

COUNTRY BRIEF 15

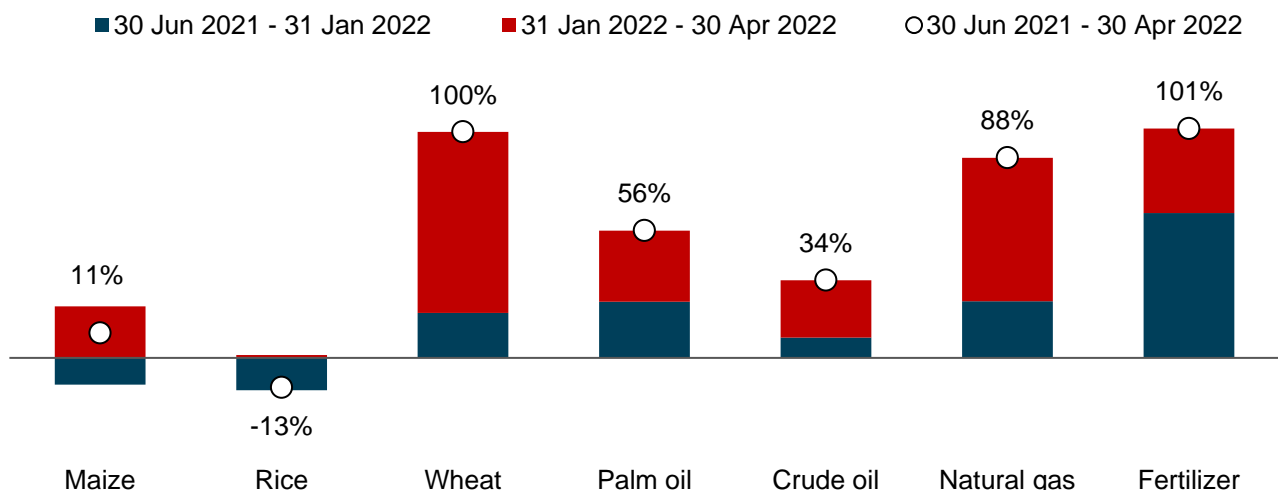
Zambia: Impacts of the Ukraine and Global Crises on Poverty and Food Security

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1. World Price Shocks and Domestic Price Transmission

Global food, fuel, and fertilizer prices have risen rapidly in recent months, driven in large part by the fallout from the ongoing war in Ukraine and the sanctions imposed on Russia. Other factors, such as export bans, have also contributed to rising prices. Palm oil and wheat prices increased by 56 and 100 percent in real terms, respectively, between June 2021 and April 2022, with most of the increase occurring since February (Figure 1).

Figure 1. Changes in global real commodity prices since mid-2021 (US dollars)



Source: Authors' calculations using data from World Bank Commodity Price Data (The Pink Sheet, <https://www.worldbank.org/en/research/commodity-markets>).

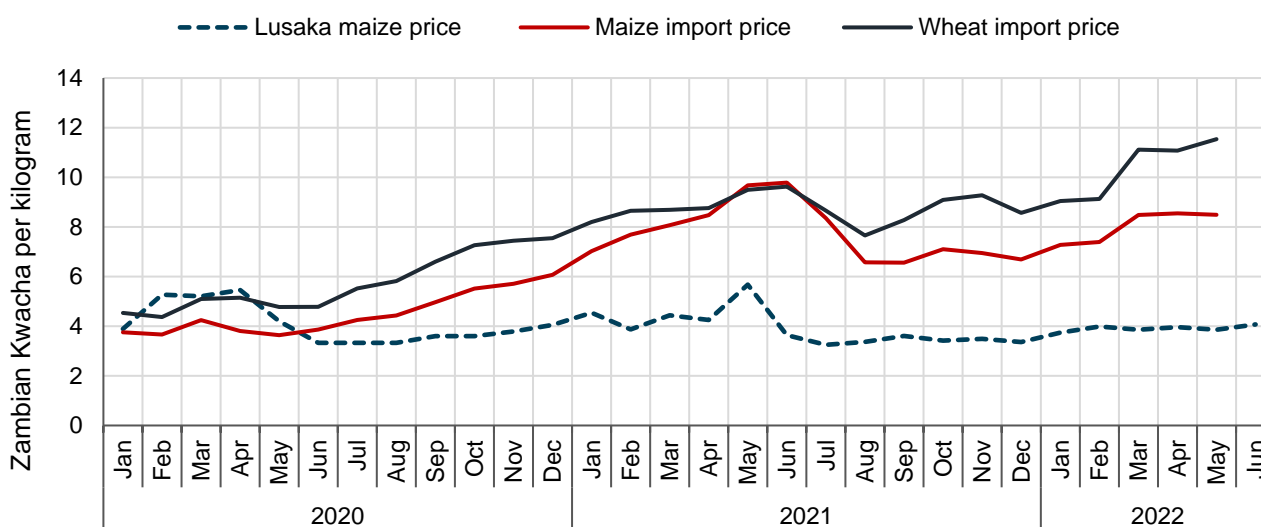
Note: Nominal prices in US dollars from World Bank Commodity Price Data (The Pink Sheet) are converted to real prices, which account for the overall increase in world prices over this period, deflated by the US consumer price index, which rose by 7.2 percent between June 2021 and April 2022.

¹ This study was conducted by IFPRI with financial support from BMGF, FCDO, and USAID. The study uses models developed with ongoing support from BMGF, USAID, and CGIAR's Foresight and Metrics initiative. The study also benefits from working with the Agricultural Policy Research and Outreach Institute (IAPRI) in Zambia. Antony Chapoto and Mitelo Subakanya are from IAPRI, and all other authors are from IFPRI. For further information, please contact Antony Chapoto (antony.chapoto@iapri.org.zm), Paul Dorosh (p.dorosh@cgiar.org), or James Thurlow (j.thurlow@cgiar.org).

Wide variation exists across products, with real maize prices increasing by only 11 percent and rice prices declining by 13 percent. The price of crude oil and natural gas has also risen substantially, while the weighted average price of fertilizer has doubled. With these changes in global prices, many developing countries and their development partners are concerned about the implications for economic stability, food security, and poverty.

Domestic prices of white maize in Lusaka were generally very stable between mid-2020 and early 2022. However, since the substantial rise in international maize prices in both US dollar and Zambian kwacha terms (even before February 2022), the gap between domestic and international maize prices has become large. (There is no data for domestic prices for March–May 2022.)

Figure 2. Nominal maize and wheat prices in Zambia, 2020–2022



Source: Authors' calculations using data from WFP, IGC, and World Bank Commodity Price Data (The Pink Sheet), and Lusaka maize price updated to June using data from Zambia Grain Market Indicators, NewGrowCo, 2022.

Note: Import prices include cost, insurance, and freight (CIF).

2. Measuring Impacts on Zambia's Economy and Population

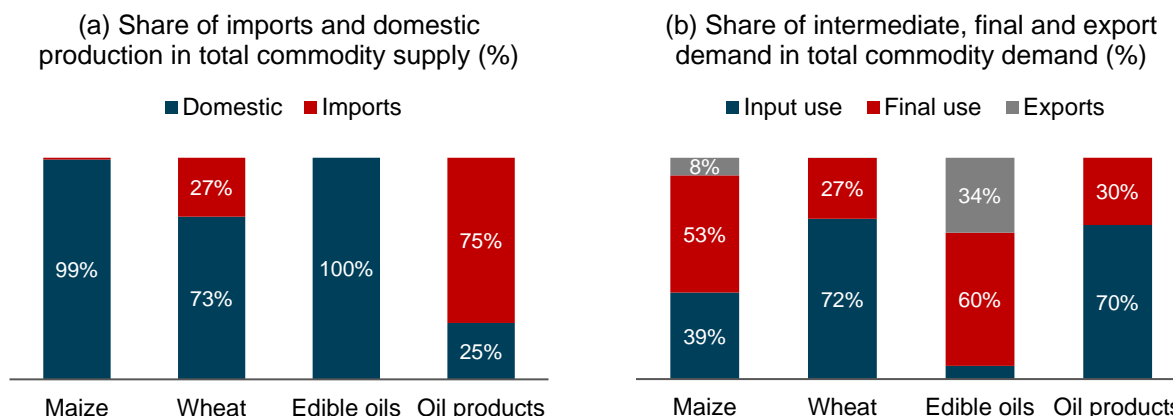
We use an economywide model of Zambia to estimate the impacts of the global price shocks on all sectors, workers, and households.² The model allows us to capture a range of considerations that will determine the overall impact of the crisis on the country. For example, the effect of higher world prices on Zambia's economy depends on the importance of the affected products in the total supply of each commodity, and whether local producers and consumers can readily substitute away from higher-priced imports. Zambia exports maize and oilseeds, while about 30 percent of its wheat grain supply comes from imports (Figure 3). As a result, we expect changes in world prices to have differential effects on domestic prices of maize, wheat, and edible oils.

All oil products (crude oil and processed petroleum) used in Zambia are imported. The impact of higher oil prices on households cannot be directly assessed by looking at the share of petroleum products in household consumption baskets. This is because oil products are primarily used as inputs into the production of other goods and services, with 70 percent of total demand for oil products in Zambia for input use (Panel B in Figure 3). Most petroleum products, for example, are used by the transport sector, the cost of which affects the price of all marketed goods and services in the

² Information on the Rural Investment and Policy Analysis (RIAPA) data and modeling system can be found [here](#).

economy. IFPRI's model tracks the flow of domestic and imported inputs between sectors and estimates the net effect on final product prices.

Figure 3. Breakdown of commodity supply and demand in Zambia, 2019

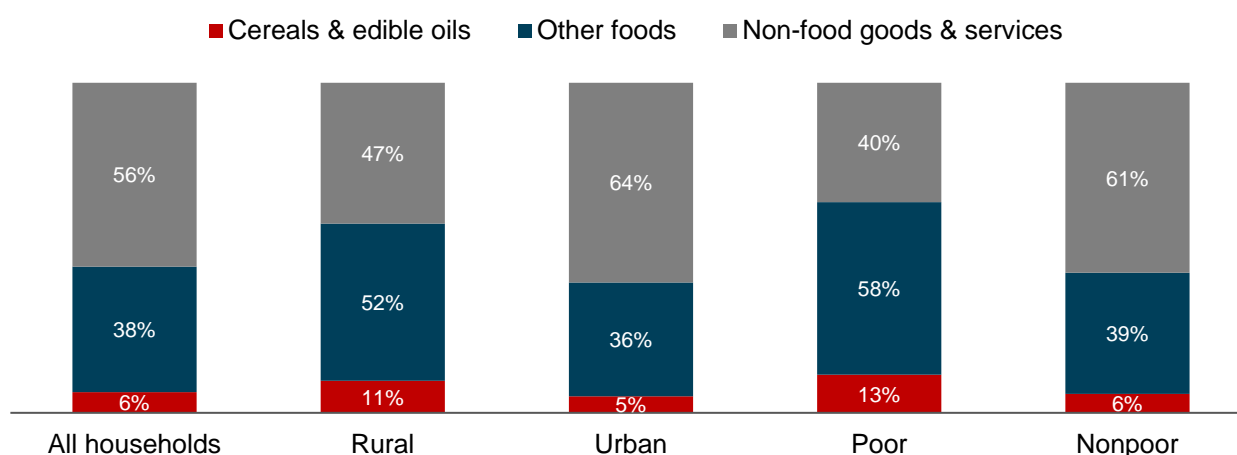


Source: Authors' calculations using social accounting matrix (SAM) data from IFPRI's Zambia RIAPA model.

Notes: Wheat includes wheat flour, and edible oils include edible oilseeds in Panel (b). Input use includes products as intermediates in the production of other products. Final use includes private and public consumption and gross capital formation.

Impacts on households also depend on the importance of commodities in their consumption baskets. Cereals and edible oils make up a small part (6 percent) of the total value of household consumption in Zambia, and about 15 percent of total food expenditures (Figure 4). The shares of cereals and edible oils in total food expenditures are higher for rural households (11 percent) and poor households (13 percent).³ IFPRI's model tracks incomes and expenditures for different population groups and is linked to a survey-based micro-simulation tool that tracks the consumption patterns of individual households.

Figure 4. Composition of household consumption spending in Zambia, 2019



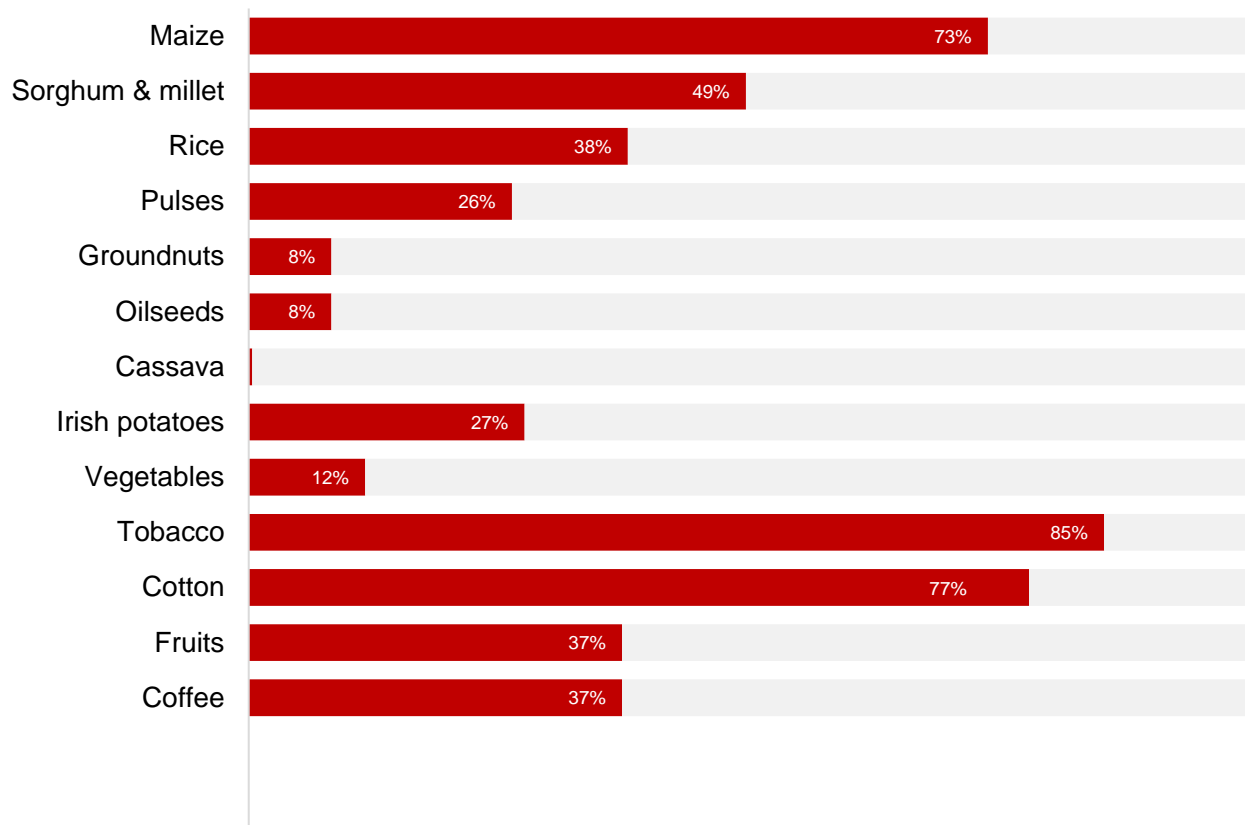
Source: Authors' calculations using social accounting matrix (SAM) data from IFPRI's Zambia RIAPA model.

Rising fertilizer prices may cause some farmers to reduce their use of this input, leading to lower agricultural production and higher food prices. The magnitude of this decline depends on: (1) the responsiveness of fertilizer demand to changes in prices; (2) the amount of fertilizer currently used to grow crops; and (3) the expected productivity losses for farmers who reduce their use of fertilizers.

³ These figures include the imputed value of home consumption, which is also tracked within the RIAPA model.

The fertilizer adoption rate in Zambia varies significantly by crop, with an estimated 73 percent of maize area cultivated using fertilizers versus close to zero for cassava. Variation also arises in the amount of fertilizer used on different crops. For our initial impact analysis, we adopt a conservative set of assumptions regarding farmers' responses to rising fertilizer prices. We assume an own-price elasticity of fertilizer demand of -0.15 , implying that a 100 percent increase in real fertilizer prices leads to a 15 percent decline in fertilizer use. Drawing on a recent survey analysis, we assume that farmers who do not use chemical fertilizers are about 20 percent less productive than farmers who do.⁴

Figure 5. Share of cropland using chemical fertilizers in Zambia



Source: Authors' estimates using data from Rural Agricultural Livelihood Survey 2019, IAPRI, Zambia.

Zambia's maize crop is planted in October through December, and harvested April through June. Thus, the surge in fertilizer, fuel, and other commodity prices related to the current supply disruptions may have significant effects on Zambia's economy in 2022, though the impact of higher fertilizer prices may not be felt fully until 2023.

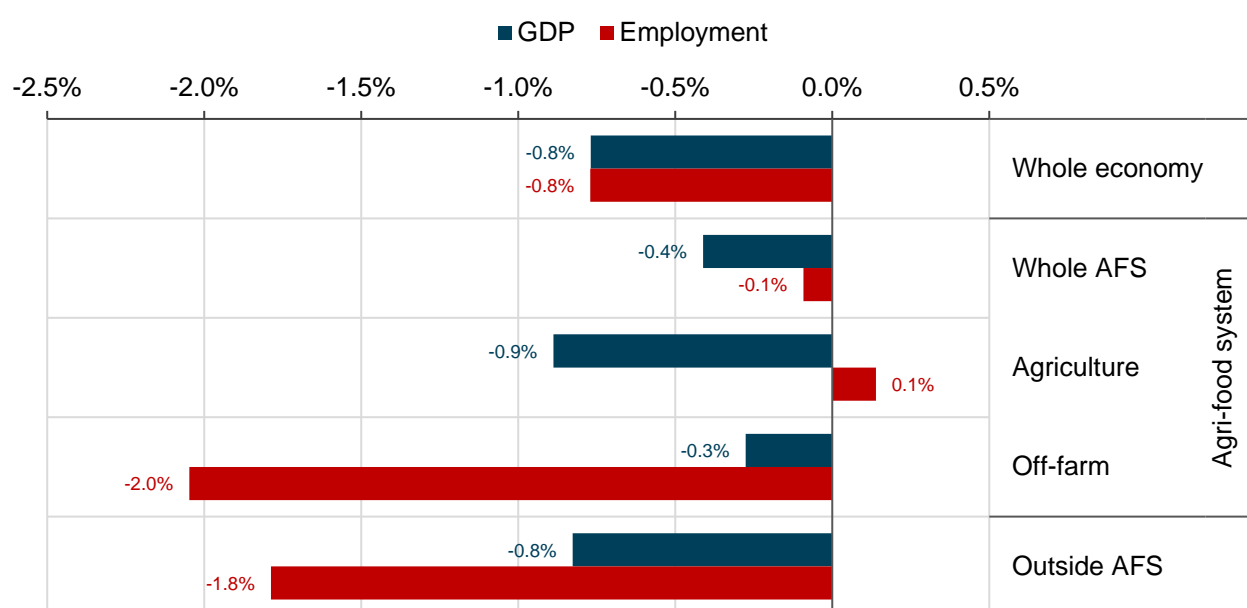
We simulate the effects of both higher world prices (recall Figure 1) and the potential productivity losses from reduced fertilizer use in the current growing season. Simulation results should be interpreted as "medium-term" impacts; that is, after the immediate spillover effects across sectors and households have occurred, but before the government and private sector make significant changes to their investments and policies in response to the crises (see Section 5 for next steps).

⁴ The final impact on crop productivity is: [Change in domestic market price] × [Price elasticity of demand] × [Share of cultivated land using fertilizer] × [Productivity gain from using fertilizer per hectare].

3. Impacts on Zambia's Economy and Agrifood System

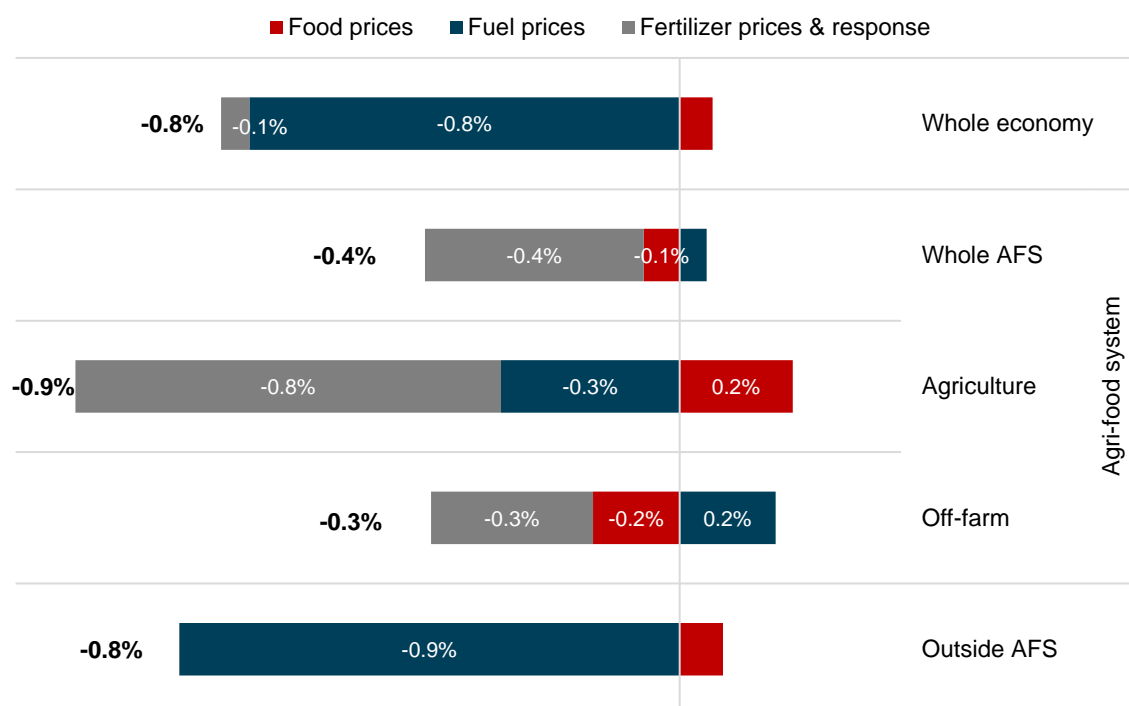
The world price and fertilizer shocks affect total GDP. Real GDP and total employment fall by 0.8 percent due to the combined effects of the negative terms-of-trade shock (that is, the negative effect of higher import prices outweighs the positive effect of higher export prices) and rising import costs that reduce spending on domestically produced goods (Figure 6). The percentage decline in agricultural GDP is slightly larger than the decline in total GDP, while the percentage decline in off-farm sectors within the agrifood system is much larger than the fall in total employment. Within the agrifood system, agricultural GDP falls more than off-farm GDP, and employment falls in the off-farm sector while there is little impact on employment on-farm. Outside of the agrifood system, GDP and employment both fall, with a larger decline in employment than in GDP, indicating that the negative impact of the world price shocks is larger for more labor-intensive nonagricultural sectors such as trade and transport and other services.

Figure 6. Percentage change in GDP and employment due to food, fuel, and fertilizer shocks



Source: Simulation results from IFPRI's Zambia RIAPA model.

Fuel shocks drive most of the decline in total GDP. Almost all losses in total GDP are due to the fuel shock, while the modest gains in total GDP from food price shocks are offset by the negative impact of fertilizer shocks (Figure 7). However, within the agrifood sector, fertilizer shocks, including reduced fertilizer use in response to higher prices, directly affect primary agricultural production and are the dominant factor driving the losses in agrifood system GDP. While rising food prices have some modest benefits for primary agriculture, especially export crops, off-farm GDP within the agrifood system is hurt by the increased cost of food processing and food-related services. The slightly positive effect of the fuel shock on off-farm GDP reflects the terms-of-trade shock, which causes the reorientation of some crop production toward supplying export markets and increases demand for related domestic trade services. Outside of the agrifood system, fuel shocks are the only factor in the fall in GDP.

Figure 7. Percentage change in real GDP decomposed by food, fuel, and fertilizer shocks

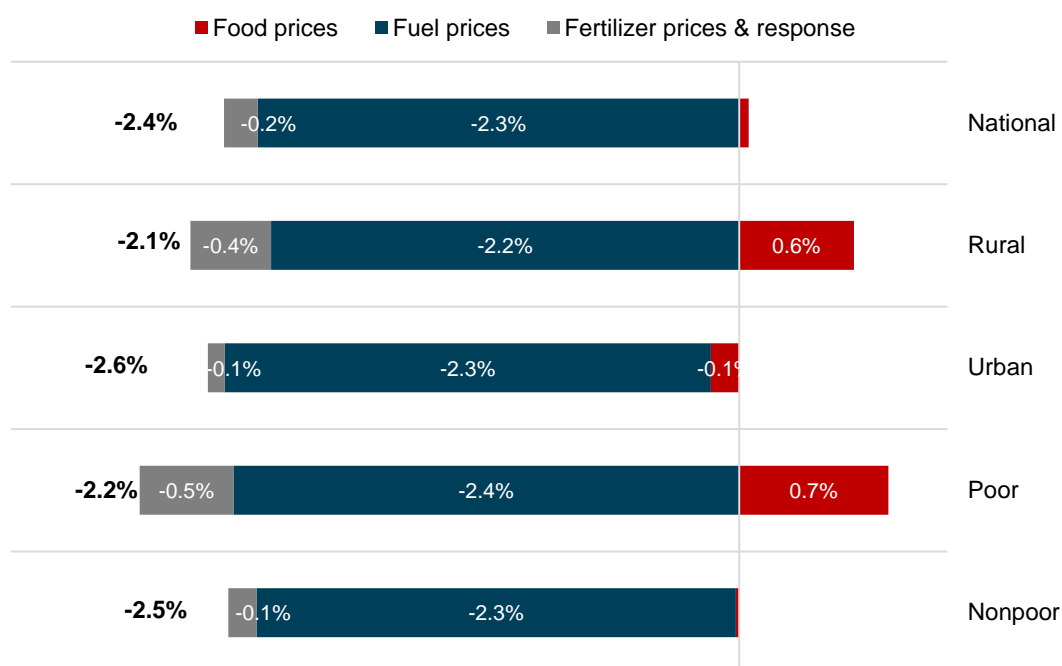
Source: Simulation results from IFPRI's Zambia RIAPA model.

Note: About 20 percent of the effect on agricultural GDP under "fertilizer prices and response" is directly from rising fertilizer prices, while the remaining 80 percent is from the productivity shock caused by lower fertilizer use.

4. Impacts on Household Poverty, Inequality, and Diets in Zambia

Household consumption falls in both rural and urban households. National consumption spending, including the value of home consumption, falls by 2.4 percent and consumption falls for both rural and urban households (Figure 8). The percentage decline in consumption is much larger than that in GDP because households are hit twice, by rising prices and falling income. Moreover, food accounts for a much larger share of household consumption than of GDP. The fall in consumption is slightly larger for urban households mainly because of a larger negative effect from the fuel shock. Rising food prices have a small negative impact only on urban households because they have a more import-intensive food basket.

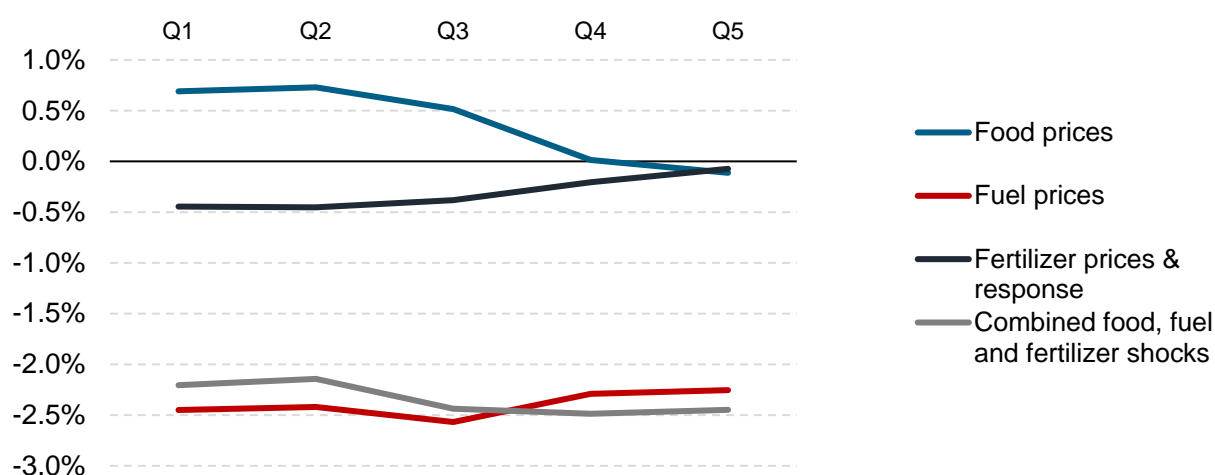
Figure 8. Percentage change in real household consumption due to food, fuel, and fertilizer shocks



Source: Simulation results from IFPRI's Zambia RIAPA model.

Inequality is not greatly affected, but all households are adversely affected. The food, fuel, and fertilizer shocks have different effects across household groups in Zambia. The increase in fuel prices leads to the largest consumption losses for all households and this negative effect is relatively large for households in the third quintile (Figure 9). The fertilizer shocks are most detrimental for poorer households, which rely more heavily on agriculture for income and spend a larger share of their income on food. These shocks have little effect on the top quintile households, thus causing inequality to increase. Finally, the food price shock benefits poor households in the lowest three quintiles and has little impact on the richer quintiles. Overall, the combined effect of the world price shocks is a decline in consumption for all households in Zambia, with inequality largely unaffected.

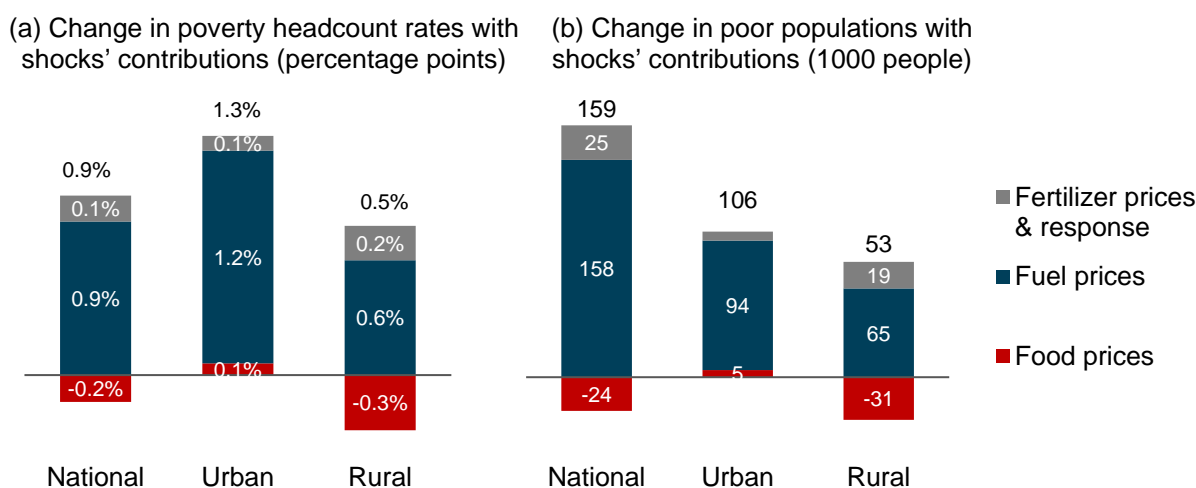
Figure 9. Percentage change in real household consumption across per capita expenditure quintiles



Source: Simulation results from IFPRI's Zambia RIAPA model.

Falling household consumption leads to greater poverty, particularly in rural areas. According to the most recent household survey in Zambia, 58 percent of the country's population has an adult equivalent consumption level that falls below the US\$1.90 international poverty line. The increase in world prices raises the national poverty headcount rate in Zambia modestly by 0.9 percentage points (Panel A in Figure 10), which is equivalent to an additional 160,000 people falling below the poverty line (Panel B). Most of the increase in poverty is caused by the fuel shocks and is concentrated in urban areas. Because the rural poverty rate was already very high prior to the shocks, the recent global shocks are expected to further impoverish those who are already poor.

Figure 10. Changes in poverty due to food, fuel, and fertilizer shocks



Source: Simulation results from the survey-based microsimulation module within IFPRI's Zambia RIAPA model.

Notes: Poverty headcount rate is the share of the population with daily adult equivalent consumption levels below the US\$1.90 poverty line.

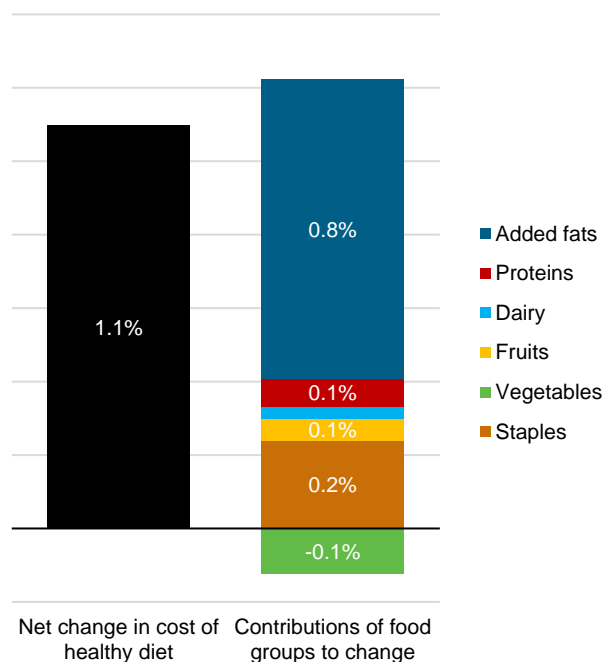
The cost of a healthy diet rises for Zambian households. The model tracks changes in the cost of a “healthy” reference diet (CoRD) with six major food groups as defined by the EAT-Lancet Commission.⁵ The combined food, fuel, and fertilizer shocks increase the CoRD by 1.1 percent in real terms (the first bar in Panel A in Figure 11).⁶ This increase is mainly driven by the rising cost of edible oils within the “added fats” food group, the domestic price of which is heavily influenced by rising palm oil import prices. Real costs also rise modestly for staples (led by higher wheat prices) and proteins and dairy products (led by falling production in the livestock sector). Real costs decline slightly for vegetables because the fall in household incomes reduces demand for vegetables. The “staples” food group includes cereals and root crops, and wheat is only a small component of this group in Zambia. Rising maize and wheat prices are compensated for by the falling cost of other staple foods when households reduce overall food consumption. Staples currently dominate most households' consumption baskets and achieving the diversity of the healthy reference diet requires a relative decline in the share of staples in the average household diet. As such, the increases in maize and wheat prices make a modest contribution to the changing cost of a healthy diet. Moreover, consumption levels of vegetables, fruits, dairy products, meats, and fish are far below the level required for a healthy diet among many households in Zambia, and the rising costs of some of these food groups cause households' deteriorating access to these foods.

⁵ For further information on the RIAPA model's diet module and indicators, see [Pauw et al. \(2021\)](#).

⁶ The CoRD is estimated using calorie targets from EAT-Lancet (for major food groups) and the World Bank's International Comparison of Prices (IPC) dataset. The estimated budget shares for the healthy diet include: staples (18.3 percent), vegetables (8.3), fruits (9.9), dairy (24.4), proteins (31.8), and added fats (7.3).

Figure 11. Changes in diet costs and household diet deprivation due to food, fuel, and fertilizer shocks

(a) Changes in the real cost of a healthy reference diet, with contributions from the six major food groups (%)



(b) Number of people to become deprived in at least one additional food group (1000 people)



Source: Simulation results from the survey-based microsimulation module within IFPRI's Zambia RIAPA model.

Diet quality worsens for many households. The survey-based micro-simulation tool also measures the number of people who experience a decline in diet quality. People are considered deprived in a food group if they obtain fewer calories from that food group than recommended by the healthy reference diet. Prior to the crisis, few households had the consumption level and diversity needed for a healthy diet in Zambia. Rising food prices are the dominant driver of deteriorated diet quality. With higher food prices, together with other price shocks, 213,000 people become deprived in at least one additional food group. Interestingly, around two-thirds of these people live in urban areas (Panel B in Figure 11), reflecting the fact that rural households already suffer more food deprivation than urban households, leaving little scope for a further increase in food deprivations.

5. Summary and Next Steps in the Analysis

Global food, fuel, and fertilizer prices have risen rapidly in recent months, raising concerns about how this will affect economic stability, food security, and poverty in developing countries. We used IFPRI's economywide model – known as RIAPA – to simulate the impacts of the global crises on Zambia's economy and population. The model allows us to track the direct and indirect effects of rising world prices, taking account of key considerations that will determine the overall impact. These include, for example: the share of imports in total product supply; the importance of different sectors and products for household employment, income, and consumption levels; and farmers' responses to rising fertilizer prices and the knock-on effect this could have on next season's agricultural production.

Our analysis indicates that the global crises cause agrifood GDP and employment in Zambia to contract, with a relatively large impact on agricultural GDP. Most agricultural GDP losses are driven by

rising fertilizer prices, while most losses in off-farm agrifood GDP are driven by higher food prices that increase the cost of food processing and food services. To some extent, rural farmers benefit from higher prices for agricultural products, but the net effect on their welfare is negative once we account for the effects of higher fertilizer prices, reduced fertilizer use, and lower agricultural productivity.

All households are adversely affected by the crises, and both rural and urban household consumption fall, led by falling income and rising prices. Such impacts are larger on urban households. Falling household consumption also leads to greater poverty, particularly in urban areas, as the rural poverty rate is already extremely high even prior to the shocks. Finally, the gap between household consumption levels and what is required to achieve a healthy diet widens for a large number of rural and urban people. While the global crises will cause a modest slowdown in Zambia's economic growth, their adverse impacts on poverty, food insecurity, and diet quality are likely to be more pronounced, especially in rural areas.

This study is part of a series of case studies that IFPRI is undertaking using economywide models to capture current world market shocks on developing countries. The analysis presented above is an initial impact assessment designed to gauge the vulnerability of countries and key population groups. Subsequent analyses will simulate the mitigating effects of different policy and investment options, including the potential roles of cash transfers, food aid, and subsidies for food, fuel, and fertilizers. Particular attention will be paid to possible synergies and trade-offs between these policy responses, including their implications for government budgets and longer-term development goals.

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