

8 Global market and food security in Africa: more trade or more domestic production?

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1 Introduction

Many African countries depend heavily on imports of wheat, rice and other food staples. Recent price increases in international food markets and price volatility like in 2008/2009, 2011/2012 and in 2021/2022 threaten food security,¹ especially the poorest segment of the population who spend often more than half of their income on food (FAO, IFAD, UNICEF, WFP and WHO, 2022). The Covid pandemic and the war in Ukraine have illustrated that many food systems depending on international markets lack the resilience to protect vulnerable households against price spikes. A growing population, stagnating agricultural productivity and climate change are just some of the factors leading to concerns about Africa's future food security, especially in the longer term (e.g. OECD-FAO, 2023:95–113). What strategy can be deployed by African governments to strengthen their population's food security? There is a large literature and ongoing debate about food self-sufficiency and food and nutrition security (e.g. Clapp, 2017) in times of globalized food markets. Reducing import dependencies by expanding domestic production can ensure market stability, but may not lead to low consumer prices. Specializing in the production of food commodities in which a country has a comparative advantage, combined with import of cheap foods, is a much followed strategy that can lead to greater general welfare, which may, however, not be distributed equally nor lead to resilience of the food system (Van Berkum, 2021). This essay analyses how international market developments affect domestic food prices in Africa (Sections 2–5) and discusses some strategies to help strengthen domestic food security in countries currently dependent on international markets (Section 6). Key to countervailing food import dependency is diversification of markets (in terms of expanding the number of suppliers of imports), commodities (increasing the variety of sales markets for various products) and consumption patterns. Besides diversification, bottom of the pyramid consumers need more and better employment/income-generating activities, resulting in improved purchasing power.

2 International price developments

As a continent, Africa is a net importer of grains (mainly of wheat, maize and rice) sourced in particular from the Americas (the USA, Canada, Argentina), Europe (Russia and Ukraine) and Asia (rice from India and Thailand) (FAO, 2022). Grain imports contribute directly to food security as imports increase the availability of these staple foods for domestic consumers and reduce domestic grain prices. Import costs are highly dependent on international price developments (combined with the country's exchange rate against the US dollar). Since the 1960s, international agricultural prices have declined in real terms, as a result of improvements in productivity worldwide, which in turn resulted from the development, adoption and widespread use of new

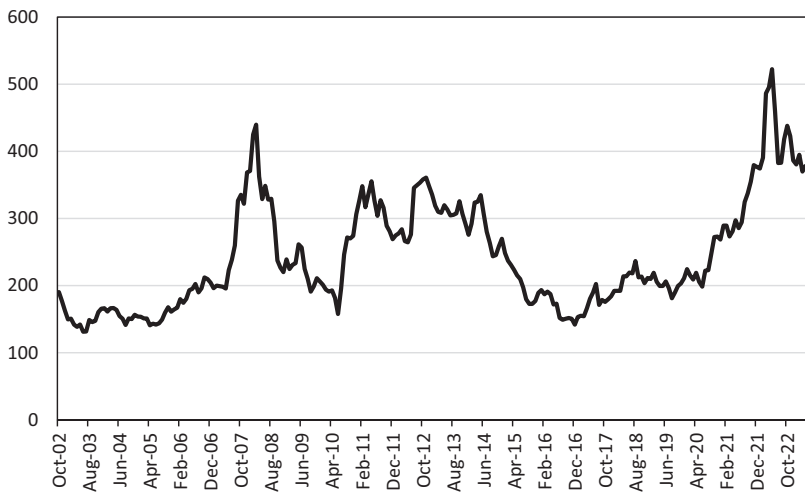


Figure 8.1 Wheat price developments 2002–2023 (nominal terms).

Source: www.indexmundi.com; accessed on 29/09/2023.

Notes: The figure shows wheat (U.S.), no. 2 hard red winter, ordinary protein, export price (US\$ per ton) delivered at the US Gulf port for prompt or 30 days shipment.

technological innovations such as fertilizers and mechanization (OECD-FAO, 2023:67). Falling marginal costs led to lower prices despite growing demand driven by global population and per capita income growth. Deviations from this general trend have been observed, such as the price spikes in the 1970s and in the period 2007–2014. In 2020–2023, grain prices increased substantially worldwide (see Figure 8.1 for wheat), although in real terms (that is, the price in US\$ adjusted for inflation in the USA) prices were higher in early 2008 (see GuruFocus.com). These price increases have been caused by tight global supply (due to smaller than expected harvests in 2021 in Canada, the USA and Russia, all three major wheat-exporting countries) and rising production and transport costs related to the global Covid pandemic. The Ukrainian-Russian war further pushed up international prices and disrupted price formation on global grain markets in 2022, also because a number of relatively large exporters of food commodities announced export restrictions to stabilize their domestic prices in response to the sharp increase in international prices (IFPRI, 2023). These export restrictions have eased and wheat prices have fallen to pre-war level, but as the war continues, markets remain volatile indicating continued uncertainty.

For the coming decade OECD-FAO (2023) projects a return to the long-term downward trend in global food prices after the disruptions of 2022. Such projections must be interpreted with caution as they assume ‘normal’ weather conditions and predictable macroeconomic and policy developments. However, food systems worldwide are under increasing pressure from the increased frequency and severity of weather extremes. Moreover, there are general fears of new plant and animal disease outbreaks, whether or not influenced by climate change, which already affect food production and consequently food security in several regions in the world. Armed conflicts such as the war between Russia and Ukraine demonstrated that unexpected events in major exporters of agricultural commodities and inputs like nitrogen fertilizers can greatly distort international food markets, resulting in rapid price hikes. The duration of the Ukrainian-Russian war is unknown, while risks of regional or international conflict are on the rise (FAO, 2022), suggesting that disruptions of international food markets will be more common in future than model projections such as those of OECD-FAO suggest.

3 A history of Africa's dependency on imported grains

Over the past 50 years, food consumption patterns worldwide have become more similar in composition due to an increased supply of some globally important cereal and oil crops, and a decline of other cereal, oil and starchy root crops. This increase in homogeneity worldwide highlights the establishment of a global standard food supply, which is relatively species-poor (Khoury et al., 2014). Natural advantages and large-scale bulk production of such foods in exporting countries resulted in historically low international food commodity prices, favouring import over domestic production in many recipient countries. This has increased dependence of countries on international food markets for their national food security.

The growing consumption of wheat by African consumers is a reflection of this homogeneity in global food supply, but is also accompanied by an increasing dependence on imported staples. For instance staple grain consumption in sub-Saharan Africa (SSA) is rising at the same time that the region is becoming more dependent on imported staples as this region consistently produces less than half, and often as little as one-third, of the wheat it consumes (FAO, 2022).

Consumption of wheat in much of Africa took off during the second half of the 20th century (Mason et al., 2012). Wheat consumption was stimulated by the abundant supply of wheat from countries such as the USA, Canada and France where technological development has boosted production per hectare since the mid-19th century. Considering that grain production in many African and Asian countries lagged behind population growth, it was clear to policymakers in wheat-exporting countries that the most promising markets were to be found in developing countries. At the same time, price-competitive high-quality wheat imports found a ready market into African countries, where they were favoured by the relatively well-off urban populations and the politically influential urban elites to secure food availability at reasonable and stable prices (De Janvry and Sadoulet, 2022).

A crucial feature of international wheat markets over the second half of the 20th century has been wheat aid shipped to developing countries. The USA began to ship subsidized wheat to a great number of developing countries and soon after World War II wheat aid was institutionalized on a global scale. Although the programme was said to pursue humanitarian goals, it was crucially motivated by a desire to dispose of growing wheat surpluses (see Friedmann, 1992; González-Esteban, 2017, and De Janvry and Sadoulet, 2022 for a discussion on impacts of food aid on domestic food sector in recipient countries).

4 How food import-dependent is Africa?

The costs of food import by African countries have increased dramatically over time. For instance, in 2021 Africa imported agricultural products worth US\$111 billion, against US\$21 billion in 2000 (FAOSTAT, values in nominal terms). However, to indicate import dependency of the continent, more important than overall import costs is how imports of key food items relate to what is consumed. Figure 8.2 shows for Africa's five most important food items in terms of daily per capita calorie intake the share of imports in consumption of that product. These five staples together make up 50% of the daily per capita calorie intake in the African countries included. Maize – 18.2% of the daily per capita intake – and wheat – 15.4% – are the staple products with largest shares of intake, yet the net import dependency of Africa of these two staples is starkly different.

There is great variation in diet composition and import dependency in Africa. Table 8.1 shows the share of total food consumption (in calories) and the share of consumed amounts imported for the five most important staple foods. Despite the heterogeneity among countries, reliance on domestic production is broadly low for wheat, rice and palm oil, reflected in relatively

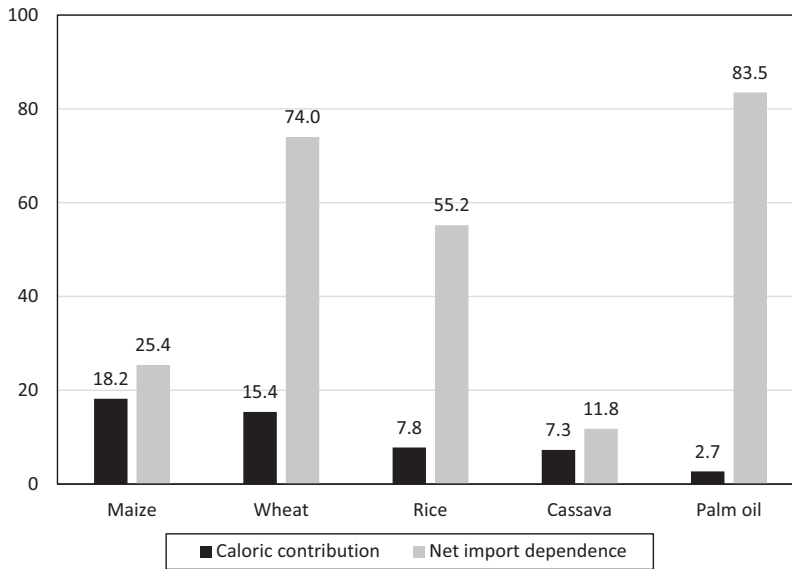


Figure 8.2 Daily caloric contribution and net import dependency (%) of the five most important staple foods in 19 African countries.

Source: FAOSTAT Food Balance Sheets data from 2019 and authors' calculations.

Notes: See Table 8.1 for the countries included; these countries are home to approximately 70% of Africa's population.

Table 8.1 Consumption share (CS) and net import dependence (NID) of the top five staples

Country	Maize		Wheat		Rice		Cassava		Palm oil	
	CS	NID	CS	NID	CS	NID	CS	NID	CS	NID
Algeria	3.6	99.9	40.1	63.6	0.7	100	N.a.	100	0.3	100
Angola	16.9	8.1	10.2	99.8	5.5	98.3	25.4	0	7.8	80.1
Côte d'Ivoire	5.4	2.5	6.3	100	26.7	53.8	14	0	6.6	-73.5
Egypt	17.2	51.2	35.3	52.4	11	11.6	N.a.	0	0.1	100
Ethiopia	19.3	0.7	13.3	21.1	1.6	78.9	N.a.	0	2	100
Ghana	7.5	0.5	4.1	100	9.5	59.9	26.4	-0.1	1.7	36
Kenya	27.6	6.3	12.2	84.6	6.2	85.5	2.1	0.1	1.7	100
Malawi	44.1	0.1	1.9	99.2	1.9	6.3	7.6	0	0.5	100
Morocco	10.3	98.6	40.7	49	0.4	46.3	N.a.	0	0.1	100
Mozambique	28.7	11.4	7.6	97.3	12.2	81	14.6	0	4.3	100
Namibia	16.9	68.8	17.3	95.8	3.1	100	N.a.	0	0	100
Nigeria	12.3	2.6	7.9	98.7	10.9	1.1	11.4	0	7.2	51.2
Rwanda	8.8	8.1	3.4	88.5	3.5	36.2	11.8	14.7	3.2	100
Senegal	7.6	41.8	12.9	100	29.8	49.7	3.3	1	4.5	91.1
South Africa	28.9	-10.5	16.9	51.7	4.8	99.8	N.a.	100	2.9	100
Tanzania	19.7	-1.7	2.8	95.4	3.1	31.5	15.6	-0.3	5.5	100
Tunisia	N.a.	100	45.3	54.1	0.4	100	N.a.	0	2	100
Uganda	21.4	-3.4	5.6	93.5	13.3	7.1	7.8	-3.2	3.7	99
Zambia	50.4	-2.1	3	-13.4	1.1	45.5	16.4	0	2.7	100

Source: FAOSTAT New Food Balances and authors' calculations.

Notes: Consumption shares are calculated as percentage of average daily per capita caloric contribution data from 2019. Net import dependence = $100 * (\text{imports} - \text{export}) / (\text{production} + \text{imports} - \text{exports})$, data from 2019. N.a. = not available. Bold indicates net import dependence greater than 65%.

high import dependency. Regarding import trading parties, Russia is the dominant source of wheat, while palm oil and rice are mainly procured from Malaysia and Indonesia respectively (FAO, 2022). By contrast, maize and cassava are mainly domestically sourced, and have low net import dependency.

We conclude from these data that countries in Africa differ much regarding their dependency on international food markets. Of all countries on the African continent, only South Africa is a net exporter of staple food, though many countries, such as Ghana and Ivory Coast, are exporters of agricultural commodities, such as cocoa and coffee (note that Ivory Coast is a net exporter of palm oil, too – see Table 8.1). Moreover, dependencies can be observed on a single commodity, while other commodities are produced domestically, or on multiple commodities, making such a food system more profoundly reliant on international markets with potential negative effects on its resilience to supply and economic shocks. For instance, North Africa's dependence on the import of wheat is considerable, while wheat also makes a major contribution to the calorie intake of the population. Besides variations among countries, the effects of dependency on food markets are not equally distributed over segments of consumers within countries. Households with little purchasing power benefit from low food prices in times of stability on international food markets, but are hit hardest by price spikes in times of crisis (see for example reports on FEWS.NET that provide early warning information and analysis of food insecurity and its drivers worldwide).

5 What drives food prices in Africa?

Food prices are determined by the processes and powers of trade that ultimately link supply and demand on a specific market, be it domestic or international. Increases in demand for food are largely determined by population and income growth, the latter affecting not only increased consumption but also shifts in preferences for food. In Africa, population growth determines the demand for food to a greater extent than per capita income growth. Population growth is expected to continue at an average 2.5% per year until 2035 and 2% annually in 2035–2050 (UNDESA, 2023). However, food supply via domestic production in Africa is projected to only increase moderately over the coming decade, which also means that Africa will become increasingly reliant on food imports to close the gap between domestic production and consumption (OECD-FAO, 2023). This greater dependency on world markets means that the influence of international developments on domestic markets will also grow, something that, due to the major uncertainties in international prices, entails the risks of fluctuations in foreign supply and thus increases domestic food security risks.

Okou et al. (2022) show for 15 SSA countries that domestic food price variations are strongly related to net import dependency and the share of food staples in overall food consumption. The 15 SSA countries in this study are in fact highly vulnerable to global price shocks as any change in the international price of the imported staples can bring about an almost one-to-one increase in the local price of the imported staples. Moreover, higher domestic production – reflected in lower net import dependency – and lower consumption shares of the imported staple correspond to lower imported food price inflation. This implies that vulnerability to international price fluctuations can be reduced by expanding domestic production as it reduces the share of imported staples in overall food consumption.

Okou et al. (2022) also show that monetary policy framework, fiscal management, income per capita and geographical challenges (e.g. countries that are landlocked) are the main factors explaining differences in staple food prices among SSA countries. Countries with stronger monetary policy frameworks and income growth tend to have lower relative food prices,

reflecting better control of inflation and a smaller share of basic food spending, respectively, when household incomes rise. In contrast, food prices are higher in countries with high debt ratios, as weaker fiscal management and transportation challenges tend to drive up the cost of food staples.

6 Building resilience to food market shocks

The above sections indicate the importance for African countries that rely heavily on staple food imports to consider strategies to increase the resilience of their food systems. In addition to macroeconomic policy aimed at sound fiscal policy (keeping government expenditure in order) and monetary policy (aimed at price stability, mainly via the interest rate instrument), sector-specific policy is also required to increase resilience to food market shocks. We have three suggestions: (1) diversify markets and commodities; (2) strengthen competitiveness through inclusive value chain development; and (3) change consumer patterns towards more healthy crops and livestock products. So far, we have focused our analysis on staple foods which provide consumers with daily carbohydrates. Yet, their dominance in African diets has given rise to the increase of many non-communicable diseases on the continent, as the intake of micronutrients is generally far below recommended WHO standards (de Steenhuijsen Piters et al., 2021, Melse-Boonstra et al., this volume).

6.1 Diversification of markets and commodities²

Food import dependency becomes a severe problem when countries are less able to finance food imports.

A significant number of the African countries with food deficits depend heavily on export of few primary commodities such as coffee, cocoa or tea, and may face food security risks from a deterioration in those products' terms of trade (FAO, IFAD, UNICEF, WFP and WHO, 2019). Food import dependency is more risky for countries that have small or unstable foreign reserves, which are, in turn, dependent on the diversity and size of the export sector. To reduce these risks, it is vital to promote commodity and market supply diversification (Van Berkum, 2021). Commodity diversification implies a shift towards the production of more and different high-value crops such as fruits, vegetables and livestock products. Market supply diversification means that exports target several markets in different countries, and, in the case of imports, that a country maintains trade contacts with several countries so that it can relatively easily obtain imports from different suppliers. The potential for agricultural diversification differs across regions due to wide heterogeneity in agro-climatic and socio-economic conditions, the latter affected by technological change in crop and livestock production, improved rural infrastructure and diversification in food demand. Based on an extensive analysis of export diversification options in Mali, Chad, Niger and Guinea, López-Cálix (2020) concluded that targeted investments in market infrastructure (for efficient logistics) and in human capital (for building skills that enhance people's productivity and employability) can benefit the diversification of an economy.

In addition to structural adjustments on the supply side, opportunities on the demand side in domestic and foreign markets should be exploited to achieve the transition to a more productive and differentiated agriculture, improve access to food and create jobs outside agriculture. Strengthening regional trade relations with more or less equally developed neighbouring countries is a way to leverage trade to make the transition to a more diversified economy. By focusing on regional trade and improving infrastructure, countries can further exploit and develop

their comparative advantages on nearby markets, using the generally existing social connections through which consumer needs and preferences are understood, and that can be served by short supply chains in which small-scale farmers and traders participate. Allen (2017) has shown that food prices are lower in West African countries that participate in the Economic Community of West African States (ECOWAS), suggesting that this free trade zone already has an impact (Frankema, this volume).

Yet regional trade within Africa remains fairly limited and accounts for less than 20% of all exports (UNECA, 2018). One reason is that existing regional trade agreements, such as the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC) and the Southern Africa Development Community (SADC), frequently exclude free trade in foods, since their product portfolio is rather similar and countries consider each other as competitors.

The recently established African Continental Free Trade Area (AfCFTA) may stimulate intra-Africa trade, accelerate export diversification and diversify export destinations and types of goods produced on the continent (Echandi et al., 2022). In particular, the AfCFTA promises to increase intra-regional trade in food products that, if accompanied with the right measures, can greatly help boost smallholder farmers' productivity growth and prospects for integration into profitable food value chains. Moreover, more intensified regional trade relations add great potential for buffering against price spikes and against drought – which rarely affects all countries and regions at the same time. To make the most of these opportunities, governments will need to reduce transaction costs by improving trade facilitation – such as import customs clearance procedures and port handling at the border – and invest in physical infrastructure, including roads, railways and harbour facilities (Echandi et al., 2022).

6.2 *Strengthening the competitiveness of domestic food production through inclusive value chain development*

A second strategy for increasing resilience of food systems to external food market shocks is to strengthen the competitiveness of the domestic agriculture and food sectors by increasing their productivity and efficiency (Van Berkum, 2021). Higher crop and livestock productivity provides farmers with higher incomes and contributes to assuring the supply of food at lower prices to consumers. Increasing the productivity of Africa's agriculture will require the sustainable intensification of production through increased, but rational use of inputs (improved seeds, fertilizer, irrigation, mechanization) as well as better access to (high-value) markets. Achieving this, while not trespassing the planetary boundaries, is a huge challenge in light of Africa's dominant small-scale agricultural structure (Giller et al., 2021).

Value chain development (VCD) is increasingly advanced as an organizational solution to the above challenge (Ingenbleek et al., this volume). In VCD arrangements, public and private sector parties cooperate, assuming each specific roles and responsibilities (Swinnen and Kuijpers, 2020). Public VCD interventions generally aim to increase the efficiency in value chains by improving the business environment. The essence of the more integrated VCD models is to involve all actors in the value chain and "link" smallholder producers with input companies, processing factories or marketing agents. Based on these arrangements, higher volumes of more consistent quality can be procured by the stakeholders in the chain in return for access to credit, agronomic knowledge, price premiums and a reduction of production and market risks for the producers (Swinnen and Kuijpers, 2020). Farmers will become more productive through better access to inputs and more certainty about sales opportunities, while buyers can purchase at lower prices.

Small farmers are not automatically included in value chains, which increasingly have to take into account the demand for high-quality and safe food (Ton et al., 2018; Swinnen and Kuijpers, 2020; Kuijpers et al., 2021). If buyers have a choice between larger and smaller farmers, they will in many cases enter into contracts with the larger farmers because transaction costs are lower.

Governments can enhance the process of involving small farmers in VCD by developing policies that focus on reducing transaction costs for smaller and less resourceful producers for entering more commercial value chains. Such policies include, for example, managing foreign direct investment (FDI) so as to integrate smallholders, and investing in rural infrastructure (roads, storage facilities, energy, information and communication technology [ICT] networks) to connect small-scale farmers in remote areas with markets. Moreover, farmers need to be empowered to obtain a better bargaining position in the supply chain (Kuijpers et al., 2021). Government policies may support the establishment of producer organizations with proper legislation, with information and knowledge transfers enabling them to operate such organizations, sometimes using financial support measures (such as tax exemptions). Also helpful for integrating smallholders into value chains are policies that invest in institutions for independent quality and food safety control, certification, public extension and market information services (Swinnen and Kuijpers, 2020).

6.3 *Influencing food consumer patterns and enhancing purchasing power*

A third strategy to become less dependent on import of wheat, maize and rice is to influence the demand for these food staples. Two tracks can be distinguished here. One track is to change the relative prices of domestically produced grains to imported grain, and a second track is to promote a healthy diet that is affordable to most consumers. Both tracks are explained below.

6.3.1 *Change the relative prices of domestically produced grains to imported grains*

Wheat consumption in Africa has been rising faster than in any other region around the world, fuelled by relatively cheap imports. For example, in countries such as Kenya and Nigeria – both large wheat importers – an important driver of increasing wheat demand has been the falling price of imported wheat compared to other staples such as maize, millet and sorghum.

To reduce import dependency on imported wheat and rice, Africa will have to grow more grains and do so more efficiently. In doing so, it could focus on the more than 2,000 native grains and fruits which hold great potential for the food security question to millions of people in Africa (Raheem et al., 2021). The African continent is a major producer of several cereals like sorghum, pearl millet, finger millet, teff and African rice; some may need to be rediscovered and made more attractive to consumers, for example by reduced retail prices or their promotion in menus and recipes. Food security and sovereignty can be improved by revisiting these indigenous food crops and their diversified forms to improve nutrition. Governments and donors should prioritize investments in breeding of local cereals and other efficient farming techniques, to increase productivity per hectare (taking into account climate change effects on the continent's production capacity) and to adapt attributes such as taste, nutritional value and ease of use in products to consumer preferences (low yields and little nutritional value are major constraints to sorghum production as an example from Uganda shows; see Andiku et al., 2021). Costs of production can be further reduced through fiscal subsidies, for example on the use of inputs such as fertilizer and credit (interest discount), and other subsidies aiming at promoting local production to be an attractive alternative to imported grains.

6.3.2 *Promote healthy diets and enhance purchasing power*

Africa is a region where grains, roots and tubers have a relatively large share in the diet and nutrient-rich foods, such as meat, dairy, fish, fruits, vegetables and pulses, only make up a small part (Willett et al., 2019; Melse-Boonstra et al., this volume). This means that diets are often high in calories and that people consume too little micronutrients (vitamins and minerals). An important reason is that an estimated 80% of the Africans cannot afford a healthy diet. A global study on fruits and vegetable sectors (de Steenhuijsen Piters et al., 2021) confirmed that in Africa fruits and vegetables are more expensive compared to other food groups such as cereals, oils and fats, and drive a large part of the costs of a healthy diet. By promoting more domestic production and efficiency in the value chain (e.g. improved logistics that lowers transport costs) the retail price of these healthy foods should decline, making them more affordable for larger segments of consumers.

Besides promoting the supply of more healthy foods, produced domestically, consumers in SSA will need to achieve more purchasing power to access such foods. Even if the costs of a healthy diet in SSA would decline to average global levels then still the majority of households would not be able to afford these due to low levels of income.

Demographic trends in SSA mean that annual newcomers to the rural workforce will rise from 20 million today to 50 million by 2050 (IFAD, 2021). The rapidly growing numbers of rural youth in Africa present a huge employment challenge. Without employment opportunities, a whole generation will not escape poverty, with significant implications for people's well-being and access to healthy foods. Off-farm opportunities in food value chains and supporting services can provide options for young people and those exiting primary production to engage in entrepreneurial activity (IFAD, 2021). This challenge can only be met by general economic growth, job creation in all economic sectors and improving the working conditions of labourers and other workers at lower socio-economic strata.

7 **Conclusions**

Recent spikes in world food prices have shown the high vulnerability of African consumers for their supplies of carbohydrates on international food trade.

Strategies to reverse the heavy dependency on international grain markets include diversification of markets and food production, promotion of domestic production in terms of productivity and diversity of supplies, and policies to promote more nutritious food consumption patterns.

Governments have an important role to play in ensuring the most vulnerable groups in society will benefit from these strategies. Governments will have to support diversification of markets and production and strengthening of competitiveness by investing in trade costs reducing market infrastructures (e.g. storage facilities, trading places), information and knowledge exchange, and the building of institutions such as independent quality control organizations. For agricultural VCD to play a meaningful role in poverty alleviation for smallholders, governments must ensure that chain relationships (e.g. in the form of contracts) meet conditions for social equality and inclusiveness. To improve the availability, affordability and accessibility of high-quality nutritious foods for the less well off, governments may need to use subsidies and taxes to entice producers to produce more and consumers to demand more. This means active involvement of African governments in domestic food markets, with policies aimed at strengthening food security being central.

An active food and nutrition security policy in Africa may also require restrictive measures such as import tariffs. This is a sensitive issue because protection of one's own market can go against trade agreements made in the World Trade Organization (WTO). Further, it may only

result in more stable, lower domestic food prices in the longer run, as it takes time for domestic production to substitute imports. Achieving more food and nutrition security through increased food system resilience is not a binary choice between domestic production and food import. National policies towards such goals must include all possible measures and optimize domestic production capacities alongside imports, depending on the economic, political and ecological context. As Jennifer Clapp (2017) argues:

A more nuanced approach based on the real-world application of food self-sufficiency policies does not view the concept as an either/or proposition, but rather sees it in relative terms. Such an approach could potentially create room for a more productive policy dialogue on this issue at the international level.

Notes

- 1 Food security is used as in the FAO definition which emphasizes accessibility, at all times, to sufficient food in a quantitative and qualitative (that is, nutritional) sense (FAO, 1996).
- 2 Sections 1 and 2 draw heavily on Van Berkum (2021).

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