Figure 8. Urea price vs natural gas price, 2014–2016=100



Source: IndexMundi.

tariff protection and/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. The mandated or incentivized quantities are largely independent of energy prices. However, since energy prices are on a sharp upward trajectory again, the use of agricultural feedstocks for biofuels 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, this feature could pull food prices up to their energy parity equivalents. The food price rise is capped again when agricultural feedstocks become so expensive that they can no longer compete in the energy market.