



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



Impact of the Russia-Ukraine War on African Agriculture, Trade, Poverty, and Food Systems

David Laborde, Greenwell Matchaya,
and Fousseini Traoré

Introduction

On February 24, 2022, Russian troops entered Ukraine, sparking one of the most intense conflicts in recent years. As of September 2023, the conflict is still active and continues to raise concerns. Russia, Ukraine, and Belarus (which has been indirectly involved in the conflict) are key actors in world markets for two product groups critical for African countries: food (mainly cereals and vegetable oils) and fertilizers. With world markets already severely disrupted by the COVID-19 pandemic, the new crisis in the Black Sea region, combined with climate shocks around the world, has further disrupted supply chains and increased prices. Since African countries are net food and fertilizer importers, the situation continues to raise serious concerns. This chapter offers an in-depth analysis of the conflict's impact on Africa's agricultural and food systems, with particular attention to the food and fertilizer sectors, the two main channels through which the shock has been transmitted. It is important to understand the extent of Africa's exposure and vulnerability to the conflict's impacts, including the impact on the ground in Africa in terms of lost or delayed agricultural production and increased food security risks. Moreover, this is an opportunity for policymakers not only to develop solutions that will mitigate the impact of the present crisis at the national, regional, and continental levels, but also to learn from the experience for future crises. As countries respond, it is also important to respect and improve the trade rules at the global level to avoid measures that may exacerbate the effects of the crisis.

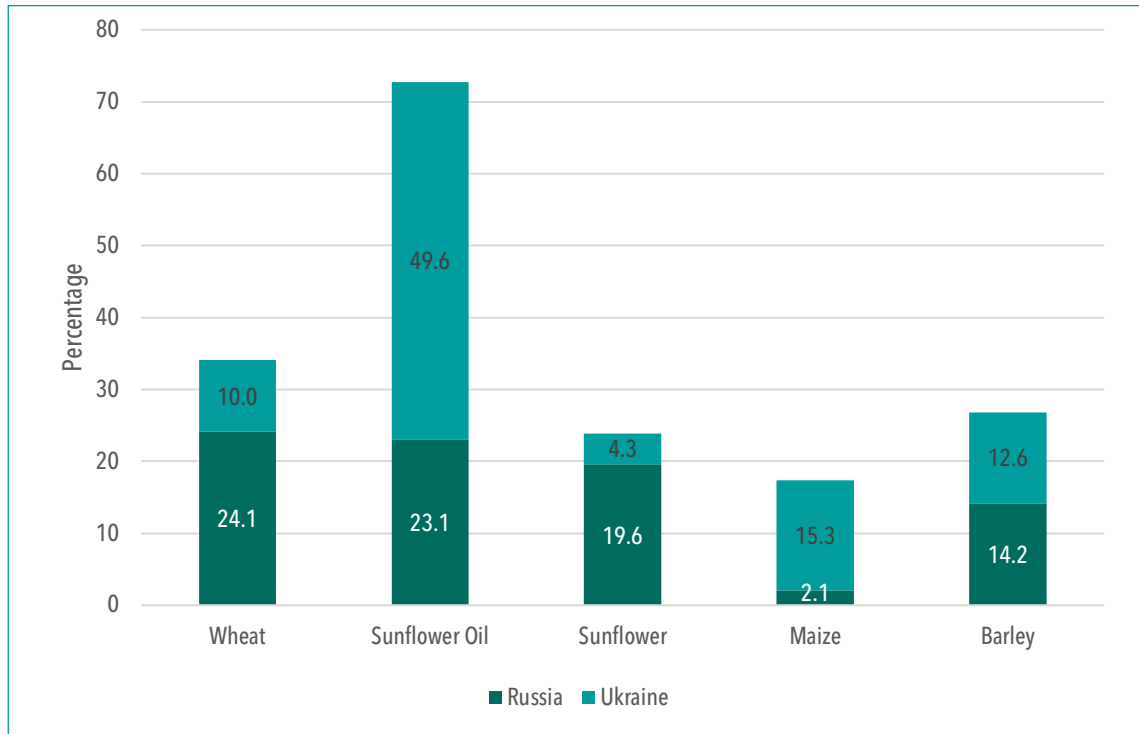
The chapter is structured as follows. In the next section, we set the scene by describing the key role played by Russia and Ukraine in world food and fertilizer markets along with the evolution of key commodity prices and the factors influencing them, such as measures restricting trade. In the following section, we examine Africa's dependence on world markets for food and fertilizers, with a focus on the role of Russia, Ukraine, and Belarus. This provides an overview of how African countries will be impacted by the conflict, with the impact proportional to the magnitude of the shock and the degree of exposure faced by different countries. We next explore the impacts of the conflict, first on African agrifood systems, then on poverty. In the final sections of the chapter, we present an overview of policy responses put in place in Africa to cushion the shocks, and provide some recommendations and conclusions.

Setting the Scene

The key positions of Russia and Ukraine in world markets

Russia and Ukraine are large players in global cereal and oilseed markets (Figure 5.1). They account for more than a third of wheat exports and a quarter of barley exports. The figures are even more impressive for sunflower oil, with 72 percent of world market share accounted for by the two countries and almost 50 percent by Ukraine alone. Together, Russia and Ukraine represent 12 percent of total calories traded in the world (Glauber and Laborde 2022). Given this configuration, the beginning of the conflict raised significant concerns about the trade of cereals. Indeed, since Ukraine's main ports were blocked, millions of metric tons¹ of grain could not be exported, although some attempts were made through railroads in Poland with limited success. The supply disruptions also affected Russian exports due to the uncertainty and rising insurance costs in the Black Sea area.

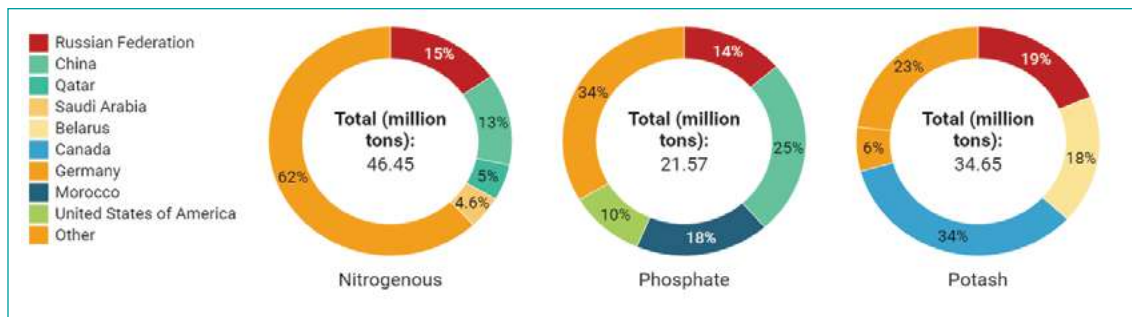
¹ Throughout this volume, tons refers to metric tons.

Figure 5.1 Share of Russia and Ukraine in world markets

Source: Glauber and Laborde (2022) and COMTRADE.

Russia and Belarus also play a key role in world fertilizer markets (Figure 5.2). Russia alone accounts for 15 percent of world trade in nitrogenous products and 14 percent of phosphate products. The market for potash is the most concentrated one, with Russia and Belarus together representing 37 percent of world trade. Only China plays a similarly large role, particularly for nitrogenous and phosphate products. Given that China has imposed export restrictions, the conflict in Ukraine has exacerbated tensions in a market already reeling from the aftermath of COVID-19 and other crises, including adverse weather conditions such as the 2021 droughts in Canada and the United States that affected global commodity supplies, including wheat. Also worth noting is the indirect impact of the fertilizer crisis on Ukraine's farmers, who normally sourced their fertilizer imports from Russia and Belarus. For Ukraine, the combination of fertilizer market disruptions, reduced output prices resulting from difficulties in accessing world markets, and the direct loss of farmland due to the war, is expected to cause a decline in 2023 grain production, and thus Ukraine's exports, undermining the global food supply and its resilience to future shocks.

Figure 5.2 Market shares of the main fertilizers exporters



Source: FAOSTAT.

Evolution of food and fertilizer prices

World prices for food, energy, and fertilizers have increased significantly over the past two years, reaching their highest levels in March 2022 (Figure 5.3). From January 2021 to March 2022, grain prices increased by 21 percent and fertilizer prices by 162 percent. More important, the conflict in Ukraine began when global markets were already in turmoil. Since their peak in mid-2022, prices have been declining on world markets, based on their readjustment to a combination of positive supply conditions (crops) and expansion of supply capacity (fertilizers and crops), as well as reorganization of global trade flows to accommodate the new reality. Even in the context of improved market conditions in 2023, it is of critical importance to review their evolution in 2022 to properly understand the vulnerabilities of African economies to such shocks.

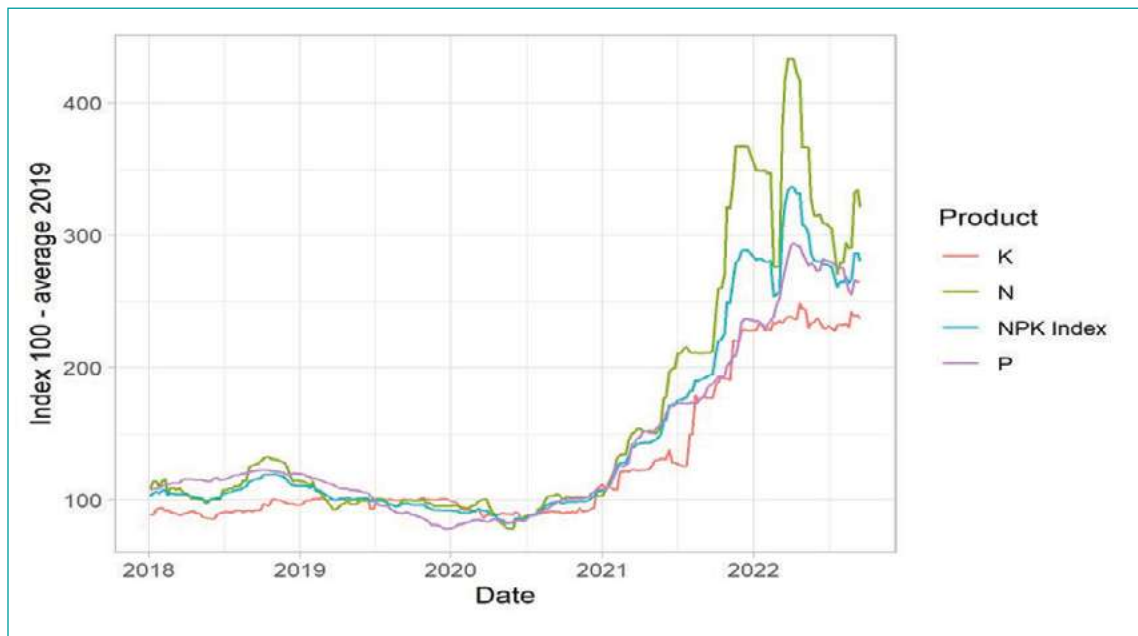
Indeed, before the crisis, fertilizer prices had already doubled from January 2021 to January 2022 and the increase between January and March 2022 represents only 17 percent of the total increase, although this was a substantial change for a three-month period. It is also worth noting that the price levels observed in the wake of the crisis are not historic highs. As shown in Figure 5.3, the peaks observed during the 2008 crisis were well above the current ones. A more disaggregated analysis shows that wheat and maize prices increased by 80 and 47 percent, respectively between January 2021 and May 2022, and by 39 and 24 percent just between January 2022 and May 2022 (World Bank 2022). For vegetable oils, the movements for soybean oil and sunflower seed oil prices are particularly notable: between January and May 2022, soybean oil prices increased by 34 percent and sunflower oil by 47 percent. Regarding fertilizers (Figure 5.4), the most significant increases were registered by nitrogenous products (+24 percent) and phosphate (+20 percent) between January and March 2022.

Figure 5.3 Evolution of grains, fertilizers, and energy prices (index based on US\$ constant prices: 100 = average 2000-2020)



Source: Constructed with data from World Bank and U.S. Bureau of Labor Statistics.

Figure 5.4 Evolution of the prices of the main nutrients



Source: Constructed with data from the World Bank.

Note: N = nitrogen; P = phosphorus; K = potassium. NPK index is the average of the three prices.

The evolution of prices is directly linked to supply and demand factors. Regarding fertilizers, demand was strong over the 2020-2021 period due to high crop prices. Demand for fertilizers rose by 6.3 percent in the 2020/21 crop year as farmers faced favorable fertilizer/crop price ratios (Hebebrand and Laborde 2022). On the supply side, many factors came into play. The most important is certainly the increase in production costs for most types of fertilizers. For

nitrogenous fertilizers, the increase in natural gas prices, one of the main inputs, has been fundamental. Together with soaring sulfur prices, the natural gas price increases drove an increase in phosphate-based fertilizer prices, since these are key elements to produce the latter. Furthermore, several countries (including China and Russia) put in place export restrictions on fertilizers, through quotas and taxes, that reduced global trade and accelerated the price increase. The start of the conflict and accompanying disruption thus exacerbated an already difficult market situation. The fact that the supply of fertilizers is highly concentrated amplified the problem. As shown in Figure 5.2, a few countries dominate the world market for fertilizers. The top three exporters represent one-third of nitrogenous products traded, 57 percent of phosphates, and 80 percent of potash.

Food prices evolved along similar lines. First, as fertilizers and energy represent key inputs in production, the same factors that led to high fertilizer prices contributed to increasing production costs for grains and vegetable oils. Grain prices have also been sensitive to the low level of stocks in 2020/21. For corn and wheat, ending stocks for the period were at the lowest point since 2012 and 2007, respectively. In other words, the grains market was already very tight when the war in Ukraine made it almost impossible for the country to export grain. The vegetable oil supply was also tight before the conflict began, due to drought in Brazil, Argentina, and Canada as well as typhoons in East Asia (Malaysia).² The onset of the war impacted sunflower oil exports primarily, for which Ukraine represents almost half of world trade (Figure 5.1). In addition, like fertilizers, export restrictions are also affecting a large part of vegetable oil trade. Vegetable oil prices are also under pressure stemming from the development of biodiesel sectors in the United States and South America. The biodiesel sector represented 15 percent of total vegetable oil use in 2022, up from less than 1 percent in 2003 (Glauber, Laborde, and Mamun 2022).

The specific impacts of export restrictions

The 2022 crisis has exacerbated the impact of pre-existing trade restriction measures that are particularly harmful for world trade. Indeed, almost a year before the start of the crisis, a number of export restriction measures were in place in key countries for both fertilizers and agricultural products, contributing to price increases and market volatility. Additional measures followed in the wake of the conflict. As of May 2022, 17 percent of world food and feed trade on a caloric basis was affected by export restriction measures in force in 23 countries, and overall, 32 countries (including major players such as Argentina, Belarus, China, India, Indonesia, Malaysia, Türkiye, Russia, and Ukraine) imposed 77 export restriction measures on food and feed trade (Glauber, Laborde, and Mamun 2023). These measures include export taxes, licensing requirements, and bans. In 2021, Russia was among the first countries to adopt such measures, first with a ban on wheat exports to the Eurasian Economic Union, then with licensing requirements for nitrogenous-based fertilizer exports. Other key countries to impose export restrictions measures for food or fertilizers include China, Ukraine, India, Indonesia, and Argentina.

At the product level, the markets for vegetable oils and wheat are the most affected by trade restrictions. At the peak of the crisis in May 2022, of the 17 percent of global food trade affected by restrictions, wheat alone accounted for 5 percent. IFPRI's Food & Fertilizer Export Restrictions Tracker³ reveals that in 2022, 43 percent of vegetable oils traded globally were affected by

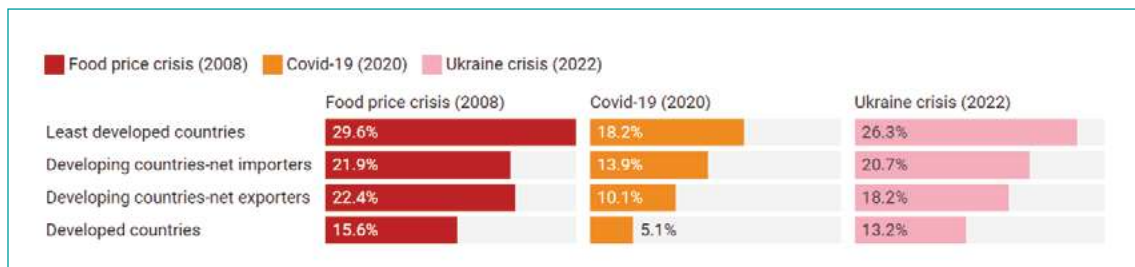
² The typhoons in Malaysia reduced the supply of palm oil on the international market thereby contributing to scarcity of vegetable oils. <https://www.ifpri.org/blog/impact-ukraine-crisis-global-vegetable-oil-market>

³ IFPRI's Food & Fertilizer Export Restrictions Tracker is a monitoring tool that tracks restrictive policies put in place by countries. It also presents the impact of these restrictions as a percentage of each country's imported calories that are affected by the restrictive measures. <https://public.tableau.com/app/profile/ifpri.food.security.portal/viz/shared/2CPYT4G8>

some form of export restriction. These measures were implemented by large players in world markets, such as Indonesia (bans on crude and refined palm oil) and Argentina (bans then taxes on soybean oil). A close analysis of the share of global trade affected by export restrictions and the FAO Food Price Index shows a strong correlation between the two data series (Glauber et al. 2023)—providing evidence of the impact of the measures on prices.

A comparison of the three recent major crises (Figure 5.5) shows that the Russia-Ukraine war has had an impact on global markets similar to the 2008 food price crisis, but much greater than the COVID-19 pandemic, although we must consider that the current crisis occurred in an environment already subject to trade tensions and restrictions and at a period when most countries were still recovering from the pandemic. The countries most affected by the Russia-Ukraine crisis are in the developing world, particularly the least developed countries, which have seen more than 26 percent of their imported calories affected (Figure 5.6). In Africa, the countries most affected include Egypt and Sudan with half of their imports affected, and to a lesser extent Uganda, Libya, and Kenya. Like food products, fertilizer imports in developing countries are also strongly affected by export restrictions. In Africa, Cameroon, Angola, Côte d'Ivoire, and Ghana are the most affected countries (Figure 5.7). The next section discusses the dependence of African nations on world markets for food and fertilizers.

Figure 5.5 Share of imported calories impacted by export restrictions

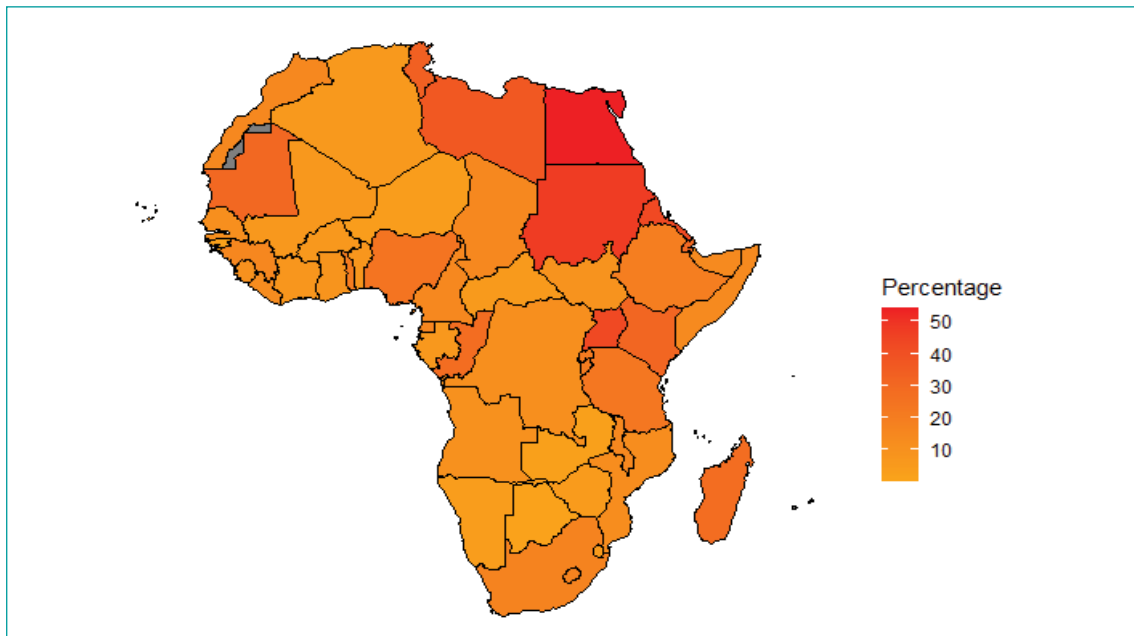


Source: IFPRI Food & Fertilizer Export Restrictions Tracker.

Note: Numbers include products used for food, feed, or energy. Intra-EU trade excluded from computations.

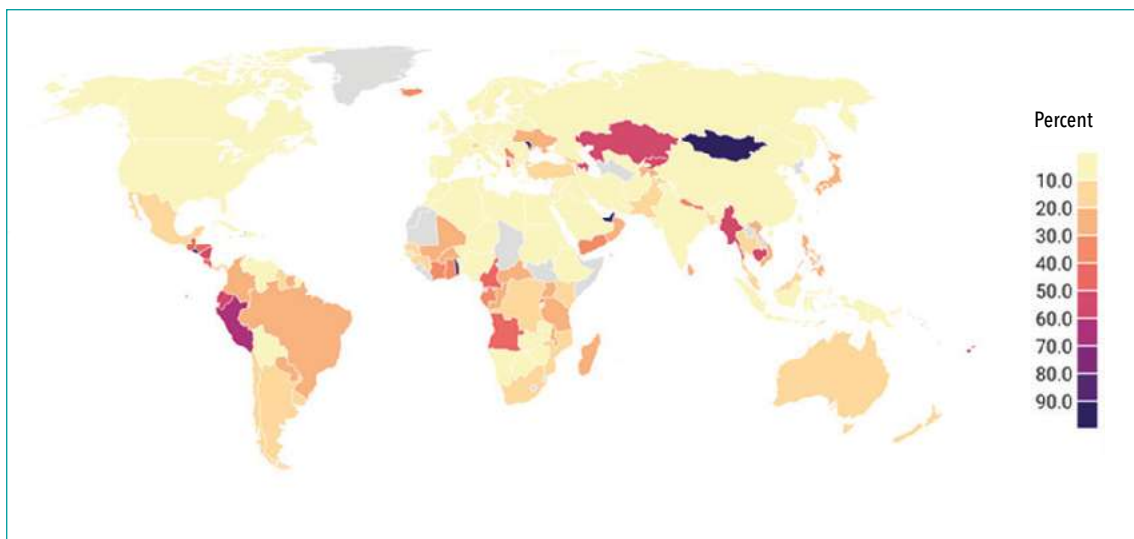


Figure 5.6 Share of imported calories impacted by export restrictions in Africa



Source: Glauber, Laborde, and Mamun (2022).

Figure 5.7 Share of fertilizers imports impacted by exporter restrictions



Source: Laborde and Mamun (2022).

Note: Trade flows impacted by sanctions not included.

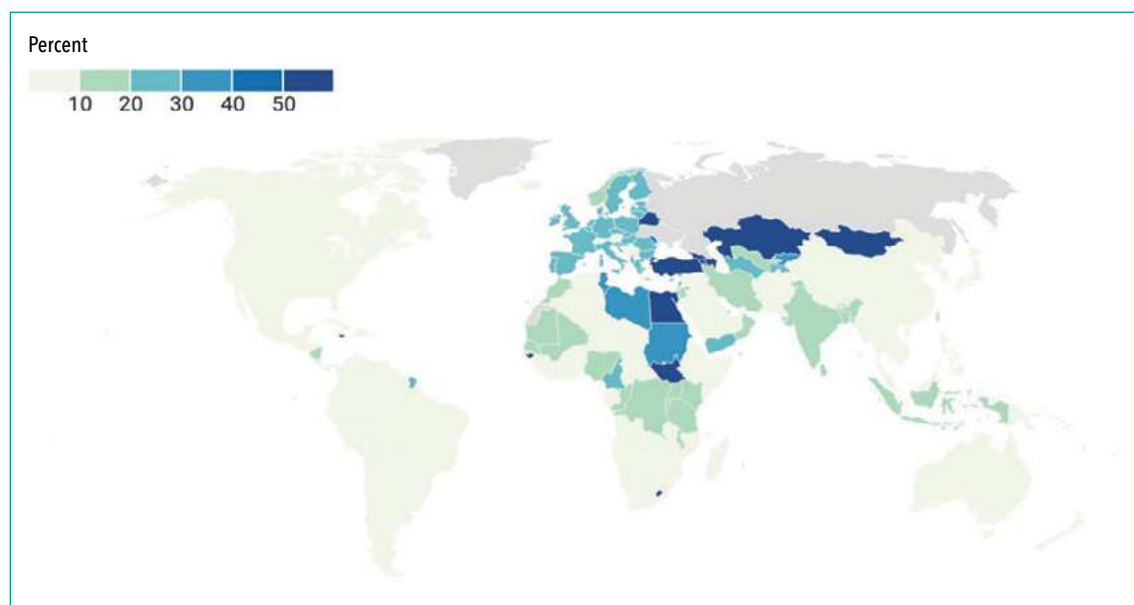
Africa's Dependence on World Markets for Food and Fertilizers

This section discusses the enormous dependency that African markets have on world markets for food and fertilizers and highlights how this may explain the significant effects that world market disruptions tend to have in Africa.

Cereals

The impact of the Russia-Ukraine war on African countries is a function of the size of the shock and the degree of dependency (exposure) of these countries on trade from the conflict area. Many African countries depend on Russia and Ukraine for their food imports in many aspects. Figure 5.8 illustrates the dependency of countries around the world on imported calories from Russia and Ukraine. Overall, almost half of African countries rely on Russia and Ukraine for at least 10 percent of their calorie imports, and eight African countries are particularly dependent, relying on Russia and Ukraine for more than 30 percent of their imports. These countries are Egypt, Sudan, South Sudan, Libya, Tunisia, Cameroon, Guinea-Bissau, and Lesotho (ordered from most dependent to less dependent).

Figure 5.8 Share of the Russian Federation and Ukraine in imported calories



Source: Laborde and Mamun (2022)

Note: EU countries are considered as one market.

For wheat, which makes up more than half of imports, the exposure is higher, with 11 countries dependent on Ukraine and Russia for more than half of their wheat imports (Badiane et al. 2022c). Overall, almost half of African countries have a moderate to high exposure to the crisis; those at highest risk are Benin, Egypt, Republic of Congo, Tanzania, Cabo Verde, Togo, Namibia, the Democratic Republic of the Congo (DRC), Libya, Madagascar, and Senegal. Among this group, the cases of Egypt, Benin, and the DRC are particularly alarming—more than 75 percent of their imports come from the conflict region. A second group of 10 countries also has a worrisome degree of exposure with import shares from Russia and Ukraine between 25 and 50 percent.

The dependence of African countries on Ukrainian and Russian imports becomes more problematic as the overall share of imports in domestic consumption rises. Table 5.1 presents

a classification of African countries along the two dimensions: dependence on imports in general and dependence on imports from Ukraine and Russia in particular. The higher the two figures, the more exposed the country is to the conflict's impacts. At the righthand side of the table (shaded), a group of 11 countries is critically exposed, with more than half of their imports coming from Ukraine, Belarus, and Russia and import penetration rates (share of imports in domestic consumption) above 50 percent. These countries are Benin, Libya, Egypt, Tanzania, Cabo Verde, Madagascar, Namibia, DRC, Togo, Senegal, and Republic of Congo. Countries like South Africa and Tunisia also are at risk, although less so than the first group. Finally, the larger the share of wheat in national diets, the greater the impact of the crisis. This is particularly the case in North African countries.

One particular aspect worth mentioning is the indirect exposure of some countries, a phenomenon often referred to as "contagion through regional re-exports" (Badiane et al. 2022a). Indeed, some countries re-export a significant part of their imports to their neighbors. This is the case in West Africa with Côte d'Ivoire and Senegal re-exporting within the region and in Southeastern Africa with South Africa and Kenya re-exporting to neighboring countries.

Table 5.1 Summary of the situation of selected African countries for wheat imports in 2020

Wheat		Dependency on imports from Ukraine, Belarus, and Russia (share in country wheat imports)			
		0-25%	25-50%	50-75%	75-100%
Import penetration rate (imports/domestic consumption)	0-25%	Ethiopia			
	25-50%	Zimbabwe, Morocco, Zambia			
	50-75%	Algeria	South Africa, Tunisia	Libya	Egypt
	75-100%	Gabon, Burkina Faso, Nigeria, Central African Republic, Comoros	Mali, Kenya	United Republic of Tanzania, Cabo Verde, Madagascar	Republic of Congo
	>100%	Guinea, Côte d'Ivoire, Niger, Botswana, Eswatini, Mauritius	Burundi, Lesotho, Uganda, Mauritania, Cameroon, Ghana, Malawi	Namibia, Democratic Republic of the Congo, Togo, Senegal	Benin

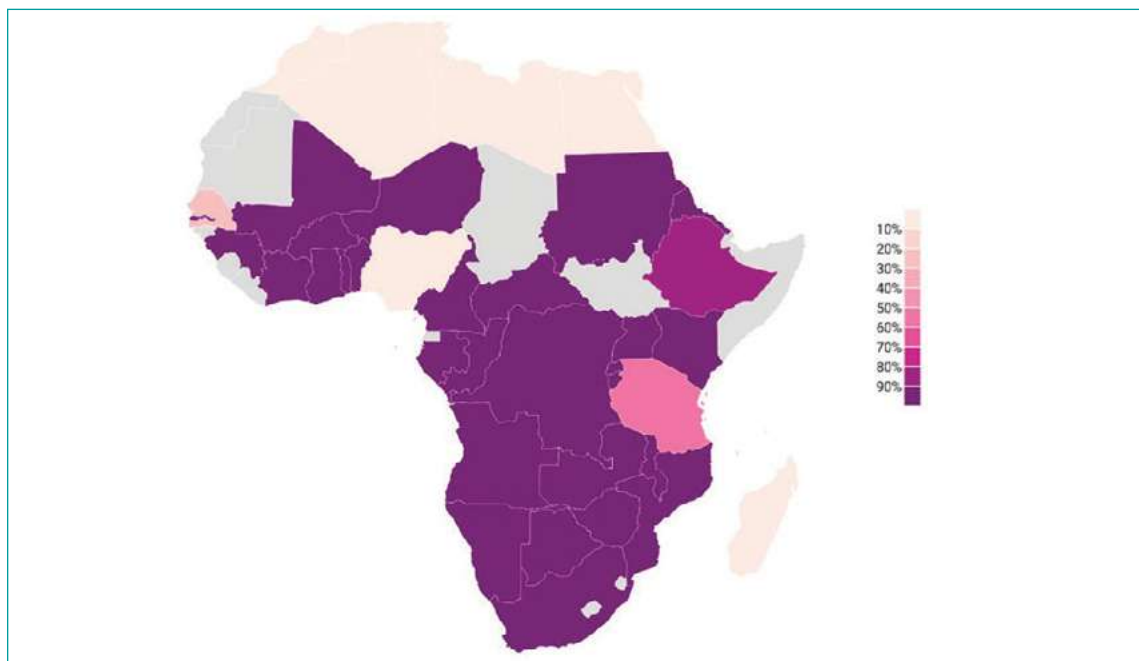
Source: Authors based on Badiane et al. (2022a).

Fertilizers

The dependence of African countries on fertilizer imports from the conflict zone is also high. Overall, more than half of African countries import fertilizer from either Russia or Ukraine, with countries including Benin, Nigeria, and the Central African Republic facing import dependency ratios above 45 percent (Badiane et al. 2022b).

A close look at the composition of fertilizer imports reveals that African countries are dependent for all types of products. Figure 5.9 shows the degree of dependency for nitrogenous fertilizers. In more than two-thirds of African countries, the share of imports in domestic use is above 80 percent.⁴ Only countries like Nigeria and those in North Africa with natural gas endowments are exceptions. Indeed, natural gas is a key input for nitrogenous fertilizers through its role in the production of ammonia and urea. When we look just at nitrogenous fertilizer imports from Russia and Belarus, the figures on dependency are a bit lower (Figure 5.10, Panel a). For potassium fertilizers, the dependence of African countries on imports from Russia and Belarus is much higher (Panel b). Countries in West Africa are the most exposed for these products, with dependency ratios often above 80 percent. This is the most problematic situation, as the market for potassium fertilizers is globally the most concentrated and few alternative sources exist on the continent or worldwide.

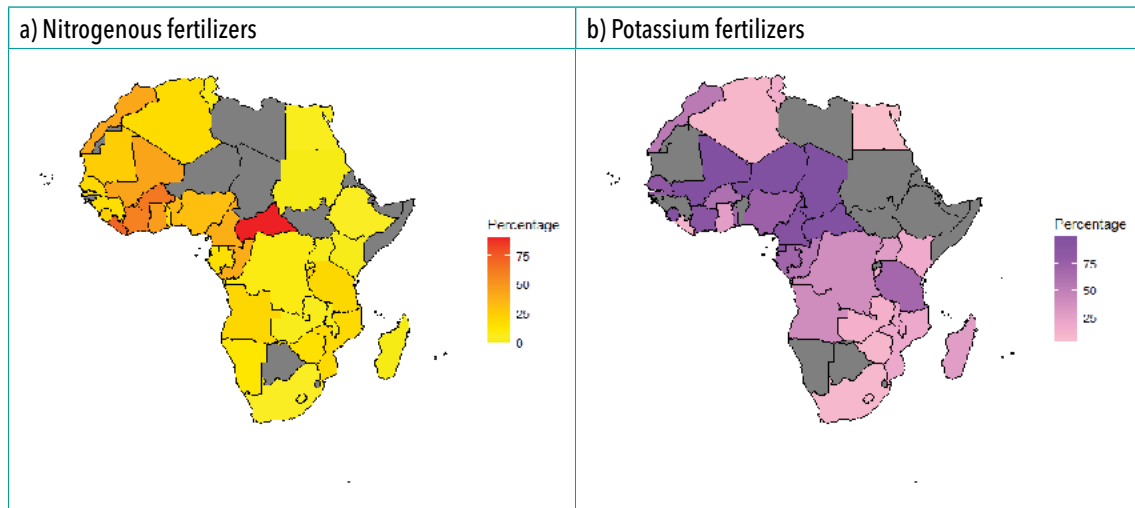
Figure 5.9 Dependence on world markets for nitrogenous fertilizers



Source: FAOSTAT.

⁴ Including imports from other African countries.

Figure 5.10 Percentage of imports from Russia and Belarus by country



Source: COMTRADE.

As with food products, the impact of the fertilizer crisis on African countries will be a function of the overall dependency of countries on imports and the share of flows coming from the conflict region. Table 5.2 classifies African countries along these two dimensions. The group of countries at the bottom right of the table are the most likely to be negatively impacted by the crisis, with import penetration rates above 25 percent and a dependency ratio to Ukraine and Russia above 30 percent. However, composition of fertilizer demand matters here. Indeed, for some type of fertilizers, notably potassium products, the degree of exposure is much higher than the aggregate exposure presented in Table 5.2.



Table 5.2 Summary of the situation of African countries for fertilizer imports

Fertilizers		Dependency on imports from Ukraine and Russia (share of total imports), 2020				
		No imports	< 15%	15-30%	30-45%	>45%
Import penetration, average 2015-2019 (imports/domestic consumption)	No data	Mauritius, Madagascar, Sao Tome and Principe, Seychelles, Equatorial Guinea	Algeria	Morocco, Togo		
	0-25%	Eswatini, Comoros, Chad, Guinea-Bissau, Djibouti, Somalia	Tunisia, Egypt, Sierra Leone	Mauritania, Cabo Verde, Liberia	Senegal	
	25-75%					Nigeria
	75-100%	Eritrea				Central African Republic
	>100%	Botswana, Ethiopia, Zambia, Malawi, Libya, Rwanda, Sudan, Gambia, South Sudan	Guinea, Zimbabwe, Gabon, Burkina Faso, Burundi, Lesotho, South Africa, Mali, Namibia, Congo, Mozambique, Angola	Côte d'Ivoire, Uganda, Kenya, Democratic Republic of the Congo	Niger, Cameroon, Ghana	Benin

Source: Authors based on Badiane et al. (2022b).

When we group African countries according to their dependency on imports from the conflict area for food and for fertilizers, we see little overlap between the two groups. Table 5.3 presents a summary. Countries that are heavily dependent on wheat imports from the conflict zone rarely rely heavily on fertilizer imports. Only four countries (Senegal, Cameroon, Ghana, and Benin) present a moderate to high level of exposure for *both* food and fertilizers. Nevertheless, the fact that many countries are heavily dependent on food *or* fertilizer imports means they are highly exposed to risks.

Table 5.3 Summary of the combined situation of African countries for both food and fertilizer imports

		Dependency on imports from Ukraine, Belarus, and Russia (share in country wheat imports)		
		0-25%	25-50%	>50%
Dependency on imports from Ukraine, Belarus, and Russia (share in country fertilizer imports)	0-30%	Ethiopia, Zimbabwe, Morocco, Zambia, Algeria, Gabon, Burkina Faso, Comoros, Guinea, Côte d'Ivoire, Botswana, Eswatini, Mauritius	South Africa, Tunisia, Mali, Kenya, Burundi, Lesotho, Uganda, Mauritania, Malawi	Libya, Cabo Verde, Madagascar, Namibia, Democratic Republic of the Congo, Togo, Egypt, Rep. of Congo
	30-45%	Niger	Cameroon, Ghana	Senegal
	>45%	Nigeria, Central African Republic		Benin

Source: Authors based on Badiane et al. (2022c; 2022d).

The next sections discuss the effects of the Russia-Ukraine crisis on African agrifood systems and poverty. They highlight the effects of the war on commodity prices as well as household consumption and incomes.

Impacts on Agrifood Systems and Poverty

After presenting the dependency of African countries on food and fertilizers imports, the next sections discuss the effect of the war on agrifood systems and poverty.

Staples and cash crops

Dependence on different types of fertilizers

We first present an overview of fertilizer availability and affordability in Africa in the wake of the crisis. Since the 2020 COVID-19 pandemic, Africa Fertilizer Watch has managed a dashboard for monitoring the fertilizer markets in selected African countries. As highlighted in Table 5.4, as of August 2022—the middle of the growing season in most countries covered by the dashboard—the situation was critical. Fertilizer availability (supply)⁵ for 11 of the 12 countries for which data are available was deemed moderate or lower, with Malawi, Zimbabwe, Uganda, and Mozambique most at risk of serious shortfalls. Regarding affordability, the situation was worse: in 8 of the 12 countries, price increases were more than 25 percent from the previous month and for 3 countries prices were up more than 50 percent. Overall, the onset of the crisis jeopardized the 2022/23 growing season in many countries. In West Africa for instance, unmet fertilizer demand as of April 2022 varied from 5 percent (Togo) to 88 percent (Burkina Faso) and prices had increased between 47 percent (Nigeria) and more than 200 percent (Ghana) compared to 2021 (ECOWAS, FAO, and WFP 2022). A similar pattern is observed in East Africa, where prices doubled in many countries in one year, particularly for di-ammonium phosphate (DAP) and calcium ammonium nitrate (CAN). Overall, fertilizer price increases ranged from 20 percent for CAN in Kenya to 112 percent for DAP in Uganda (WFP 2022).

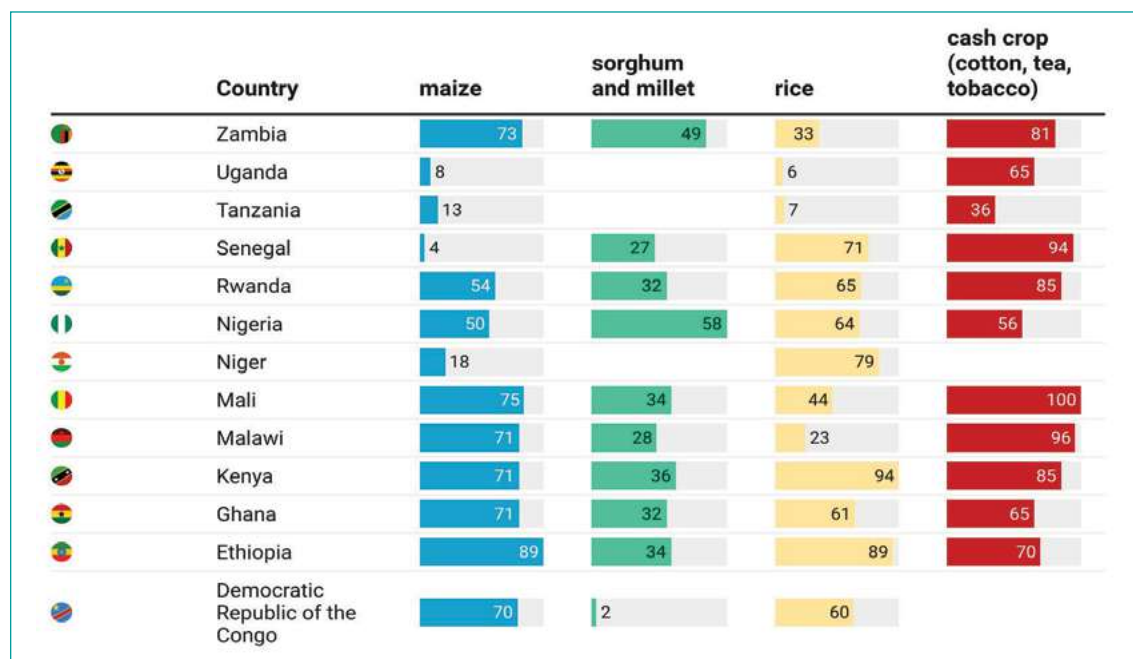
⁵ Unfortunately, Africa Fertilizer Watch does not provide a precise indicator or threshold on which the classification is made.

Table 5.4 Availability and affordability of fertilizers in selected countries, August 2022

		Affordability →			
		Stable or decrease	Increase of <25%	Increase of 25–50%	Increase of >50%
Availability ↑	Low or none	Malawi			Uganda
	Limited		Zimbabwe		Mozambique
	Moderate	South Africa		Ghana, Kenya Rwanda, Zambia Tanzania	Ethiopia
	Strong		Nigeria		

Source: Africa Fertilizer Watch, <https://africafertilizerwatch.org/>

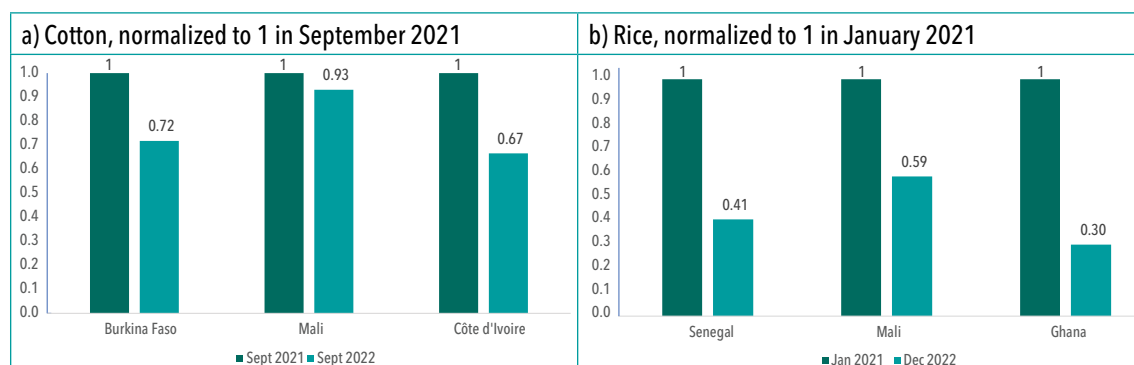
The main impact of the fertilizer crisis on agrifood systems in Africa will be reductions in use, due to both the price and availability effects. In general, producers tend to use fertilizers first for the most profitable crops, which are usually cash crops (Figure 5.11). The high share of cultivated areas using fertilizers that are devoted to cash crops also reflects the fact that these are more organized sectors with inputs furnished by downstream buying companies (the cotton sectors in West Africa, for instance). However, cross utilization is also possible, as between cotton and maize. Overall, the projected impacts of the crisis on yields and production are considerable, particularly given that fertilizer application rates and yields in Africa were among the lowest in the world even before the crisis. In East Africa, for example, cereal production is projected to decrease by 16 percent (7.4 million tons) compared to the previous cropping year and the number of food insecure people is expected to rise by 7 million (WFP 2022).

Figure 5.11 Share of smallholders' cultivated areas using fertilizers (%)

Source: Diao et al. (2022a-2022j).

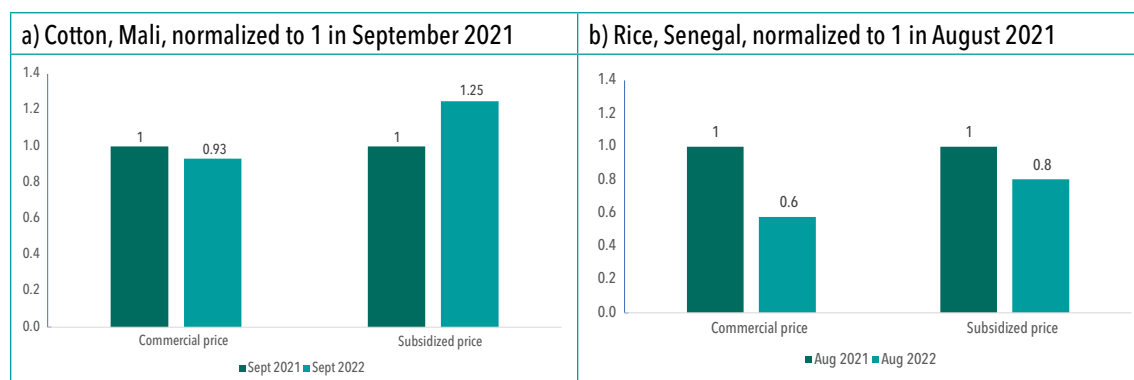
When analyzing the impact of the crisis on agrifood systems, the evolution of the ratio of crop prices to fertilizer prices is paramount as this will drive producers' decisions. Figure 5.12 presents the evolution of this ratio for selected products in several countries. The broad picture we see is that the ratio deteriorated significantly between 2021 and 2022, which has been detrimental to producers, particularly producers of food crops. In countries like Ghana, the ratio decreased by two-thirds. To fully understand the situation, however, we need to consider the subsidy programs in force in African countries, which allow farmers to purchase inputs at below market price. Such programs exist in many African countries, including Senegal, Mali, Burkina Faso, Kenya, and Ghana (we limit the analysis to the countries considered here). Figure 5.13 presents the crop/fertilizers price ratios in two countries (Mali and Senegal) at commercial and subsidized prices. When taken into account, the subsidy significantly dampens the negative evolution of the price ratio (rice in Senegal) and even negates it (cotton in Mali). The impact of subsidies should therefore qualify the previous analysis conducted with commercial prices.

Figure 5.12 Ratio of cotton and rice prices to commercial urea prices



Source: AfricaFertilizer, <https://ifdc.org/projects/africafertilizer-org/>; <https://ifdc.org/projects/africafertilizer-org/>

Figure 5.13 Ratio of cotton and rice prices to commercial and subsidized urea prices



Source: AfricaFertilizer, <https://ifdc.org/projects/africafertilizer-org/>

The next section discusses the evolution of local and world prices for various food items and highlights the relationships between them.

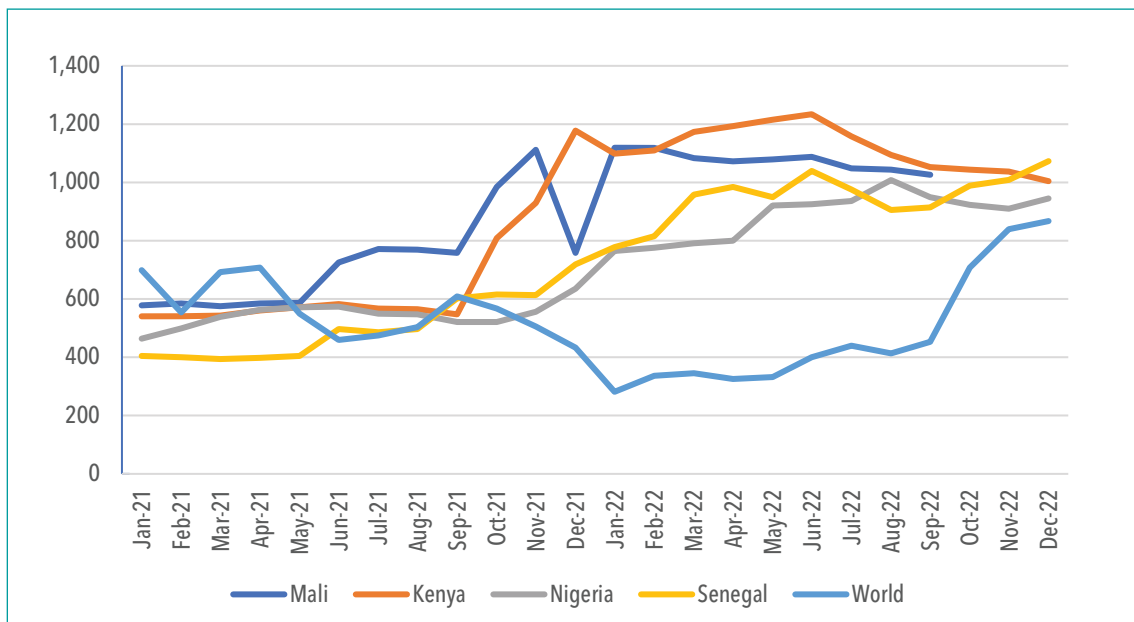
Evolution of local vs. world prices: Price transmission

Rising food and fertilizer prices are one of the key transmission channels of the crisis to Africa. The evolution of world prices observed earlier in this chapter was largely transmitted to local markets, although some mitigation measures cushioned the shock. Figure 5.14 shows the evolution of world and domestic prices of urea, one of the most commonly used fertilizers, in

selected African countries. While domestic prices in some countries seem to follow the pattern of world prices, in other countries domestic prices stabilized after peaking in June 2022. From January to December 2022, world urea prices tripled while domestic prices increased by just 23 percent in Nigeria and 37 percent in Senegal. Domestic prices remained stable over the year in Mali and Kenya. We computed pairwise correlations between world and domestic prices and found they were not significant for the January to December 2022 period, with the exception of Nigeria. Several factors may explain the lack of significance of the correlation coefficients including delays and lags in price changes and stabilization policies (implemented through subsidies in Kenya, Mali, and Senegal). In addition, while prices may have remained stable in some countries in 2022, prices had already reached very high levels before the crisis. Perhaps more importantly, we looked at only a few countries, as shown in Figure 5.14; Table 5.4 presents a broader picture.

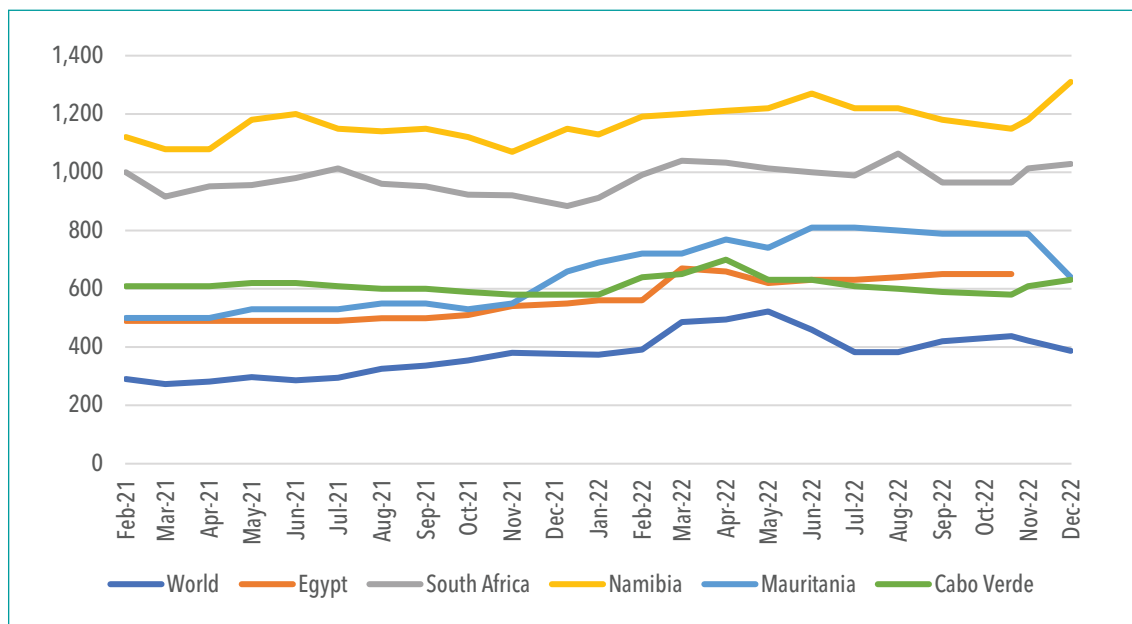
World and domestic food prices also follow a similar pattern (Figure 5.15). Local prices increased in all the considered countries from January 2022 to their peaks in May or June 2022, with increases ranging from 6 to 15 percent. In general, in most of the countries, all food prices increased, including those of close substitutes for wheat. Thus, in East Africa for instance, the average per capita monthly price of the local food basket increased by 22 percent between January and May 2022 and by 54 percent compared with 2021 (WFP 2022). However, the coefficients of correlation we computed were not statistically significant for the post-crisis period.⁶ In addition to the limitations mentioned for fertilizer prices, the decorrelation in 2022 for wheat prices may also be explained primarily by the policy responses put in place to reduce price transmission. These included subsidies, duty and tax remissions, local export bans, and other price controls or price setting mechanisms. As previously mentioned, the conflict occurred in an environment of very high prices and added an additional threat that pushed policymakers to initiate or increase public interventions to stabilize prices.

Figure 5.14 Evolution of world and domestic urea prices (US\$/metric ton)



Source: Constructed with data from AfricaFertilizer (<https://ifdc.org/projects/africafertilizer-org/>) and World Bank.

⁶ In addition, there might be non-linearities in the relationship that are not properly captured by a linear coefficient of correlation.

Figure 5.15 Evolution of world and domestic wheat prices (US\$/metric ton)

Source: FAO GIEWS.

Impacts of the Russia-Ukraine War on Poverty

This section discusses how the Russia-Ukraine crisis has affected indicators of poverty in Africa, including GDP growth, employment, consumption by households, and the cost of a healthy diet. Considering that the nature and speed of impacts on these indicators is likely to be heterogeneous across countries, income status, locations, and commodities, this section organizes the discussion along these lines. The evidence is presented by country, by income classification of the countries, share of agriculture in countries' GDP, by location (rural versus urban), and by local markets. The analysis of these impacts is based on past work and data generated by AKADEMIYA2063 and the International Food Policy Research Institute through a series of computable general equilibrium modeling exercises designed to examine the effects of the crisis on various components of the agriculture sector. Many of the results derive from the simulations carried out after implementing an economywide analysis of each country using IFPRI's Rural Investment and Policy Analysis (RIAPA) model⁷ to estimate the impacts of the global price shocks on all sectors, workers, and households

Local market price changes for selected commodities

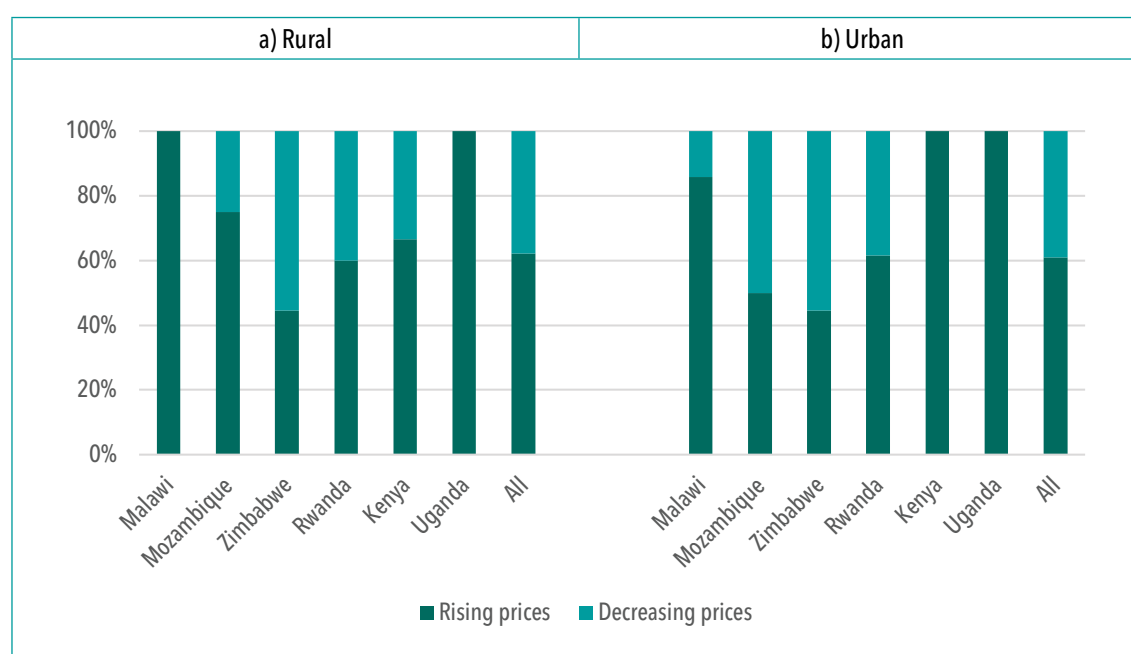
The subsections below present local market price changes for selected commodities and for selected countries following the onset of the Russia-Ukraine war. The choice of countries and commodities used to evaluate the war's impact was determined by the availability of data at the time of the study.

Figure 5.16 summarizes the weekly-observed negative and positive price changes in local rural and urban markets of six African countries where sufficient data were available, namely Malawi, Mozambique, Zimbabwe, Rwanda, Kenya, and Uganda. From a theoretical perspective, the effects of the Russia-Ukraine war may be transmitted into local markets for various commodities

⁷ The Rural Investment and Policy Analysis (RIAPA) data and modeling system is IFPRI's primary tool for forward-looking, economy-wide country-level analysis, serving as a simulation laboratory for experimenting with policies, investments, or economic shocks. Information on the RIAPA data and modeling system can be found here (<https://www.ifpri.org/project/riapa-model>).

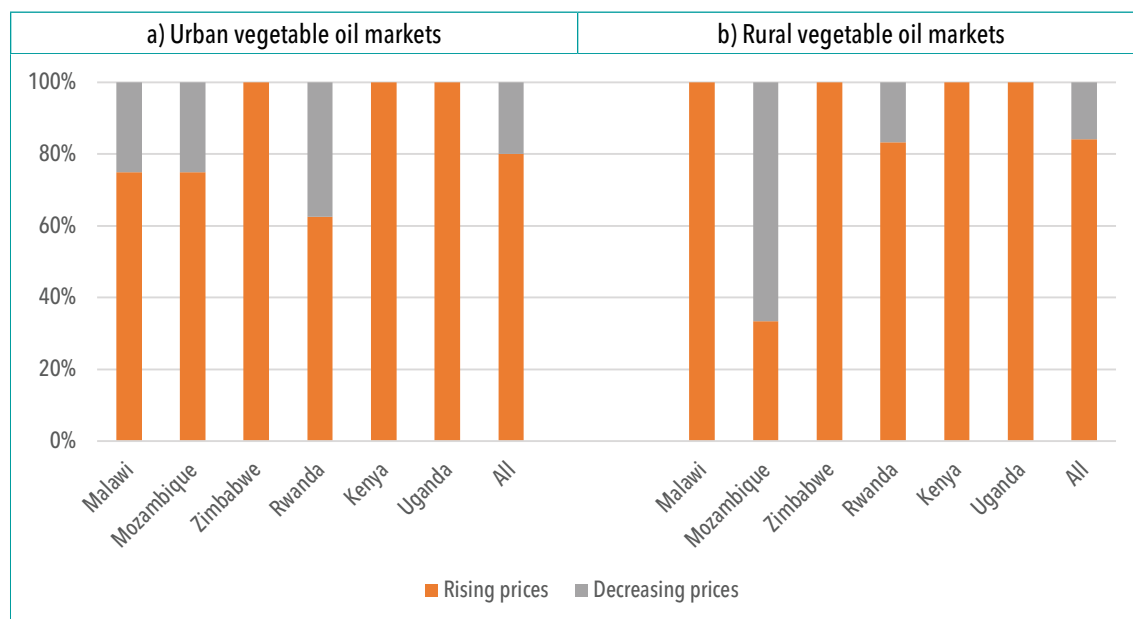
in other countries through its impact on terms of trade as well as exchange rates. The scarcity created by the war for some commodities including wheat, cooking oils, and fuels increases import costs for net importers (although it may improve terms of trade for net exporters). African countries are dependent on international markets to meet a large portion of their wheat, vegetable oils, and fuels demand and are thus expected to experience inflationary effects of the war. These effects would differ between urban and rural markets depending on the combined effects of local production in rural areas and higher urban incomes. It is clear from Figure 5.16 that prices increased more often than they decreased in both urban and rural markets in all countries except Zimbabwe, where the frequency of increasing prices was below 50 percent. Malawi, Uganda, and Kenya experienced the most frequent wheat price increases in both rural and urban markets, followed by Mozambique and Rwanda (see Matchaya 2022a, 2022b; Guthiga 2022a, 2022c).

Figure 5.16 Frequency of episodes of increasing and decreasing wheat prices in local urban and rural markets



Source: Constructed using data from the Ministry of Agriculture, Malawi (2022); Ministry of Agriculture, Mozambique (2022); Ministry of Agriculture, Zimbabwe (2022); National Institute of Statistics and Ministry of Agriculture and Animal Resources, Rwanda (2022); Bureau of Statistics, Uganda (2022); and Ministry of Agriculture, Livestock, Fisheries, and Co-operatives, Kenya (2022).

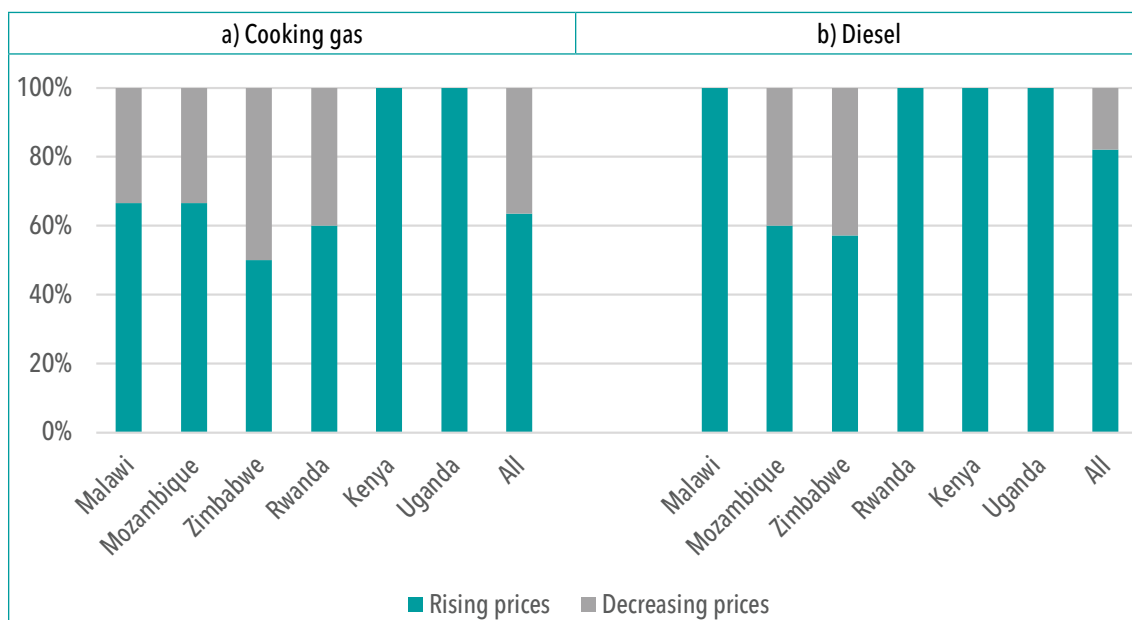
Through international contagion effects and the impact of the Russia-Ukraine war on international markets for sunflower seed oil and other cooking oils, other countries experienced increasing prices as well, depending on whether they were net importers or exporters of cooking oils. Figure 5.17 shows that prices for cooking oils increased frequently in many rural and urban markets, with episodes of increases being more frequent than decreases in Zimbabwe, Kenya, Uganda, and Malawi; the only exception is the rural markets of Mozambique, where prices fell more often than they rose. The price increases in cooking oils were directly related to the scarcity created by the Russia-Ukraine war, since the share of sunflower oil trade by Russia and Ukraine was significant at the beginning of the war, and many of the cooking oils consumed in Africa were vegetable based, and as ready substitutes also saw price increases. Guthiga (2022a) observed that in many of Kenya's markets, cooking oil prices rose by around 27 percent, while the increase was around 30 percent in Uganda between February and June 2022.

Figure 5.17 Frequency of episodes of increasing and decreasing cooking oil prices in local urban and rural markets

Source: Constructed using data from the Ministry of Agriculture, Malawi (2022); Ministry of Agriculture, Mozambique (2022); Ministry of Agriculture, Zimbabwe (2022); National Institute of Statistics and Ministry of Agriculture and Animal Resources, Rwanda (2022); Bureau of Statistics, Uganda (2022); and Ministry of Agriculture, Livestock, Fisheries, and Co-operatives, Kenya (2022).

Compared with cooking gas, which has substitutes such as wood and wind, solar, and water-based energy systems, diesel and petrol have limited ready substitutes. This may explain why diesel and petrol prices increased more often than cooking gas prices as the war created international scarcity, as shown in Figure 5.18. Some countries including Zimbabwe, Malawi, and Kenya implemented subsidy programs to limit the price increase for some commodities including fuels and cooking oils (see Matchaya 2022a, 2022c; Guthiga 2022a). These subsidy programs limited the increase in fuel prices and thus limited the negative consequences that such price increases would have had on the economies, including on employment, consumption, economic growth, poverty, and general price increases. This echoes the finding that changes in energy prices in Malawi (fuel), Mozambique (cooking gas and diesel), and Rwanda (cooking gas) were similar to changes in global energy prices during the early stages of the war, which in turn supports the deduction that the observed price changes resulted from the Russia-Ukraine crisis (also see Guthiga 2022a, 2022b, 2022c; Matchaya 2022a, 2022b, 2022c). On the other hand, changes in cooking gas prices were up to three times higher in Malawi and Zimbabwe than would have been expected over the February to May period (Badiane et al. 2022b).

Figure 5.18 Frequency of episodes of increasing and decreasing cooking gas and diesel prices in local markets



Source: Constructed using data from the Ministry of Agriculture, Malawi (2022); Ministry of Agriculture, Mozambique (2022); Ministry of Agriculture, Zimbabwe (2022); National Institute of Statistics and Ministry of Agriculture and Animal Resources, Rwanda (2022); Bureau of Statistics, Uganda (2022); and Ministry of Agriculture, Livestock, Fisheries, and Co-operatives, Kenya (2022).

The next section focuses on effects of the crisis on poverty and the cost of a healthy diet, which are long-term challenges for a large share of Africa’s population.

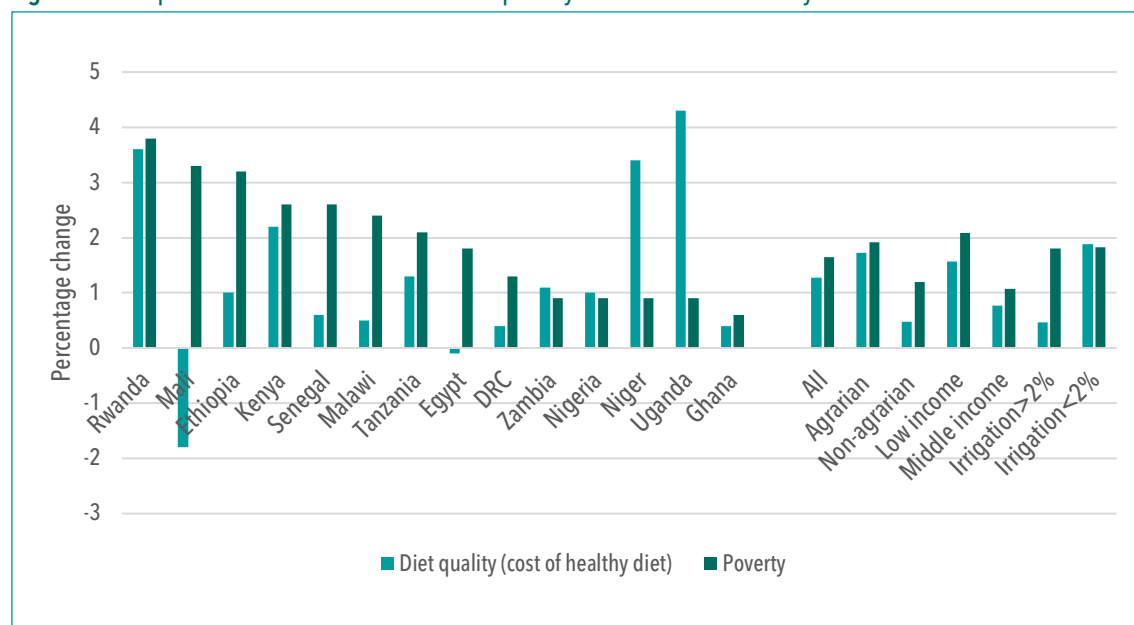
Poverty and the cost of a healthy diet

The Russia-Ukraine war has contributed to global market disruptions, which, along with other factors, have affected terms of trade and real exchange rates of other countries, with ramifications throughout their economies (Badiane, Fofana, and Sall 2022). The impacts on employment and economic growth affect household incomes and their distribution, and in turn, affect local commodity prices.

The impacts presented in Figure 5.19 and Figure 5.20 were drawn from IFPRI’s Ukraine crisis briefs for each country (Diao et al. 2022a–2022i). They were calculated using simulations after implementing economywide analysis of each country using IFPRI’s RIAPA model to estimate the domestic impacts of the global price shocks on all sectors, workers, and households. The RIAPA model makes it possible to capture a range of factors to measure the overall impact of the crisis for each country.

Figure 5.19 presents the impact of the global market disruptions on poverty as well as the cost of a healthy diet.⁸

Figure 5.19 Impact of the Russia-Ukraine shock on poverty and the cost of a healthy diet



Source: Author's construction with data from Abay et al. 2022; Andam et al. 2022; Badiane, Fofana, and Sall 2022a, 2022b; Breisinger et al. 2022; Diao et al. 2022a-2022j; and Chapoto et al. 2022.

Egypt experienced little change in the cost of a healthy diet during the study period. The small decline in cost was driven by the fact that increasing prices for edible oils and for wheat pushed up their costs, while falling incomes reduced demand for fruits, dairy, and protein foods, and so lowered the cost of these nutritious foods (Abay et al. 2022). The size of these price increases and decreases was generally similar, and thus they essentially cancelled each other out. For Mali, these two opposite factors led to a greater decline in real costs of a healthy diet, although this should not be interpreted as a real gain since most of the fall was due to low demand as incomes fell (Diao et al. 2022e). Uganda, Niger, and Rwanda experienced large increases in the cost of a healthy diet, which likely led to declines in consumption of high-quality foods, especially in Rwanda where poverty rates also increased significantly.

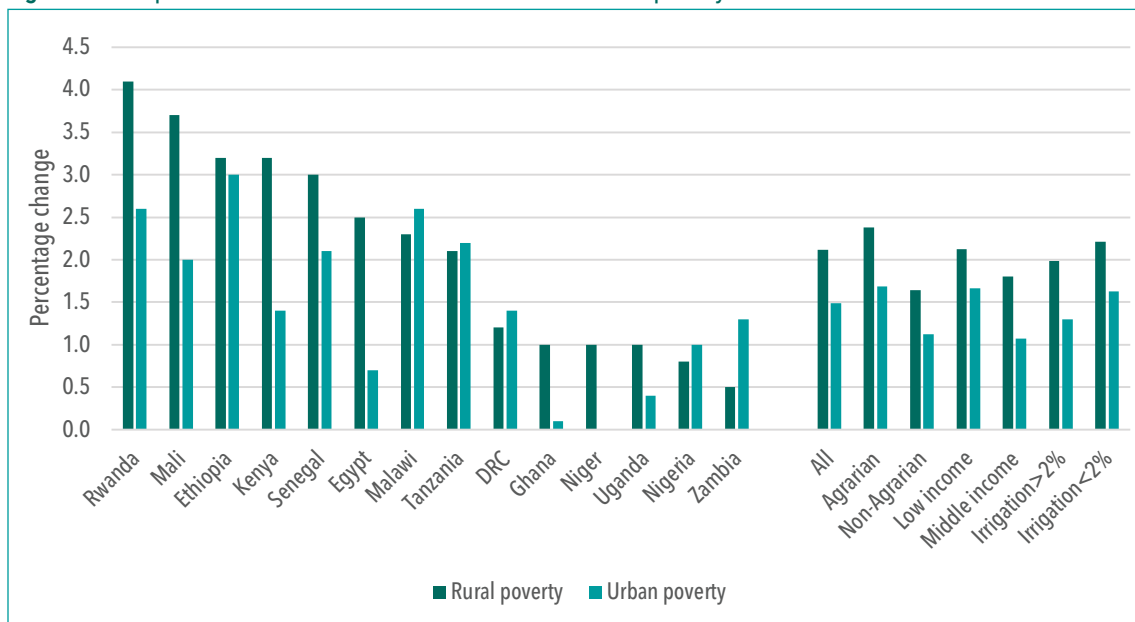
Economies that were predominantly agrarian appear to have experienced the largest increases in poverty (2 percent) and the cost of a healthy diet (1.8 percent). In contrast, economies where agriculture accounts for a smaller share of GDP experienced an increase in the cost of a healthy diet of less than 0.5 percent and poverty increases of just around 1 percent. These different effects may reflect the fact that agrarian economies tend to lack diversification of economic activities, so when there is a disruption to the agricultural market, sources of income dry up for many people. The countries with low rates of agriculture irrigation (irrigating less than 2 percent of arable land) appear to have experienced higher costs of healthy diets and greater increases in poverty, which implies that increasing irrigation might help to cushion economies from the effects of international food price spikes.

⁸ The cost of a "healthy" reference diet (CoRD) is tracked with six food crops as defined by the EAT-Lancet Commission (<https://eat-forum.org/eat-lancet-commission/>) (see Diao et al. 2022e). Poverty headcounts are calculated as the population that lives below the poverty line of \$1.90 per day (Diao et al. 2022e).

Location and the distribution of the Russia-Ukraine shock

For appropriate policy formulation and implementation, it is often useful to understand the spatial distribution of impacts of crises. Hence, understanding any differential impacts of the global market disruptions in rural and urban areas can be useful for intervention planning and implementation. Global market disruptions affect rural and urban areas differently because the two are characterized by different population densities, incomes, and production patterns. Incomes and import dependency tend to be higher in urban centers than rural areas. In addition, rural and urban areas usually face different regimes of transaction costs to access markets. For instance, urban centers are generally well connected to commodity markets and are the landing points for imports, though they also are rarely self-sufficient and must import food from rural areas.

Figure 5.20 Impact of the Russia-Ukraine shock on rural and urban poverty



Source: The data used to construct this graph were extracted from the following briefs developed by AKADEMIYA2063 and IFPRI to provide insights into the implications of the Russia-Ukraine war on economies: Abay et al. 2022; Andam et al. 2022; Badiane, Fofana, and Sall 2022a, 2022b; Breisinger et al. 2022; Diao et al. 2022a-2022j; and Chapoto et al. 2022.

Figure 5.20 shows that the impact of the Russia-Ukraine crisis on poverty in rural areas has generally differed from the impact in urban areas. In the sample of countries, rural poverty increased by 2.1 percent, on average, while urban poverty increased by 1.5 percent over the study period. Considering the rural dependency on fertilizers for production and agriculture for jobs, it is perhaps no surprise that the crisis hit rural areas the hardest. As import prices for fertilizers and food rose and incomes generally declined, rural areas bore the brunt of the crisis.

The countries that saw the largest increases in rural poverty include Rwanda (4.1 percent), Mali (3.7 percent), Ethiopia and Kenya (3.2 percent), and Senegal (3.0 percent), while the least affected countries include Zambia (0.5 percent), Nigeria (0.8 percent), and Uganda, Niger, and Ghana, each with a rural poverty increase of just 1 percent. In contrast, urban poverty increased the most in Ethiopia (3.0 percent), Malawi and Rwanda (2.6 percent), Tanzania (2.2 percent), as well as Senegal and Mali (2.1 percent). In Egypt, gains from increasing fuel prices helped reduce urban poverty, but food prices increased in both rural and urban centers, increasing

poverty, perhaps because diesel prices are a major cost of production and food commodities are sensitive to fuel prices (Abay et al. 2022). Overall, low-income countries experienced a larger increase in rural poverty (2.1 percent) than low-middle-income countries (1.8 percent). Clearly, the Russia-Ukraine war contributed to these increases in poverty, though the impact may vary by country depending on other factors affecting the poverty impact. For example, Mozambique benefited from higher prices (Badiane, Fofana, and Sall 2022a) through the mining and energy industries, but these gains did not lead to immediate gains in employment or consumption across Mozambique because such industries are not labor intensive. Moreover, Mozambique was undergoing other internal crises, including the unrest in Cabo Delgado and massive floods. As a result, the effects of the Russia-Ukraine war made the situation worse. Similarly, in Ethiopia where a state of a civil war and a drought were occurring during the study period, rural poverty increased dramatically following the onset of the Russia-Ukraine war. These examples serve to highlight the importance of other local shocks within countries in shaping the final impacts of external crises.

Highlighted national policy responses

This section highlights the policy responses put in place in Africa to cushion the impact of the shock. The insights from the section will contribute to the policy recommendations in the conclusion of the chapter.

Trade bans: Following the onset of the war and the initial episodes of commodity price increases, various countries began responding.⁹ Some African countries, including Algeria, Burkina Faso, Cameroon, Morocco, Tunisia, and Uganda, implemented trade bans on various food commodities, including sugar, vegetable oils, wheat derivatives (Algeria), millet, sorghum, maize (Burkina Faso), cereals, vegetable oils (Cameroon), tomatoes, potatoes (Morocco), as well as maize, soybeans and rice (Uganda) and fruits and vegetables (Tunisia) (World Bank 2023). Such food trade bans are likely to slow the rate of recovery of prices from the Russia-Ukraine war and should thus be avoided. These bans also tend to damage the private sector's confidence in investing in the regional trade network, especially those investments aiming to promote value addition. Indeed, one export ban at a specific stage of the value chain will disrupt all upstream and downstream activities.

Subsidies: Tanzania, Namibia, Malawi, Mozambique, Zimbabwe, and Botswana embarked on initiatives to improve food security in early 2022. Tanzania has moved to subsidize fertilizers in order to improve maize, rice, and wheat yields. It has also put in place import substitution strategies to increase domestic production of sunflowers, wheat, and palm oil and has revived the government-owned estate farms for wheat in Arusha. Similarly, Namibia moved to subsidize some commodities to reduce price increases, and embarked on agricultural productivity improvement programs under the UN Joint Programme Namibia. Under this program, Namibia intensified activities at two Green Scheme irrigation projects (Shadikongoro and Sikondo) by planting them with wheat, and further, the government planned to increase agriculture funding, reduce trade restrictions, invest in oil seeds, and subsidize other agriculture inputs (Namibia Agronomic Board 2022).

Tax reduction: Mozambique also took several steps to reduce price increases for food commodities and to enhance future agricultural production. For example, the government reduced the taxes (VAT) on agricultural inputs (seeds, pesticides, and fungicides), agricultural

⁹ Although the focus here is on national initiatives, some regional actions have also been triggered and are worth mentioning. These include the Africa Trade Exchange (ATEX) platform, initially designed by UNECA and Afreximbank under the AfCFTA and in the wake of the COVID-19 crisis, to procure cereals, vegetable oils, and fertilizers at a reduced cost.

machinery, and fertilizers, and together with the Mozambique Institute of Agricultural Research (IIAM), will increase wheat production in Nissa province, where wheat potential is highest. Similar efforts were also made in the livestock subsector, where subsidies targeted national feed production and national production of chicks, as well as mandatory vaccines for livestock.

Loans, interest rates, and social protection programs: Some countries, including Egypt, have launched fiscal and monetary policy instruments that include interest rate increases to curb future inflation and limit the crises' adverse effects. Egypt has also expanded its social protection programs targeting the poor, and announced a price cap on unsubsidized bread while also increasing planned wheat procurement from the domestic market through a combination of offering higher prices and other incentives to wheat farmers (Enterprise 2022). The government of Botswana introduced soft loans to support emerging and commercial farmers to produce more grains and venture into seed production. The government has also sought to provide targeted free seeds, fertilizers, and services for ploughing, harrowing, and planting to some farmers. Malawi is subsidizing cooking oils and has reduced taxes on fuel imports, and Zimbabwe put a cap on fuel prices in early 2022.

Conclusion and Recommendations

The Russia-Ukraine war has added to the disruption in already turbulent global markets. The impacts of the crisis on African countries could be substantial as a significant number of them are highly exposed, directly or indirectly, through their dependence on imports of food and fertilizers. The impact of this shock on African economies depends on the size of the shock, the overall degree of dependence of the country on imports, the share of Russia, Ukraine and Belarus in the country's imports, and on the measures put in place to mitigate the effects. Findings discussed in this chapter show that the magnitude of the shock has been significant: observed price increases have been substantial and quantity disruptions significant, especially for fertilizers and to a lesser extent for food products, particularly wheat and vegetable oils. For these two sectors, several African countries are highly exposed, raising concerns about the coming crop years and the food security situation in the continent, which is already set back by the COVID-19 pandemic. It is worth noting though that on the export side, African countries are much less dependent on Ukraine and Russia.

In a world still recovering from the pandemic, climatic and geopolitical shocks have put substantial pressure on global markets, countries, and households. Unfortunately, policy responses from key players in agricultural and fertilizer trade added to the problem, reducing supply and increasing prices and volatility. Indeed, beggar-thy-neighbor policies put in place by major food and fertilizer exporters through various trade restriction measures have contributed to keeping additional pressure on markets and threatening food security in least developed countries. The restrictions imposed are of the same magnitude as those in force during the 2008 food crisis, suggesting that no lesson was learned from that experience, and that countries that are small and net importers remain exposed because of the lack of cooperation on global markets. As the war continues and to prevent future crisis, several short-term and long-term options and policy recommendations are worth mentioning here for both African countries and the international community.

In the short to medium term, establishing social safety net programs can be one way of building the resilience of vulnerable households in the current circumstances (see Badiane, Fofana, and Sall 2022b). Smallholders facing fertilizer shortages should be identified and given safety nets to compensate for expected production losses. Where possible, governments should work with

other stakeholders to ensure that some of the most affected commodities receive subsidies or tax reductions to limit the extent to which prices rise during global market disruptions. However, fertilizer subsidies should be temporary and targeted and should not compete with private sector distribution. In the long run, domestic fertilizers should be produced on the continent to minimize fertilizer import dependency. In addition, scaling up extension services to optimize fertilizer use through the 4R approach (right source, right rate, right time, right place) is paramount.

On the international trade side, three measures could be taken in the short run. First, export restrictions should be removed to the extent possible. Second, the consultation and notification process at WTO should be improved to ensure timely and transparent notifications of restrictions. Unfortunately, countries barely notify the trade restriction measures they put in place and when they do so, it is not done on a timely basis.¹⁰ Moreover, when markets panic, other countries tend to follow the lead of those imposing restrictions. In the medium term, exemptions on export restrictions should be extended to all least developed countries and insular economies. At the WTO level, an operational definition of a critical food shortage situation should be developed that could justify implementing an export-restricting measure. At the regional level, the African Continental Free Trade Area (AfCFTA) Agreement represents a timely opportunity to increase intra-African trade and mitigate the negative impacts of a global crisis. Studies have showed that when fully implemented, the agreement can significantly reduce the negative effects of global trade tensions and even represent an opportunity for some countries (Bouet et al. 2019). In this context, African countries should limit to the maximum extent possible the use of export restrictions among AfCFTA members.

In the long run, economic diversification is key. First, African countries should try to diversify their import sources as much as possible by developing existing African potential based on the opportunities provided by the continent's natural endowments and the use of new, and greener, technologies. For fertilizers, although the high concentration of the market for phosphates and potash makes it difficult, there are opportunities to be seized for nitrogenous fertilizers. The new production capacities coming in Nigeria could fill a significant gap for West Africa and beyond. For potash, things are more challenging in the near future although some deposits are present in the DRC, Ethiopia, and Republic of Congo.

More broadly, countries must endeavor to develop broad-based economies where agriculture, agri-business, manufacturing, mining, and other sectors contribute significantly to total GDP. In countries where it is clear that some sectors are being impacted negatively while others are gaining from the crisis, efforts should be made to improve income redistribution from winners to losers to minimize impacts for households that depend on the sectors that are directly hit. At the same time, to increase chances of adapting to the impacts of the crisis, countries that have suffered heavy foreign exchange and GDP losses should explore debt restructuring programs as well as debt cancellation opportunities with their creditors to avoid being caught up in deeper financial crises as unpaid debt interest accumulates.

¹⁰ Only 14 percent of the restriction measures put in place since the beginning of the war were notified to the WTO (WTO 2023).

References

- Abay, K.A., F. Abdelradi, C. Breisinger, X. Diao, P. Dorosh, K. Pauw, J. Randriamamonjy, M. Raouf, and J. Thurlow. 2022. *Egypt: Impacts of the Ukraine and Global Crises on Poverty and Food Security*. Global Crisis Country Series, Country Brief 18. Washington, DC: International Food Policy Research Institute (IFPRI).
- Andam, K., X. Diao, P. Dorosh, A. Pradesha, and J. Thurlow. 2022. *Nigeria: Impacts of the Ukraine and Global Crisis on Food Systems and Poverty*. Global Crisis Country Series, Country Brief 4. Washington, DC: IFPRI.
- Badiane, O., I. Fofana, and L.M. Sall. 2022a. *Poverty and Food Security Effects among Selected African Countries*. AKADEMIYA2063 Ukraine Crisis Brief Series, No. 006. Kigali: AKADEMIYA2063.
- Badiane, O., I. Fofana, and L.M. Sall. 2022b. *Impacts on Trade, Growth, Poverty, Employment, and Food Security: Summary of Findings and Policy Implications*. AKADEMIYA2063 Ukraine Crisis Brief Series, No. 12. Kigali: AKADEMIYA2063.
- Badiane, O., I. Fofana, L.M. Sall, and B. Ceesay. 2022c. *Contagion and Exposure of African Countries to Global Wheat Trade Disruptions*. Ukraine Crisis Brief Series No. 001, AKADEMIYA2063, Kigali.
- Badiane, O., I. Fofana, L. M. Sall, and W. Tefara. 2022d. *Contagion and Exposure of African Countries to Global Fertilizer Trade Disruptions*. Ukraine Crisis Brief Series No. 008, Akademiya2063, Kigali.
- Bouet, A., D. Laborde, and F. Traore. 2019. "A Global Trading System in Turmoil: What Is at Stake for Africa?" In *Africa Agriculture Trade Monitor Report 2019*, eds. A. Bouët and S. Odjo, 109-130. Washington, DC: IFPRI.
- Breisinger, C, X. Diao, P. Dorosh, J. Mbuthia, L. Omune, E.O. Oseko, A. Pradesha, J. Smart, and J. Thurlow. 2022. *Kenya: Impacts of the Ukraine and Global Crisis on Poverty and Food Security*. Global Crisis Country Series, Country Brief 1. Washington, DC: IFPRI.
- Chapoto, A., X. Diao, P. Dorosh, M. Ellis, K. Pauw, J. Smart, M. Subakanya, and J. Thurlow. 2022. *Zambia: Impacts of the Ukraine and Global Crises on Poverty and Food Security*. Global Crisis Country Series, Country Brief 15. Washington, DC: IFPRI.
- Diao, X., P. Dorosh, K.Pauw, J. Randriamamonjy, J. Thurlow, and J. Ulimwengu. 2022a. *Congo: Impacts of the Ukraine and Global Crises on Poverty and Food Security*. Global Crisis Country Series, Country Brief 17. Washington, DC: IFPRI.
- Diao, X., P. Dorosh, M.K. Jemal, J. Smart, A.S. Taffesse, and J. Thurlow. 2022b. *Ethiopia: Impacts of the Ukraine and Global Crises on Poverty and Food Security*. Global Crisis Country Series, Country Brief 2. Washington, DC: IFPRI.
- Diao, X., P. Dorosh, K. Pauw, J. Smart, J. Thurlow, S. Asante, and P. Pati. 2022c. *Ghana: Impacts of the Ukraine and Global Crises on Poverty and Food Security*. Global Crisis Country Series, Country Brief 9. Washington, DC: IFPRI.
- Diao, X., P. Dorosh, J. Duchoslav, K. Pauw, J. Smart, and J. Thurlow. 2022d. *Malawi: Impacts of the Ukraine and Global Crises on Poverty and Food Security*. Global Crisis Country Series, Country Brief 10. Washington, DC: IFPRI.

- Diao, X., P. Dorosh, J. Randriamamonjy, J. Smart, and J. Thurlow. 2022e. *Mali: Impacts of the Ukraine and Global Crises on Poverty and Food Security*. Global Crisis Country Series, Country Brief 7. Washington, DC: IFPRI.
- Diao, X., P. Dorosh, J. Randriamamonjy, and J. Thurlow. 2022f. *Niger: Impacts of the Ukraine and Global Crisis on Food Systems and Poverty*. Global Crisis Country Series, Country Brief 6. Washington, DC: IFPRI.
- Diao, X., P. Dorosh, J. Thurlow, D. Spielman, G. Benimana, S. Mugabo, and G. Rosenbach. 2022g. *Rwanda: Impacts of the Ukraine and Global Crisis on Food Systems and Poverty*. Global Crisis Country Series, Country Brief 5. Washington, DC: IFPRI.
- Diao, X., P. Dorosh, J. Randriamamonjy, J. Smart, J. Thurlow. 2022h. *Senegal: Impacts of the Ukraine and Global Crisis on Food Systems and Poverty*. Global Crisis Country Series, Country Brief 8. Washington, DC: IFPRI.
- Diao, X., P. Dorosh, M. Ellis, K. Pauw, and J. Thurlow. 2022i. *Tanzania: Impacts of the Ukraine and Global Crisis on Food Systems and Poverty*. Global Crisis Country Series, Country Brief 11. Washington, DC: IFPRI.
- Diao, X., P. Dorosh, M. Ellis, K. Pauw, J. Smart, and J. Thurlow. 2022j. *Uganda: Impacts of the Ukraine and Global Crises on Poverty and Food Security*. Global Crisis Country Series, Country Brief 12. Washington, DC: IFPRI.
- Enterprise. 2022. "Carrots + Sticks for Local Wheat Farmers to Up Supply." *Enterprise*, March 17.
- Laborde Debuquet, D., and A. Mamun. 2022. "Documentation for Food and Fertilizers Export Restriction Tracker: Tracking Export Policy Responses Affecting Global Food Markets during Crisis." Food and Fertilizer Trade Policy Tracker Working Paper 2. IFPRI, Washington, DC.
- Glauber, J., and D. Laborde. 2022. *How Russia's Invasion of Ukraine Is Affecting Global Agricultural Markets*. Washington, DC: American Enterprise Institute).
- Glauber, J., D. Laborde, and A. Mamun. 2022. "The Impact of the Ukraine Crisis on the Global Vegetable Oil Market." *IFPRI Blog*, May 3.
- Glauber, J., D. Laborde, and A. Mamun. 2023. "Food Export Restrictions Have Eased as the Russia-Ukraine war Continues, but Concerns Remain for Key Commodities." *IFPRI Blog*, January 23.
- Guthiga, P. 2022a. *The Russia-Ukraine Conflict: Impacts on Commodity Markets in Kenya*. AKADEMIYA2063 Ukraine Crisis Brief Series, No. 18. Kigali, Rwanda: AKADEMIYA2063.
- Guthiga, P. 2022b. *Impacts of the Ukraine -Russia Crisis on Commodity Prices in Local Markets in Rwanda*. AKADEMIYA2063 Ukraine Crisis Brief Series, No. 13. Kigali, Rwanda: AKADEMIYA2063.
- Guthiga, P. 2022c. *The Russia-Ukraine Conflict: Impacts on Commodity Markets in Uganda*. AKADEMIYA2063 Ukraine Crisis Brief Series, No. 19. Kigali: AKADEMIYA2063.
- Hebebrand, C., and D. Laborde. 2022. "High Fertilizer Prices Contribute to Rising Global Food Security Concerns." *IFPRI Blog*, April 25.

Matchaya, G., 2022a. *The Russia-Ukraine Conflict: Impacts on Commodity Markets in Malawi*. AKADEMIYA 2063 Ukraine Crisis Brief Series, No. 10. Kigali: AKADEMIYA2063.

Matchaya, G., 2022b. *The Russia-Ukraine Conflict: Impacts on Commodity Markets in Mozambique*. AKADEMIYA2063 Ukraine Crisis Brief Series, No. 15. Kigali: AKADEMIYA2063.

Matchaya, G., 2022c. *The Russia-Ukraine Conflict: Impacts on Commodity Markets in Zimbabwe*. AKADEMIYA2063 Ukraine Crisis Brief Series, No. 16. Kigali: AKADEMIYA2063.

Namibia Agronomic Board. 2022. *The Impact of the Russia-Ukraine War on Namibia's Crop Industry*. Policy Brief No:03. Windhoek: Namibian Agronomic Board.

World Bank. 2023. *Food Security Update*. Washington, DC: World Bank.

World Bank. 2022. Commodity Price Data (The Pink Sheet). <https://www.worldbank.org/en/research/commodity-markets>

WFP (World Food Programme). 2022. *Implications of the Conflict in Ukraine on Food Access and Availability in the East Africa Region - Update #3*. Rome.

WTO (World Trade Organization). 2023. *A Year of Turbulence on Food and Fertilizers Markets*. Trade Monitoring Updates. Washington, DC.