Food and Agriculture Organization of the United Nations

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Background paper for *The State of Food Security and Nutrition in the World 2023*

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Abstract

This study analyses a key element of agrifood systems transformation: the change of patterns in food supply and demand. Several studies have discussed this topic, but this one takes an innovative perspective of analysis, considering these changes with a spatial perspective using the urban–rural catchment areas (URCA) approach to analyse changes in food expenditure across the rural–urban continuum, using the Living Standards Measurement Studies (LSMS) of 11 African countries. The analysis is preceded by a literature review of the transformation stages, drivers and current situation of agrifood value chains, focused on low- and middle-income countries (LMICs), and is followed by a macro review of food supply around the world and a macro-meso review of the supply of wheat and rice in two African countries. The study shows that in all households across the rural–urban continuum, even in more remote rural areas, most food is purchased – dispelling the myth of rural subsistence farming in Africa. In addition, the results show a diffusion of the consumption of processed foods (including, though to a lesser extent, highly processed foods), across the rural–urban continuum. Furthermore, from a food supply perspective and at a global level, the study reveals a low availability of foods that are part of a healthy diet – fruits, vegetables and legumes, nuts and seeds, calling for increasing efforts to produce more nutritious foods across the world.

Keywords: agrifood value chains, rural–urban continuum, food demand and supply, processed foods.

JEL codes: D12, O18, Q12, R11, R12.

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1 Introduction

This paper examines the transformation of and patterns in food demand and supply in low- and middle-income countries (LMICs) applying a rural–urban continuum lens. The paper presents micro, meso and macro analyses of food demand and supply transformation across the rural–urban continuum, focusing on selected countries in sub-Saharan Africa, and a macro analysis and literature review across world regions, with a discussion emphasis on LMICs.

To serve as context, a literature review and conceptualization of the transformation of agrifood value chains in LMICs is first provided in Chapter 2. The focus is on stages of agrifood value chain transformation and, within this transformation, demand and supply changes that take place and patterns that have been observed to dominate in the food sector. The methods and main findings of the empirical analysis presented have antecedents in the literature, but this study extends these in coverage, detail and time.

The literature points to past studies that show that supply chains within countries originate in one set of zones that supply other sets of rural zones and cities, thus describing long supply chains that operate within countries and providing a spatial view of supply from origin to destination. (This is different from examining only realized supply, equal to demand, at a destination, which is presented in Chapter 5). Second, the literature review also points to past studies that show the process of industrial organization of supply chains, including the shift from small and medium enterprises (SMEs) to large processors and retailers, the emergence of third-party logistics, and other structural changes that further complement the data analysis in the rest of the paper.

Chapter 3 takes a micro perspective, presenting an empirical analysis of 11 countries in sub-Saharan Africa that had the requisite level and type of detail in the Living Standards Measurement Study (LSMS) surveys to allow for analysis by urban–rural catchment areas (URCAs), as well as by income strata (proxied by total expenditure). The 11 countries were divided into low- and high-food-budget levels as strata to allow for comparisons across broad levels of development as well as meso spatial areas and household incomes. The analysis examines the patterns and determinants of purchases of food; consumption of minimally, moderately, and highly processed foods; and consumption of various food products (cereals, fruits and vegetables, animal products, and so on).

Chapter 4 takes a macro perspective on supply (cum demand) using FAOSTAT data to examine change in domestic supply, import supply shares and levels, and adequacy (relative to norms) of intake, over the period of a decade. This is done over regions of the world for comparison.

Chapter 5 takes a macro-meso perspective on the question of how supply of various products is distributed (in a spatial and socioeconomic sense of who gets what) over URCAs and income terciles. The analysis focuses on a high-food-budget country (Nigeria) and low-food-budget country (Burkina Faso), and on two products (rice and wheat, which make up the majority of food imports in quantity). The analysis shows the share of imports in the total supply cum demand of those products, and then shows how the supply cum demand is distributed over the URCAs and the terciles. This is a "pie" analysis of consumption (vs an analysis of the consumption of a stratum, as provided in Chapter 3), showing what share of the national consumption of rice and wheat is consumed by each URCA and each stratum. This makes it possible to identify who/where is getting what part of the supply of imported wheat and rice and of the supply of domestic rice (as there is nearly no domestic production of wheat in those countries) and makes it possible to test the hypothesis of whether the imports are mainly going to urban areas, a key issue for analysis of transformation. The final chapter briefly summarizes the findings of the previous chapters.

2 Literature review and conceptualization of agrifood value chain transformation from demand and supply perspectives

Agrifood value chains in LMICs in Africa, Asia and Latin America and the Caribbean have been transforming over the past 50 years, but rapid transformation has occurred in the past 25 years (Barrett *et al.*, 2022; Reardon *et al.*, 2019). In many countries, this transformation has not been gradual, but rather abrupt. Reardon and Timmer (2014), illustrating with Asian evidence, explain the drivers of this rapid change as a combination of meta drivers (such as market and trade policy liberalization) and a confluence of three sets of interlinked transformations: 1) downstream demand-side change (urbanization and diet change), pulling system transformation; 2) midstream and downstream change (in the structure and conduct of retail, wholesale, logistics and processing), intermediating system transformation; and 3) upstream change (intensification, diversification and commercialization of farming), feeding system transformation.

While a lot of policy debate and international discussion has focused on the role of exports and imports driving the transformation of agrifood value chains in LMICs, this has been a modest driver of transformation. Agricultural exports and imports are small compared to the domestic agrifood system. For example, the average share of agriculture exports compared to domestic consumption is less than 10 percent in Africa and Asia, and 22 percent in Latin America. Similarly, imports shares are also low – 21 percent in Africa and 18 percent in Asia, and only 9 percent in Latin America and the Caribbean (for LMICs overall, see Reardon *et al.* [2019]; for sub-Saharan Africa, see Awokuse *et al.* [2019]). Trade shares are of course higher in particular products and locations, such as coffee exports everywhere and rice imports in West Africa. But, in general, the domestic market and domestic agrifood value chains form the great bulk of food supply and demand in LMICs. As such, this review focuses on the domestic sector.

This chapter, describing the results of the literature review, focuses on downstream and midstream changes. The chapter proceeds as follows: Section 1.2 lays out a stylized description of the stages of agrifood value chain transformation. Section 1.3 and Section 1.4 review recent literature and evidence of agrifood value chain transformation over the past 25 years in LMICs. Section 1.3 examines the meta conditioners (policy, public and private investments, and technology transfer and adaptation) and downstream pull factors (urbanization and diet change) for agrifood value chain transformation; while Section 1.4 discusses the literature and findings over the past several decades on trends in changes in structure and conduct of agrifood value chains in these regions.

2.1 Conceptual framework: a stylized view of the three stages of agrifood value chain transformation

Based on primary data and a review of evidence on the evolution of rice and potato agrifood value chains in LMICs in Asia, Reardon *et al.* (2012) observe a three-stage transformation process – traditional, transitional and modern. This is broadly applicable to other products and regions. This section lays out a stylized presentation (drawing from Reardon and Minten [2021] and Reardon *et al.* [2019]) of these three stages to set in context the literature and evidence of value chain transformation discussed in this report.

LMICs vary considerably in terms of their level of development and the impact of the drivers of agrifood value chain transformation previewed above. Evidence, as well as casual observation,

shows that a given country's agrifood value chains are a mix of value chains that have evolved to various stages. Table 1 roughly summarizes the three stages of agrifood value chain transformation.

Table 1. Stages of agrifood value chain transformation

	Traditional agrifood value chains	Transitional agrifood value chains	Modern agrifood value chains
Main enterprise type:			
Retail	Home enterprise	Small and medium enterprises (SMEs), wet markets	Supermarkets
Food service	None (home cooking)	Street vendors, independent restaurants	Fast food chains, supermarkets and hypermarkets, independent restaurants
Processing	None (home processing)	SMEs such as small mills	Large processors and food manufacturers
Wholesale	Brokers based in rural villages	Wholesalers based in urban markets	Off-market distribution companies
Logistics	Own logistics by brokers	SMEs in third-party logistics (3PL)	Large 3PL companies and freight forwarders
Supply chain length	Short, local	Long, rural–urban	Long, rural–urban, international
Exchange arrangements	No contracts, no standards	No contracts, public standards, some vertical integration	Emerging contracts, private standards, vertical integration
Technology	Labour intensive	Labour intensive	Capital intensive
Foreign direct investment	None	Emerging	Significant

Source: Adapted from Barrett, C.B., Reardon, T., Swinnen, J. & Zilberman, D. 2022. Agri-food Value Chain Revolutions in Low- and Middle-Income Countries. *Journal of Economic Literature*, 60 (4): 1316–1377. https://doi.org/10.1257/jel.20201539

For example, in Colombia, one finds dairy value chains firmly in the modern stage (with farms selling directly to Nestle, for instance) in the same valley floor district as transitional diary value chains (with farms selling milk to wholesale collection centres that sell to SME processors and to large scale modern processors). In the mountain valleys above the valley floor there are still traditional dairy value chains with small-scale farmers selling to bicycling itinerant wholesalers who sell to consumers, village milk stands or artisanal cheese makers (Vargas, 2023).

Because of the coexistence of the three stages of transformation of a given product's value chain, the country or product can be described as an average of the stages attained. Hence, Colombia's dairy value chain is more modern (mainly a combination of modern and transitional) compared to Ethiopia's, which is more traditional (mainly traditional, with emerging transitional).

2.1.1 The traditional stage

This section describes the patterns commonly found in the traditional stage, for instance in current cereal or dairy supply into rural village markets in Ethiopia or Nepal, or most agrifood value chains in LMICs in the 1970s.

In terms of structure, traditional agrifood value chains are spatially short because the urban share of the population in the food market is low. They are also short because much of the market is in the rural areas and even in the same village. The share of grains and other staples in the food economy is very high: there is relatively little production of non-grain products, hence there are few value chains for them, except in pockets of traditional cash crops. The share of value added in post-harvest segments of the agrifood value chains is small: home processing reigns, and the wholesale and logistics sectors are small because food is not moved far. Most of the segments are fragmented. Concentration is mainly observed where governments assure grain supply to emerging urban populations at subsidized prices via parastatals.

In terms of conduct, as the bulk of the agrifood value chains is in niche phase for non-grains and niche-to-commodity phase for grains, there is little quality differentiation, standards or economies of scope. Technologies are labour intensive per unit of output. Enterprise scale is tiny. Spot market relations dominate agrifood value chains, and contracts are not used.

2.1.2 The transitional stage

This section describes the common patterns found in agrifood value chains in the transitional stage, such as current teff, aquaculture fish and maize supply into urban markets in Bangladesh, Ethiopia and the United Republic of Tanzania. This stage is dominant in most of sub-Saharan Africa and South Asia and parts of Southeast Asia.

In terms of structure, transitional agrifood value chains are spatially long, because the urban share of the population in the food market is moderately high. Examples of this are fruit and vegetable agrifood value chains in Ethiopia (Minten, Mohammed and Tamru, 2020), Senegal (Faye *et al.*, 2023), the United Republic of Tanzania (Ijumba *et al.*, 2023) and Zambia (Chapoto *et al.*, 2013), where the bulk of key products – such as tomatoes and onions – are produced in a few main commercial horticulture zones and then transported for many hours to cities and to other rural areas.

The exception, where short value chains still dominate, is in highly perishable products such as green leafy vegetables and smallholder dairy (for example, see Minten, Mohammed and Tamru [2020] for dairy agrifood value chains in Ethiopia). In a number of LMICs, short and long agrifood value chains for products coexist, depending on their degree of packaging and processing. This is the case, for instance, for dairy in India (Birthal *et al.*, 2017) and Uganda (Van Campenhout, Minten and Swinnen, 2021).

Agrifood value chains are long when there are many steps or stages of actors in the midstream. In the transitional stage, as agrifood value chains become spatially longer (compared with the traditional stage), many actors emerge in the midstream to add value and move food from rural to urban areas. The share of value added in post-harvest segments of the agrifood value chains is moderately large, as wholesale, processing and logistics sectors have developed, primarily as small and medium-sized enterprises (SMEs), in what Reardon (2015) calls the “hidden middle”, with examples mainly from Asia, Latin America and sub-Saharan Africa (Reardon *et al.*, 2019; Reardon, Liverpool-Tasie and Minten, 2021).

By the transitional stage, governments have largely dismantled output and input parastatals, and private firms (especially SMEs) have flooded in. Reardon (2015) terms this a J-curve of concentration: In the traditional stage, there is moderate concentration (parastatals in the public sector alongside a fragmented “parallel market” private sector). Then, with liberalization and privatization of parastatals (in developing regions, this occurred in the 1980s and 1990s), there

is deconcentration, with the proliferation of SMEs. This is illustrated by the grain processing sector in Brazil in the 1990s (Farina, 1997).

By the transitional stage, the share of grains and other staples in the food economy has dropped to a minority share. (Dolislager *et al.* [2022] has studied this in sub-Saharan Africa, while Minten, Reardon and Vandeplas [2009] studied this in India.) As per Bennett's law,[1] consumption (further discussed in Section 2.3.2) and production have diversified, moving beyond grains, with radically increased production of and agrifood value chains in animal and horticultural products.

Second, in terms of conduct, by the transitional stage, most agrifood value chains are in a major shift from the niche to the commodity phase of the product cycle. There is still little quality differentiation, but public standards have started to emerge for grades and quality and, in some cases, for product safety. The exception is mostly on the side of value added, as purchased processed foods and differentiated grain products (convenience foods and high-quality products) develop rapidly at this stage (for reviews of the development on the supply side of these sectors, see Reardon *et al.* [2021] for Africa, and Popkin and Reardon [2018] for Latin America).

Technologies in the transition phase are still labour intensive, but machine use has emerged in farming and in other segments of the agrifood value chains. For example, home processing, such as hand pounding of grain found in the traditional phase, has now given way to the proliferation of small and medium-sized milling companies, alongside a few emerging large-scale companies (for sub-Saharan Africa, see Reardon *et al.* [2021]). Small and medium-sized enterprises (SMEs) also begin playing a bigger role in logistics and wholesale (see Reardon, Liverpool-Tasie and Minten [2021] for sub-Saharan Africa). Although most of the relations between, for example, processors and farmers are still based on the spot market or "relational contracts" (informal but regular relations), formal contracts are beginning to emerge (Liverpool-Tasie *et al.*, 2020; Macchiavello, 2022; Macchiavello, Reardon and Richards, 2022; Michler and Wu, 2020).

2.1.3 The modern stage

Examples of the modern stage, the last stage of transition, are Senegal's current mango-export agrifood value chain, the supply of rice into the main urban markets in China, and the dairy product agrifood value chain in Brazil. In sub-Saharan Africa, South Asia and parts of Southeast Asia, this stage is emerging, but is not yet dominant. It has become dominant in most of Latin America and the Caribbean and in East Asia.

First, in terms of structure, modern agrifood value chains are generally spatially long, as the urban share is high. This has induced large "marketsheds" (that is, catchment areas supplying a market outlet) to feed cities. Even perishable products, such as poultry, dairy and vegetables, are by this stage produced far from cities and shipped frozen, chilled, packed and so on (Reardon, 2015). But, for some products, such as high-value leafy green vegetables, there has been an intensification of peri-urban production, for example with the rise of vertical farming and

[1] In agricultural economics and development economics, Bennett's law is well established. It observes that as incomes rise, people eat relatively fewer staples and relatively more non-staples, including some nutrient-dense foods (e.g. meats, fruits and vegetables) (Bennett, 1941). Bennett's law is related to Engel's law, which considers the relationship between rising household incomes and total food spending. Engel's law, also well established, is related to the observation that as family income increases, the percentage spent on food decreases; that spent on clothing, rent, heat and light remains the same; while that spent on education, health and recreation increases.

protected agriculture (such as in greenhouses and tunnels) near cities (for Asia, see Takeshima and Joshi [2019]).

By the modern stage, agrifood value chains have become intermediationally short with a trend toward "disintermediation", as supermarkets and large processors transact directly between themselves and, in some cases, buy directly from farms. At this stage, the right-hand side of the J-curve noted above has occurred, with substantial concentration, in all segments at least upstream and downstream from farms, and, in some countries, within the farm sector. The SMEs that remain stay competitive through product differentiation or a shield of high transaction costs (such as those in the hinterlands). Foreign direct investment (FDI) liberalization, which began in the transition stage, has by this stage caused the widespread multinationalization (the process in which a firm becomes a multinational enterprise) of a number of agrifood value chain segments (Barrett *et al.*, 2022; Reardon *et al.*, 2019). (See examples of this in the dairy sector from Poland [Dries and Swinnen, 2004], Argentina and Brazil [Farina *et al.*, 2005], India [Burkitbayeva, Janssen and Swinnen, 2023] and Uganda [Van Campenhout, Minten and Swinnen, 2021].)

The wholesale sector has evolved to be off-market (outside wholesale markets), with the rise of large logistics and wholesale firms. In the modern stage, the share of value added in post-harvest segments of agrifood value chains is large (around 90 percent in the United States of America) in long and complex value chains. The food service sector, such as fast-food chains, has increased to a substantial share of the food economy (from a tiny share in the traditional stage and a modest share in the transitional stage).

By the modern stage, the share of grains and other staples in the food economy is now small, about a quarter or less. Non-grain value chains and processed food agrifood value chains dominate the food sector.

In terms of conduct, by the modern stage, the bulk of the agrifood value chains is in a major shift from the commodity to the differentiated products phase of the product cycle. There is now substantial quality differentiation, and private standards for quality (and in some cases safety) have emerged to begin to eclipse public standards, such as occurred in the dairy sector in Brazil in the 1990s (Farina and Reardon, 2000; Swinnen and Maertens, 2007; Swinnen, 2007).

By the modern stage, technologies are largely capital intensive; that is, they are mechanized all along the agrifood value chains. Information-based systems, such as smart chips in packaging and logistics and drones in agriculture, have emerged. Spot market relations are relegated to some sectors, such as fruits and vegetables; but in meats, grains and dairy, contracts have come to dominate.

2.2 Drivers of rapid transformation of agrifood value chains in low- and middle-income countries

While the transformation from traditional to transitional to modern agrifood value chains took about 100 years in the United States of America and Western Europe, the other regions have made the step to the transitional stage in 20 years, and the frontrunners made the step to emerging modern agrifood value chains in 20 to 30 years. What is surprising is that, although the transformation in other regions has been similar to what happened in the United States of America, it was far faster, nearly abrupt. A fitting image is a tidal wave, which is a small ripple in

the ocean for a thousand miles then wells up as it comes to the continental shelf. That is the shape of the change in the rest of the world's food economy.

The main reason agrifood value chains changed so fast in LMICs was that there was a confluence of changes that were mutually reinforcing, magnifying and accelerating – a coevolution of the different pieces. These factors are explored in the next sections.

2.2.1 Meta conditioners

First, policy liberalization and privatization occurred during the 1980s to 2000s as part of a move away from administered food economies in countries that used to have mainly "command economies", such as China and Viet Nam. This policy liberalization also included the introduction of structural-adjustment programmes in most of the countries in Africa, Asia and Latin America and the Caribbean. Food procurement and distribution parastatals were largely privatized, and internal and external food trade was at least partially liberalized. This spurred the spread of SMEs as well as the entry of modern firms via both FDI and domestic investments. The latter led to the spread of large processors, supermarkets and fast food chains. FDI liberalization was particularly important as a key inducement to this process.

Second, public infrastructural investment encouraged the lengthening of value chains and transformation in midstream and downstream segments. Hard infrastructure encouraged the development of agrifood value chains. Combined with rising urban demand, infrastructural investment encouraged private investment by SMEs in the midstream of value chains – such as by teff millers, transporters and retailers in Ethiopia (Minten *et al.*, 2016). Small farmer access to markets is conditioned by infrastructure and distance to market. Barrett (2008) found the latter to be much more influential than macroeconomic and trade policies on small farmer participation in markets. Stifel, Minten and Koru (2016) show a doubling of commercial surplus for farmers connected to a market, compared to more remote farmers.

Third, as identified by Nakasone, Torero and Minten (2014), access to information has increased significantly with the widespread availability of mobile phones. It appears that has spurred the development of agrifood value chains. A large share of farmers in commercial areas interviewed in the study, ranging from a high of 97 percent in China to a low of 27 percent in Ethiopia, owned mobile phones at the time of the study (conducted in around 2010). Taking a simple average of crops and countries in Asia, the data show that almost a quarter of farmers in commercial zones had reached a price agreement in their last transaction by phone. For rice and potato value chains in Dhaka, rice chains in Beijing and potato chains in Delhi, almost all farmers who used phones contacted multiple traders before engaging in a transaction. Overall, 40 percent of staple suppliers in these rural–urban value chains had contacted multiple buyers by phone before their last transaction.

Fourth, income and population growth in the developing regions was crucial as a pull factor. Incomes rose, especially starting in the 1980s in Latin America and the Caribbean, and Asia (outside the transition countries – China, India and Viet Nam) and in the 1990s in Africa and in the Asian transition countries. Income growth, along with increasing opportunity cost of time, as women worked outside the home in urban and rural areas, led to diet and shopping changes.

Fifth, massive private investment was an important driver – itself encouraged and facilitated by the aforementioned policy and demand-side changes. Private investment came in two parallel waves. On the one hand, there was a rapid proliferation of SMEs that stepped into the void left by parastatals, with a large aggregate of many small investments along the value chain

encouraged by expanding urban markets. On the other hand, the policy changes also led to the entry of large-scale domestic and foreign firms, including processors and supermarket and fast food chains, as well as large input firms. The massive ingress of foreign companies was abetted by liberalization of the once-ubiquitous FDI regulations in the 1980s through the 2000s.

Last, but far from least, technology change was a major driver in LMICs, much of it transferred and adapted from technology innovations in developed countries. These changes occurred throughout the value chain, from the use of farm chemicals and new seeds and mechanization in the Green Revolution (starting in the 1960s and 1970s), to post-farmgate changes in processing, transport and storage technologies (Reardon *et al.*, 2019).

2.2.2 Downstream pull forces

Urbanization

Urbanization has advanced to the point where rural–urban food value chains dominate food markets in Asia, Latin America and the Caribbean, and Africa. The impacts of urban markets have transmitted out deeper and deeper into rural areas, and value chains have grown longer, spurred by urbanization and aided by the spread of rural wholesale markets, rural roads and rural electrical grids. This section describes the characteristics of urbanization relevant to agrifood value chain transformation, although only telegraphic points are made here as this subject has been covered by de Bruin and Holleman (2023).

The first characteristic is that there has been steady urbanization. Second, urban population shares underestimate the share of total food consumption and total food purchased in urban areas. This is because urban incomes sufficiently exceed rural incomes, which compensates for the higher-income urban consumers (per Engel's law) having lower shares of food in their total budgets. For example, in Eastern and Southern Africa, 25 percent of the population is urban, but this population consumes 48 percent of food produced and sold in the countries. In four countries in Asia (Bangladesh, Indonesia, Nepal and Viet Nam), Reardon *et al.* (2014) show that while 38 percent of the population is urban, 53 percent of the (purchased) food market is urban. Liverpool-Tasie *et al.* (2020) show, in various African countries, that the share of urban areas in food consumption also exceeds their share in the national population: in Nigeria, 58 percent versus 51 percent; in the United Republic of Tanzania, 46 percent versus 32 percent; in Uganda, 32 percent versus 23 percent; in Ethiopia, 35 percent versus 20 percent; and in Malawi, 23 percent versus 16 percent.

Third, while the urbanization debate tends to focus on mega cities (with populations over 1 million), a large share of the urban population resides in secondary and tertiary (smaller) cities and towns, comprising 50 percent of the urban population globally. Compared with mega cities, which source from around the country, smaller cities are more reliant on their surrounding rural areas for food (Berdegué, Proctor and Cazzuffi, 2014).

There are two major implications of the above points: 1) urban markets have become important markets for farmers; 2) urban market demand, especially for high-value, non-grain products, is transmitted to rural areas via rural–urban value chains.

However, the rural market – as a cash market – has expanded enormously over time, as rural households throughout the developing world have shifted from subsistence agriculture to relying heavily on purchases of food. This is important because it shows that not only urban areas are transforming, nor is urban transformation the only driver of agrifood value chain transformation

in these countries. For example, Liverpool-Tasie *et al.* (2020) show that in Ethiopia, Malawi, Nigeria, Uganda and the United Republic of Tanzania, the average share of purchases in rural household consumption (for all five countries) is 67 percent (78 percent in Nigeria). Faye *et al.* (2023) show that, in Senegal, 76 percent of rural household consumption of fruits and vegetables in rural zones both near to and far from cities, come from purchases (from long supply chains from several commercial horticulture areas). The aforementioned study by Reardon *et al.* (2014) of Nepal, Indonesia and Viet Nam shows that rural households purchased 73 percent of their food (in value terms). Reardon *et al.* (2020) show that 80 percent of rural food consumption in India is from purchases.

Diet change

Higher average incomes, combined with changing lifestyles and employment, are driving a dietary transition. While this is occurring in countries and regions at different speeds and with variations, it is happening around the world. This transition is characterized by changes in the types and quantities of food consumed, with diets shifting beyond traditional grains into dairy, fish, meat, vegetables and fruits, but also into consumption of more processed foods and convenience foods or food away from home. These changing preferences are reinforced by the greater diversity of both food products and places to buy food in urban food environments, ranging from supermarkets to informal markets, food street vendors and restaurants (Pingali *et al.*, 2019). The diet transition is also occurring in rural areas, though lagged and to a lesser extent compared to urban and peri-urban areas. New studies in the last two years (Dolislager *et al.*, 2022; Faye *et al.*, 2023; Sauer *et al.*, 2021), including the new micro-analysis presented in Chapter 3, underscore the extent of the diet transition across the rural–urban continuum and the absence of stark differences between urban and rural areas within countries analysed.

First, in terms of diet change as a downstream pull factor, in Africa, Asia and Latin America and the Caribbean, the diet has transformed from mainly home-produced foods to, increasingly, purchased foods. Even the rural poor are heavily engaged in the food market as buyers. (Research evidence for share of purchases for this point were noted in the previous section in the context of a rising rural market, and here as a characteristic of diet change.)

Second, there has been substantial diet diversification into processed foods with penetration first in urban areas, but also in rural areas. In Eastern and Southern Africa (Tschirley *et al.*, 2015), urban households dedicate 56 percent of food expenditure to processed foods, while rural households spend 29 percent on processed foods. In Asia, the share of food expenditure on processed foods is 73 percent among urban households and 60 percent among rural households (Reardon *et al.*, 2014).

Third, diets have diversified greatly beyond grains, with little difference between urban and rural households. In Eastern and Southern Africa, the share of non-grains in food expenditure was 66 percent in urban areas and 61 percent in rural areas. In Asia, the figures were 74 percent for urban areas and 63 percent for rural areas. The shares of particular product categories, such as fruits and vegetables, are surprisingly high. For example, in Senegal, 26 percent of total food consumption in urban areas and 17 percent in rural areas is in fruits and vegetables (Faye *et al.*, 2023), with similar shares in Asia.

Fourth, the middle class in Asia and Latin America and the Caribbean is increasingly demanding food quality and safety, in particular for semi-processed foods such as dairy and, to a certain extent, perishable foods (for Asia, see Pingali [2007]).

Fifth, diets remain basically domestic, with only a small share being imported: 80 to 90 percent of national food consumption is supplied by domestic value chains in Africa, Asia and Latin America and the Caribbean (Reardon *et al.* [2019] based on calculations from FAOSTAT Food Balance Sheets [FBS]).

Diet change is driven by a confluence of factors on the demand side. First, higher incomes drive a relative shift towards non-staples (per Bennett's law). However, that income increase is not only between poor and middle-class status. Dolislager *et al.* (2022) show for a number of countries in sub-Saharan Africa that sharp changes in diet occur over the segments of the poor, with the rate of change being steeper than between the poor and non-poor segments. Secondly, with urbanization, women are increasingly working outside the home, which increases the opportunity costs of time to shop for, process and prepare food. Furthermore, men are increasingly working far from home. These trends spur the purchase of processed foods and restaurant-prepared foods (for the United Republic of Tanzania, see Sauer *et al.* [2021], who showed this over rural zones from those near to cities to those far from cities).

Diet change has also been driven by three factors on the supply side: 1) the food processing sector has grown fast in the past several decades (discussed in Section 2.4.2); 2) agriculture has rapidly diversified beyond grains into horticulture, dairy, livestock, fish and pulses; 3) rural–urban food value chains have developed enormously to move these products to urban, as well as rural consumers. Haggblade (2011) calculated that African food value chain volumes increased six- to eightfold over the period 1970 to 2010, with most of the increase occurring in the past 20 years.

The implications are the following: 1) as diets are 80 to 90 percent "local", the transformation and performance of domestic food value chains are extremely important; 2) the rapid development of the non-grain and processed-food markets in urban and rural areas represents an opportunity for farmers, wholesalers and processors; 3) the rural poor depend to a great extent on food purchases and thus, as consumers, depend on well-performing food value chains.

2.3 Recent evidence of change in the structure, conduct and performance of agrifood value chains in low- and middle-income countries

Changes in the structure and conduct of agrifood value chains have occurred over the entire length of the chain, as well as at each segment: downstream, midstream and upstream. This section describes these changes.

2.3.1 Overall changes in agrifood value chains

One of the primary changes in agrifood value chains is that urbanization and better transportation infrastructure have induced spatial lengthening and removed the seasonality constraints of agrifood value chains, drawing from an increasingly broad market-catchment area to feed cities.

Second, there was an initial proliferation of traditional intermediaries, followed by a reduction of their numbers and, subsequently, by a rise of modern intermediaries: 1) traditionally, there were short agrifood value chains (with farms supplying local villages and towns); 2) with urbanization, the agrifood value chains grew longer and there was a proliferation of rural brokers and wholesalers, urban wholesalers, urban semi-wholesalers, transporters, warehouse firms and retailers – all small-scale firms; 3) as consolidation in processing and retail occurred, there has been a shift (faster in processed and semi-processed foods and slower in perishables) towards

the exit (or absorption) of small rural brokers and small processors (Reardon, 2015); 4) with the rise of supermarkets and food processors, "re-intermediation" has occurred, with the rise of dedicated/specialized wholesalers (see Reardon and Berdegué [2002] for Latin America; and Michelson *et al.* [2018] for China).

Third, organizational and institutional change has occurred in linkages between the segments of agrifood value chains, albeit at very different paces, depending on the product, the scale of the firm buying the product, and the country. Vertical coordination has begun, through de facto semi contractual relations, including, for instance, supplier lists in Central America (Berdegué *et al.*, 2005) and some formal (even if verbal) contracts. The latter are still limited, but the former appear to be spreading, especially among large companies. There is also a rise of private standards (Reardon *et al.*, 1999; Swinnen, 2007) specified in the contracts.

Moreover, a traditional method of intersegment linkage, tied to output-credit markets (Bardhan, 1980), wherein a trader advances funds to a farmer to support agricultural production costs and then receives his harvest at the end of the season, have declined substantially, as shown in Asia for rice and potato sectors (Reardon *et al.*, 2012) and in Africa generally (Adjognon, Liverpool-Tasie and Reardon, 2017).

2.3.2 Waves of diffusion of downstream and midstream transformation

Overview of waves of diffusion

Despite heterogeneous conditions, there is some regularity in "waves" of diffusion of downstream and midstream agrifood value chains transformation, over countries and within countries, over income classes, and over products, as described in the next paragraphs.

The first wave occurred in countries that began their post-World War II growth spurt, were urbanized and started industrializing earlier – in particular, countries in South America, East Asia (outside China) and South Africa. The start of their processing transformation began with FDI liberalization and the start of privatization began in the mid-1980s to early 1990s, while retail transformation took off from the early 1990s.

The second wave occurred in countries that experienced growth and urbanization spurts later or had prolonged internal sociopolitical pressure to limit FDI. In Mexico, Central America and Southeast Asia, processing transformation took off in the 1980s, while retail transformation did not start until the mid to late 1990s.

The third wave occurred in countries, such as in China, India, and Viet Nam, that experienced growth and urbanization spurts mainly in the 1990s and 2000s, and/or had lagged liberalization into the 1990s. Processing transformation occurred somewhat before retail, with the latter occurring mainly in the late 1990s and in the 2000s. There was also a late part of the third wave (or it could be considered a fourth wave), which was an incipient processing and retail transformation in Eastern and Southern Africa.

Downstream segment transformation: retail

Initially, the retail segment changed as the result of direct government action. Further change occurred with the relinquishing of government involvement and the rapid diffusion of private-sector supermarkets. The modern retailers themselves had several phases of change in their conduct, in particular the shift from traditional to modern procurement systems. The next paragraphs describe this process of change.

Governments themselves induced the first stage of retail transformation from traditional, fragmented retail to state-run chain stores. An example is the Fair Price Shops in India. (This was prior to liberalization and privatization in the 1990s/2000s, when most of the state chains were dismantled.)

Second, after the liberalization of retail FDI and the privatization of state retail, there was a huge surge in the 1990s and 2000s in private investment in supermarket chains in LMICs (Reardon *et al.*, 2003). The waves of diffusion emerged in the spatial pattern discussed above. The share of modern retail in overall food differs over the wave of diffusion, with the deepest penetration to date in the first-wave countries, where the share was nearly 50 percent by the late 1990s and 50 to 60 percent in the 2000s. In the second-wave countries, the share was about 30 to 50 percent by the 2000s, and in the third-wave countries, the share was around 10 to 30 percent (Reardon *et al.*, 2003). The fastest spread has occurred in the third-wave countries in Asia, where the supermarket sector is growing at 3 to 5 times the rate of gross domestic product per capita growth (Reardon, Timmer and Minten, 2012). Supermarket chains also grew at this rate in the 2000s in Latin America (Popkin and Reardon, 2018).

Third, within countries diffusion has rolled out: 1) from large cities to small cities and finally into rural towns, in adapted formats; 2) from upper to middle to poorer classes; and 3) from processed foods to semi-processed foods to fresh produce. These paths are essentially the same as those which occurred in the United States of America and in Western Europe.

Fourth, to become cost-competitive with traditional retail, supermarket chains have increasingly modernized their procurement systems. They have started to: 1) buy direct from processors, including under contracts; 2) specify private standards (in some cases); 3) use centralized procurement and logistics via distribution centres; 4) use specialized-dedicated wholesalers who distribute to their stores, as well as organizing procurement from suppliers according to volume, quality and timing specifications (Reardon and Berdegué, 2002). This process has advanced the furthest by far in processed foods, but has begun in fresh produce as well (see, for instance, Berdegué *et al.* [2005] for Central America).

Midstream segment transformation: processing

Similar and in parallel to the retail sector, the processing sector has transformed in structure and conduct. The processed foods sector has grown quickly in the past several decades. Packaged-food sales are growing at only 2 to 3 percent annually in developed countries, versus 13 percent, 28 percent and 7 percent in low-income and lower middle- and upper middle-income developing countries (Wilkinson and Rocha, 2009).

As in retail and wholesale, the first stage of transformation of food processing was driven mainly by governments setting up parastatals, especially in grains (and in export crops, such as rubber). However, the actual effect on agrifood value chains was limited, as the parastatal processors were confined primarily to grain sold to urban markets and there were large parallel markets (not via parastatals). This was followed by the second phase of transformation, which occurred along with rapid privatization in the late 1980s and 1990s. (Only a few countries still have substantial government food processing operations in the 2000s). The remaining changes, described in the next paragraphs, occurred from the late 1980s through today.

Privatization and liberalization, combined with urbanization and income increase, led to two phenomena referred to as the J-curve. On the one hand, especially from the 1990s until the present, there was a proliferation of SMEs in the processing of grain, dairy, meat, fish and

produce both to fill the gap left by the demise of public sector operations and to meet growing urban demand. This is the transitional stage of agrifood value chain transformation. Examples include SMEs processing teff, dairy, wheat and horticultural products in Brazil (Farina *et al.*, 2005; Farina, 1997); and grains, dairy, vegetables and fruits in Africa (Broutin and Bricas, 2006; Jaffee *et al.*, 2003; Reardon *et al.*, 2021; Rubey, 1995; Tschirley *et al.*, 2015; Jaffee and Morton, 1995).

On the other hand, privatization and FDI liberalization led to an avalanche of FDI from the United States of America and Western Europe, and then from Japan. The consequence was that foreign firms comprised a major share of the processing sector in a number of first and second wave countries by the end of the 1990s, and this trend has begun in third- and even fourth-wave countries in the 2000s. Regional multinationals, like Charoen Pokphand Group (Thailand) and Bimbo (Mexico), have also been buying domestic processors in their regions since the early 2000s (Wilkinson and Rocha, 2009). This has also begun in Africa, including, for instance, the 2015 purchase of Blue Ribbon (a large maize mill in Zimbabwe) by Bakhresa (a large Tanzanian wheat and maize mill) (see Reardon *et al.*, 2021) and the acquisition by Olam International (a large agribusiness group initially established in Nigeria) of several mills in West Africa. Large regional multinationals have also acquired large UK and US processors. An example is the 2014 acquisition by Shuanghui International (now WH Group, established in China) of the US processor, Smithfield Foods, which had been the largest pork processor in the world (Zhang, Rao and Wang, 2019).

This latter part of the J-curve is the modernization stage, during which consolidation occurs. For example, by the early 2000s, Nestlé had a 61 percent market share in Latin America for packaged foods (confections, soups, pet food, baby food, dairy and baked goods). The advantages large processing firms have over SME processors has largely driven this process. Larger processors often have: 1) economies of scale; 2) economies of scope; 3) bargaining power, monitoring capacity and capacity to provide resource-provision contracts; 4) access to cheaper credit; and 5) more efficient marketing systems (for instance, via distribution centres and logistics fleets). The latter has created something of a symbiosis between large-scale processors and supermarket chains, between processors and large logistic firms, and between supermarkets and processors and modern wholesale companies (Reardon and Zilberman, 2023).

In the modern stage, SMEs have found it difficult, especially in the medium term, to compete with large processors. An example is large tortilla firms displacing traditional women's tortilla firms in Mexico (Saavedra and Rello, 2007). The emerging penetration by modern retail into rural towns, selling branded processed foods at a discount, may accelerate this competition (Reardon, Stamoulis and Pingali, 2007). With health crises, consumers have also moved away from small processors and wet markets as a result of food safety concerns (for Thailand, see Posri, Shankar and Chadbunchachai [2006]).

Midstream segment transformation: wholesale and logistics

While governments played a major role in the development and transformation of wholesale food markets, the overall segment of wholesale and logistics underwent changes similar to that of processing: beginning with expansion, then fragmentation (following liberalization and privatization), and then concentration.

First, governments induced a first stage of wholesale transformation from traditional, fragmented wholesale to government-run wholesale markets (of private wholesalers). This shift created economies of agglomeration and, sometimes, economies of scale relative to the traditional fragmented wholesale sector, such as in Africa (Tollens, 1997). The large markets created by this investment are huge, such as Mexico City's wholesale food market, one of the largest wholesale food market in the world.[2] The value of marketing transaction in China's wholesale food markets increased from 11.4 billion yuan to more than 331 billion yuan (in real terms) between 1990 and 2000 (Ahmadi-Esfahani and Locke, 1998; Huang *et al.*, 2007). For a review of this wholesale sector evolution, see Reardon, Liverpool-Tasie and Minten [2021].

Second, the traditional wholesale sector appears to be restructuring presently in several ways. The public-sector wholesale market segment is consolidating in some countries over wholesale markets, such as in South Africa (Louw *et al.*, 2007), and over wholesalers within wholesale markets, such as in Mexico (Echánove and Reardon, 2006) and Peru (Escobal and Agreda, 1997). There is also evidence in some countries of a decline in the share of rural brokers upstream in the agrifood value chains, with the exit of village traders in Bangladesh, China and India in rice and potato (Reardon *et al.*, 2012). However, in the segment from rural towns to cities, it appears that SMEs in wholesale and logistics are proliferating (what Reardon *et al.* [2012] call the "Quiet Revolution in food value chains" that is being observed in Asia and, increasingly, in Africa).

Third, beyond the traditional wholesale sector, a modern wholesale sector is emerging, with the emergence of the specialized/dedicated modern wholesalers noted above, as well as large-scale foreign and domestic logistics firms. In some cases, large processors and retailers are buying direct from suppliers, most common with respect to procurement from processors (such as Carrefour buying from Nestlé).

Fourth, there has been rapid development and rise to importance of the third-party logistics (3PLS) sector as a lateral service value chain. This has been evidenced, for example, in the rise of cold storage SMEs in India (Minten *et al.*, 2014) and trucking SMEs serving maize traders in Nigeria (Liverpool-Tasie *et al.*, 2018).

[2] The Central de Abasto, located in the Iztapalapa borough of Mexico City, is the world's largest food wholesale market, covering 3.27 km^2 of land area, making it larger than the country of Monaco, and handling over 30 000 tonnes of merchandise each day (CEDA, 2021).

3 Micro view: household food consumption in sub-Saharan Africa with a rural–urban continuum lens

As highlighted in Chapter 2, new research suggests that the differences between urban and rural food demand may not be as acute as previously thought. However, this research does not provide an understanding of the magnitude of the differences in food demand across the full spectrum of the rural–urban continuum, nor an understanding of the location-related factors (for instance, where households live in relation to various points across the rural–urban continuum), and other household (such as socioeconomic) or food environment factors that may be driving these differences.

To help bridge this gap, this section presents an analysis of food demand, defined as household food consumption (at market value) across the rural–urban continuum in selected countries, applying the newly available geospatial URCA dataset (Cattaneo *et al.*, 2022). Data from 11 LSMS household surveys from sub-Saharan Africa dated between 2018 and 2020 were used to analyse household food consumption across the rural–urban continuum.

3.1 Data and methods

3.1.1 Rural–urban continuum

The FAO Urban Rural Catchment Areas (URCA) database, a newly available global geospatial database, is used to provide the mapping of the rural–urban continuum in the 11 sub-Saharan African countries studied. This global database places urban centres on a gradient based on population size and density, whereby city size is a proxy for the breadth of services and opportunities provided by an urban centre. It also adds a second dimension: rural locations are assigned a gradient of their own, using the shortest travel time to urban centres of various sizes as a proxy for the cost of accessing goods, services and employment opportunities (Figure 1).

Figure 1. Rural–urban continuum based on the Urban Rural Catchment Areas (URCA) dataset

Notes: The figure is a stylized representation of the URCA-defined rural–urban continuum which has a two-dimensional gradient. The size of the bubble roughly expresses population sizes based on the URCA dataset of global population distribution across the rural–urban continuum in 2015.

Source: Adapted from FAO. 2021. Global Urban Rural Catchment Areas (URCA) Grid – 2021. In: *FAO*. [Cited 12 June 2023]. https://data.apps.fao.org/?share=g-3c88219e20d55c7ce70c8b3b0459001a

Table 2. Rural–urban continuum defined by urban–rural catchment areas (URCAs) and applied in this paper

Applied in the analysis of this paper		Original URCA categories
General classification of urban, peri-urban and rural	**Rural–urban continuum (URCA)**	
Urban	Large city (>1 million people)	Large city (>5 million)
		Large city (1–5 million)
	Intermediate city (0.25–1 million people)	Intermediate city (500 000–1 million)
		Intermediate city (250 000–500 000)
	Small city (50–250 thousand people)	Small city (100 000–250 000)
		Small city (50 000–100 000)
	Town (20–50 thousand people)	Town (20 000–50 000)
Peri-urban	<1 hour to a large city	<1 hour to a large city (>5 million)
		<1 hour to a large city (1–5 million)
	<1 hour to an intermediate city	<1 hour to an intermediate city (500 000–1 million)
		<1 hour to an intermediate city (250 000–500 000)
	<1 hour to a small city	<1 hour to a small city (100 000–250 000)
		<1 hour to a small city (50 000–100 000)
Rural	<1 hour to a town	<1 hour to a town (20 000–50 000)
	1–2 hours to a city or town	1–2 hours to a large city (>5 million)
		1–2 hours to a large city (1–5 million)
		1–2 hours to an intermediate city (500 000–1 million)
		1–2 hours to an intermediate city (250 000–500 000)
		1–2 hours to a small city (100 000–250 000)
		1–2 hours to a small city (50 000–100 000)
		1–2 hours to a town (20 000–50 000)
	>2 hours to a city or town	2–3 hours to a large city (>5 million)
		2–3 hours to a large city (1–5 million)
		2–3 hours to an intermediate city (500 000–1 million)
		2–3 hours to an intermediate city (250 000–500 000)
		2–3 hours to a small city (100 000–250 000)
		2–3 hours to a small city (50 000–100 000)
		2–3 hours to a town (20 000– 50 000)
		Dispersed towns (>3 hours to any city)
		Hinterland (>3 hours to any city)

Source: Authors' own elaboration based on FAO. 2021. Global Urban Rural Catchment Areas (URCA) Grid – 2021. In: *FAO*. [Cited 12 June 2023]. https://data.apps.fao.org/?share=g-3c88219e20d55c7ce70c8b3b0459001a for original URCA categories.

The application of URCAs provides greater insight into the variance of food demand across urban and rural markets and helps consider the effects of urbanization. The URCA database georeferenced the globe to allow for a mapping of coordinates of latitude and longitude to urban areas of various sizes or the travel time to an urban area. Table 2 shows how the URCAs were further aggregated for the purposes of this paper.

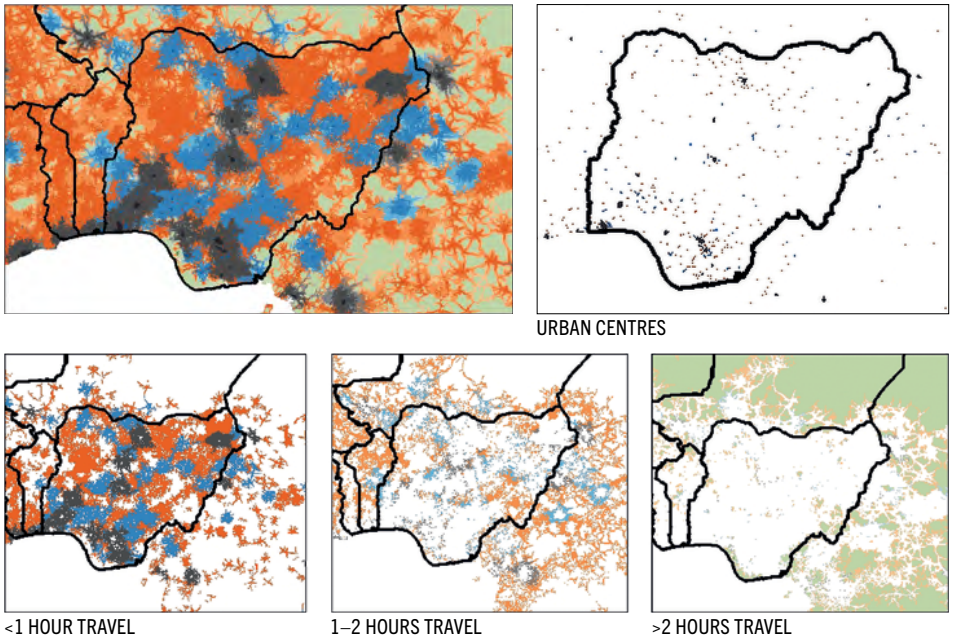
The URCA database is a raster dataset of 30 urban–rural catchment areas around cities and towns of different sizes. Each rural pixel is assigned to one defined travel time category: less than 1 hour, 1 to 2 hours, and 2 to 3 hours travel time to one of seven urban agglomeration sizes. The remaining pixels that are more than 3 hours away from any urban agglomeration of at least 20 000 people are considered either hinterland or dispersed towns, as they do not gravitate around any urban agglomeration (see Table 2).

Figure 2 shows mapping overlay of URCAs for two countries analysed in this chapter that represent two contrasting patterns of urbanization, one with dense metropolitan urbanization (Nigeria) and one with small city and town dispersed population (Burkina Faso). The maps provide a useful visual for unpacking the ten URCA categories (see Annex 1 for maps of other countries analysed).

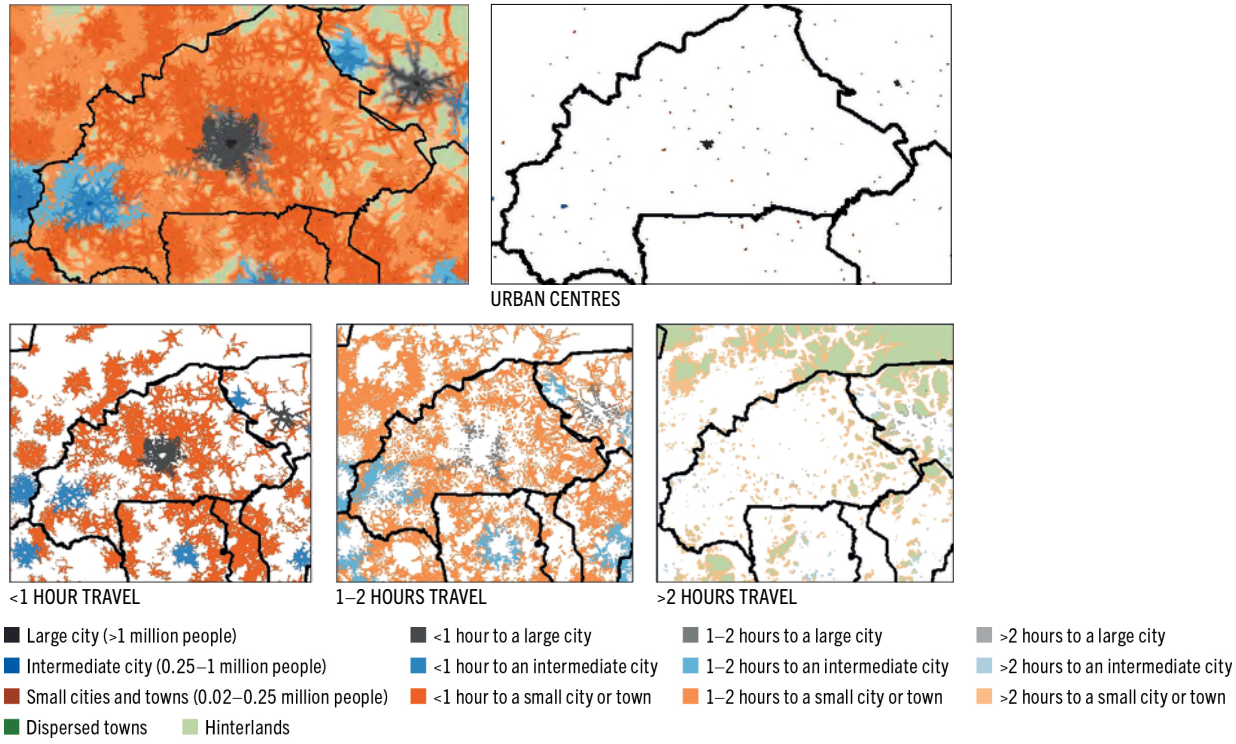
Finally, as shown in Table 2, the URCAs are used to identify urban, peri-urban and rural areas. Urban zones are population centres with populations greater than 20 000. Peri-urban areas include households within one hour of an urban centre, with populations above 50 000. Rural households are those that are further than one hour from any urban centre and households that are outside, but within one hour of, a town with a population below 50 000.

Figure 2. Two contrasting patterns of urbanization applying the rural–urban continuum (URCA)

a. Dense metropolitan urbanization pattern – Example Nigeria



b. Small city and town dispersed urbanization pattern – Example Burkina Faso



Notes: In panel A and B, the top left map displays all urban–rural catchments areas. The top right map shows only the three categories of urban centres (large, intermediate, and small city or town). The bottom left map displays areas 1 hour travel or less to any urban centre, corresponding to what are defined as peri-urban areas in Table 2. The bottom centre map displays areas 1 to 2 hours travel to any urban centre, and the bottom right map displays areas more than 2 hours travel to any urban centre. The bottom centre and bottom right maps correspond to what are defined as rural areas (see Table 2).

Source*:* Authors' own elaboration based on FAO. 2021. Global Urban Rural Catchment Areas (URCA) Grid – 2021. In: *FAO*. [Cited 12 June 2023]. https://data.apps.fao.org/?share=g-3c88219e20d55c7ce70c8b3b0459001a for URCA categories.

3.1.2 Household food consumption

In this paper, the URCA global geospatial dataset is mapped against latitudinal and longitudinal data of households from the most recent World Bank Living Standards Measurement Study (LSMS), making it possible to work with different categories of catchment areas across the rural–urban continuum. As an analysis of food demand across the URCA-defined rural–urban continuum, it is the first of its kind and provides insights on the importance of using a rural–urban continuum lens.

Trends of household food consumption were measured based on shares of consumed value of food aggregates in total value of food consumption. Food consumption was measured for three food aggregations: acquisition, commodity, and processing level. The acquisition aggregation has four aggregates: own production, food received as a gift or barter, purchases for consumption at home, and purchases for consumption away from home.

The commodity aggregation is based on the FAO Global Individual Food consumption data Tool (GIFT) aggregation (FAO, 2023a), where household-reported consumption is allocated based on the primary ingredient of the food item into one of 18 food aggregates. Table 3 shows food group aggregates used, along with their food group names, which are simplified for presentation purposes in the figures and tables of this report.

Table 3. Summary of food group aggregates and terminology of food groups used in this report

	Staple foods	Pulses, seeds and nuts	Animal-source foods	Vegetables	Fruits	Fats and oils	Sweets, condiments and beverages	Food away from home
Food item examples	Rice, wheat, maize, maize flour, sorghum, millet, bread, pasta, potato, cassava, taro, yam, plantains, other	Soybeans, groundnuts, cowpeas, sesame	Fresh milk, powdered milk, cheese, eggs, fish, shellfish, chicken, beef, pork, mutton	Cabbage, lettuce, tomato, okra, onion, melon	Mango, orange, papaya, sweet banana, avocados, apples, coconut	Palm oil, vegetable oil, cottonseed oil, butter	Pastries, cakes, biscuits, sweets, jams, sugars, salt, ginger, mayonnaise, beer, wine, water, soft drinks, coffee, tea, juices	Savoury snacks, full meals

Note: The following FAO/GIFT food group level aggregates have a negligible presence in the LSMS data: insects, grubs, and their products; foods for particular nutritional uses; food additives and composite dishes. The food demand analysis in uses a food grouping originally adapted from the FAO/WHO GIFT classification, but is further aggregated for presentation purposes.

Source: Authors' own elaboration.

The food processing aggregation is based on the NOVA classification definitions (Monteiro *et al.*, 2016, 2019). In the NOVA classification, foods are grouped based on level of processing, with four groups defined as: 1) unprocessed and minimally processed; 2) processed culinary ingredients; 3) processed foods; and 4) ultra-processed. In this paper, however, whereas as NOVA combines unprocessed and minimally processed foods into one category, here unprocessed foods are separated from minimally processed foods and is aggregated with the two other processed categories (processed culinary and processed foods). Furthermore, in this paper, NOVA's ultra-processed category is retained, but is instead referred to as "highly processed".

Table 4 shows the resulting modified NOVA processing aggregation that is applied in Section 3.3 of this paper, comprising three categories: 1) unprocessed; 2) low processed; and 3) highly processed. The only change made in this modified NOVA is to include "minimally processed" food items (such as milled flour and dried fruit) in the category of "low processed" foods. This modification is useful when considering how urbanization is affecting agrifood systems and food supply chains, because even minimally processed foods like milled flour can create significant nonfarm employment all along the food supply chains, as well as reducing the opportunity cost of women engaging in the workforce (thus positively affecting the affordability of a healthy diet). This related food supply employment is not restricted to highly processed foods, but also is related to the production of minimally, low and moderately processed foods, including flour and bread.

However, a second parallel analysis was undertaken applying the standard NOVA processing classification without the above-mentioned modification which follows the standard application of the NOVA aggregation, except that the NOVA categories of processed foods and processed culinary ingredients are combined into one category (see FAO [2015]). Note that in this application the NOVA categories of unprocessed and minimally processed foods are not presented. The results applying the standard NOVA processing classification are presented in

Annex 2 and are reported in detail in *The State of Food Security and Nutrition in the World 2023* (FAO *et al.*, 2023).

Table 4. Modified NOVA food processing aggregation used in Section 3.3 of this report

NOVA food group	Modified NOVA	Food items – examples				
1. Unprocessed and	**1. Unprocessed**	**Fresh/raw:** cereals, roots, tubers, plantains, pulses, seeds, nuts, animal proteins, vegetables, fruits	**Dried:** cereals (rice, maize, wheat, barley, millet, sorghum), pulses (groundnut, soybean, cowpea), tubers,	**Unsweetened drinks:** bottled water, milk (fresh)		
minimally processed	**2. Low processed**	**Dried:** vegetables, fruits	**Flour from starches:** wheat, maize, cassava	**Drinks:** tea, coffee, fruit juice, milk (fermented, tinned, powder)		
2. Processed culinary ingredients		**Fats and oils:** cooking oil, butter, margarine, ghee, shea butter, groundnut oil, coconut oil	**Seasonings:** spices, salt, sugars, honey			
3. Processed foods		**Pastes and purees:** groundnut, tomato, sesame	**Dried/smoked:** fish (including tinned)	**Flour-based goods:** bread, chapati, pasta	**Beer and wine**	
4. Ultra-processed	**3. Highly processed**	**Sweets and confectionary:** biscuits, cakes, pastries, jams	**Industrial products:** modern bread, breakfast cereals, infant formula	**Canned/ processed meats:** sausage	**Other drinks:** soft drinks, spirits	**Meals at restaurants**

Note: The modified NOVA include "minimally processed" food items (e.g. milled flour) in the category of "low processed" foods.

Source: Adapted from Monteiro, C., Cannon, G., Jaime, P., Canella, D., Louzada, M.L., Calixto, G., Machado, P. *et al.* 2016. Food classification. Public health NOVA. The star shines bright. *World Nutrition*, 7(1–3): 28–38. https://worldnutritionjournal.org/index.php/wn/article/view/5/4

Detailed data are required for analysis of household food consumption across the rural–urban continuum. The availability of georeferenced household survey data was a major limiting factor for selection of countries for this food demand analysis, as there are currently only a handful of LSMS datasets that have latitude and longitude information which is publicly available. All these datasets are for Africa; hence the analysis is limited to country case studies in that region.

The 11 LSMS household surveys that provided the necessary detailed data required and which are analysed are listed in Table 5. Each dataset that corresponds with these surveys includes coordinates for latitude and longitude that are used to map households to their respective URCA. The datasets also include detailed food consumption data that make it possible to aggregate food items into the previously mentioned food aggregates. A total of 78 754 households remain in these

data after households were removed that failed to report at-home food consumption or were unable to be mapped to an URCA due to missing spatial coordinates (Table 6).

Table 5. Household surveys selected for the demand analysis

Country	Year	Survey
Benin	2018/19	*Enquête Harmonisée sur le Conditions de Vie des Ménages* (Harmonized Survey on Households Living Standards)
Burkina Faso	2018/19	*Enquête Harmonisée sur le Conditions de Vie des Ménages* (Harmonized Survey on Households Living Standards)
Côte d'Ivoire	2018/19	*Enquête Harmonisée sur le Conditions de Vie des Ménages* (Harmonized Survey on Households Living Standards)
Ethiopia	2018/19	Socioeconomic Survey Panel II
Guinea-Bissau	2018/19	*Inquérito Harmonizado sobre as Condições de vide dos Agreagados Familiares* (Harmonized Survey on Households Living Standards)
Malawi	2019/20	Fifth Integrated Household Survey
Mali	2018/19	*Enquête Harmonisée sur le Conditions de Vie des Ménages* (Harmonized Survey on Households Living Standards)
Niger	2018/19	*Enquête Harmonisée sur le Conditions de Vie des Ménages* (Harmonized Survey on Households Living Standards)
Nigeria	2018/19	General Household Survey-Panel, Wave 4
Senegal	2018/19	*Enquête Harmonisée sur le Conditions de Vie des Ménages* (Harmonized Survey on Households Living Standards)
Togo	2018/19	*Enquête Harmonisée sur le Conditions de Vie des Ménages* (Harmonized Survey on Households Living Standards)

Source: Authors' own elaboration.

Table 6. Number of household observations by urban–rural catchment area

	Large city (>1 million people)	Intermediate city (0.25–1 million people)	Small city (50–250 thousand people)	Town (20–50 thousand people)	<1 hour to a large city	<1 hour to an intermediate city	<1 hour to a small city	<1 hour to a town	1–2 hours to a city or town	>2 hours to a city or town
Full sample	6 907	4 810	6 873	2 711	6 841	9 935	19 689	1 856	15 639	3 493
High-food-budget countries	3 806	2 029	3 702	1 442	3 390	3 991	8 377	1 215	6 986	1 154
Senegal	1 069	735	979	389	634	939	1 187	23	779	59
Ethiopia	695	500	822	151	358	940	1 757	58	743	411
Côte d'Ivoire	647	335	805	455	619	802	3 755	486	3 401	84
Mali	806	119	719	312	480	216	810	612	1 867	562
Nigeria	589	340	377	135	1 299	1 094	868	36	196	38

	Large city (>1 million people)	Intermediate city (0.25–1 million people)	Small city (50–250 thousand people)	Town (20–50 thousand people)	<1 hour to a large city	<1 hour to an intermediate city	<1 hour to a small city	<1 hour to a town	1–2 hours to a city or town	>2 hours to a city or town
Low-food-budget countries	3 101	2 781	3 171	1 269	3 451	5 944	11 312	641	8 653	2 339
Guinea-Bissau	n.a.	1 063	230	24	117	636	610	36	1 523	965
Benin	1 167	497	552	360	1 361	442	2 866	96	659	12
Togo	1 045	58	697	133	723	190	2 565	24	563	24
Burkina Faso	576	270	951	320	751	440	2 046	84	1 031	132
Malawi	n.a.	615	279	290	190	3 570	2 079	317	3 553	72
Niger	313	278	462	142	309	666	1 146	84	1 324	1 134

Notes: Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars. See Table 7 for breakdown of high- and low-food-budget countries. There are no large cities in Guinea-Bissau and Malawi that meet the population criteria of >1 million people, therefore, there are no values for this category (n.a. = not applicable).

Source: Authors' own elaboration.

Many of the LSMS datasets indicate quantity consumed of purchases, gifts and own production, but not values by acquisition type. The analysis reported here estimates shares of food consumption value; therefore, the non-reported values are estimated by multiplying the reported quantities by the revealed prices estimated by the quantities purchased and the spent value on that purchase.

Often, if a household received the item as a gift or produced it themselves, they did not also purchase the item. As such, in that case, the median of revealed prices from the smallest spatial unit that includes the household where there was a minimum of three observations of the same item unit combination was applied. Prior to identifying qualifying medians, the units were converted to as common a unit as possible for the item.

Data regarding purchased food that is consumed away from home (referred to as food away from home) did not have quantities, but values representing the food away from home were reported.

To account for outliers and data reporting errors, all per-adult equivalent quantities and values were Winsorized[3] at the 98 percent level (cuts at 1 and 99) before and after the non-reported value data were estimated.

In addition to analysing food consumption value patterns across URCAs, both countries and households were stratified by total household food expenditure (also termed "food budget"),

[3] Winsorization is the process of replacing a specified number of extreme values with a smaller data value. The sample mean is sensitive to extreme values, and Winsorization is a way to "robustify" the sample mean. To obtain the Winsorized mean, the smallest and largest k values of the sorted data are replaced by the (k+1) smallest and largest values. If the data are from a symmetric population, the Winsorized mean is a robust unbiased estimate of the population mean (Wicklin, 2017).

defined as the sum of purchases, home consumption of own production, and gifts and in-kind payments of food received.[4]

The 11 countries were classified into two groups according to their food budget, that is, the market value of the average total household food consumption per capita per day: high-food-budget countries (average 2.3 PPP dollars per capita per day) and low-food-budget countries (average 1.6 PPP dollars per capita per day). Table 7 shows a split between high-food-budget countries and low-food-budget countries delineated at USD 2.25 average per capita daily food consumption value. This stratification is done to test the hypothesis of whether countries of different average income, usually correlated with overall level of development, have different behaviours. Usually observed in the policy debates is the assumption that richer countries have undergone agrifood system transformation while poorer countries have not done so yet. This assumption is investigated in this section. See Table 6 for the total number of household observations by high- and low-food-budget countries and by urban–rural catchment area.

Table 8 shows, in addition, daily per capita food consumption values for all countries and country aggregates at the national, urban, peri-urban, rural and the ten URCA levels.

Table 7. Household food budgets, income levels and food consumption shares for high- and low-food-budget countries analysed

	Food budget	Income	Food consumption shares
	Total household food consumption	Total household expenditure	Household food consumption as a percentage of total household expenditure
	(PPP dollars per capita per day)		(%)
Full sample	2.19	3.88	56
High-food-budget countries	2.34	4.04	58
Senegal	2.57	6.10	42
Ethiopia	2.44	3.85	63
Côte d'Ivoire	2.29	5.04	45
Mali	2.29	4.54	50
Nigeria	2.26	3.81	59
Low-food-budget countries	1.62	3.29	49
Guinea-Bissau	2.06	4.38	47
Benin	2.00	4.41	45
Togo	1.69	4.12	41
Burkina Faso	1.57	3.70	42
Malawi	1.52	2.39	64
Niger	1.46	2.78	52

Notes: All surveys are 2018/19, except Malawi (2019/20). Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars.

Source: Authors' own elaboration.

[4] All monetary values are presented in purchasing-power-parity-adjusted constant 2017 international dollars.

Table 8. Total household food consumption

	Full sample	Urban households	Peri-urban households	Rural households	Large city (>1 million people)	Intermediate city (0.25–1 million people)	Small city (50–250 thousand people)	Town (20–50 thousand people)	<1 hour to a large city	<1 hour to an intermediate city	<1 hour to a small city	<1 hour to a town	1–2 hours to a city or town	>2 hours to a city or town
	(PPP dollars per capita per day)													
Full sample	2.19	2.97	1.99	1.72	3.07	2.77	3.23	2.33	2.47	1.84	1.81	1.75	1.75	1.59
High-food-budget countries	2.34	3.12	2.11	1.90	3.18	2.88	3.44	2.41	2.57	1.93	1.93	1.78	1.94	1.79
Senegal	2.57	3.16	1.97	1.79	3.45	2.82	2.75	2.32	2.18	1.76	1.98	1.67	1.80	1.70
Ethiopia	2.44	3.93	2.23	1.83	3.66	4.32	4.36	2.48	2.98	2.04	2.17	1.71	1.97	1.55
Côte d'Ivoire	2.29	2.65	2.12	2.12	2.91	2.31	2.46	2.29	2.38	2.14	2.05	2.08	2.13	2.07
Mali	2.29	3.07	2.20	1.83	3.19	2.63	2.94	3.04	2.48	2.57	2.01	1.83	1.78	2.31
Nigeria	2.26	2.84	2.03	1.99	3.04	2.44	3.08	2.32	2.51	1.85	1.52	1.59	1.88	3.80
Low-food-budget countries	1.62	2.34	1.45	1.33	2.56	2.35	2.08	1.93	1.63	1.43	1.40	1.63	1.34	1.22
Guinea-Bissau	2.06	2.53	1.97	1.71	n.a.	2.56	2.39	2.02	2.60	1.97	1.83	1.58	1.61	1.97
Benin	2.00	2.58	1.74	1.61	2.93	2.54	2.19	2.00	1.73	1.71	1.75	1.44	1.65	1.30
Togo	1.69	2.07	1.41	1.30	2.20	1.52	1.82	1.77	1.53	1.80	1.32	1.08	1.29	1.76
Burkina Faso	1.57	2.32	1.25	1.34	2.64	1.83	2.12	1.76	1.31	1.38	1.23	2.35	1.25	1.24
Malawi	1.52	2.57	1.40	1.39	n.a.	2.65	2.43	2.36	1.88	1.37	1.43	1.40	1.40	1.16
Niger	1.46	2.22	1.43	1.23	2.99	2.28	2.08	1.60	1.79	1.52	1.29	1.19	1.26	1.19

Notes: All surveys are 2018/19, except Malawi (2019/20). Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars. There are no large cities in Guinea-Bissau and Malawi the meet the population criteria of >1 million people, therefore, there are no values for this category (n.a. not applicable).

Source: Authors' own elaboration.

The analysis also explores food consumption value patterns by household income levels. Household income levels are calculated using terciles of total household expenditure per adult equivalent as proxy (that is, low-, middle- and high-income groups). The household total expenditure/income stratification is based on terciles of total expenditure (food and non-food) within each spatial classification. Therefore, it is possible that a household might be identified as a middle-expenditure-tercile household at the URCA, but as a high-expenditure-tercile household at the national level.

To estimate the marginal effects of the drivers of demand, augmented Engel curves with shares of food consumption value as the dependent variables were used (Banks, Blundell and Lewbel, 1997). Determinant variables included: URCA dummy variables (excluding towns with populations ranging from 20 000 to 50 000); total expenditure (log of annual per capita expenditure and the square of log of annual per capita expenditure); prices of food aggregates (estimated as Fisher price indices); non-farm employment (variables for both male and female full-time equivalents); household-head variables (age, completion of secondary education,

female, married); ownership of assets (automobile, motorcycle, bicycle, phone, hectares of cultivated land, tropical livestock units); and household composition (dependency ratio, household size).

To account for the high occurrence of corner solutions naturally occurring with consumption data over a one-week period, this model was estimated using a fractional probit method of estimation (Papke and Wooldridge, 1996, 2008).

3.2 Findings: purchases of food (for at-home and food away from home)

The data show that food purchases are a major source of food consumption across the rural–urban continuum, even among the rural poor. Figure 3 shows high levels of purchased food value in total food value consumed, not simply in urban areas, but across the rural–urban continuum. As expected, urban households average over 90 percent of purchased food of their consumed-food value (95 percent for large cities), but it is of note that almost every location analysed across the rural–urban continuum (URCA) has purchased shares above 50 percent. Food markets (and supply chains) are important to rural areas in both sets of countries. The lowest average share of purchased food value in total food value across the rural–urban continuum in any country is 38 percent observed in Malawi in very remote rural areas (2+ hours to a city or town).

Peri-urban households are purchasing approximately two-thirds or 66 percent of their consumed food value, and rural areas are purchasing around 56 percent of their food consumption. Senegal is an outlier, in that even the peri-urban and rural areas have purchased shares averaging above 80 percent. In Nigeria, purchase shares are 74 percent and 68 percent for peri-urban and rural areas respectively.

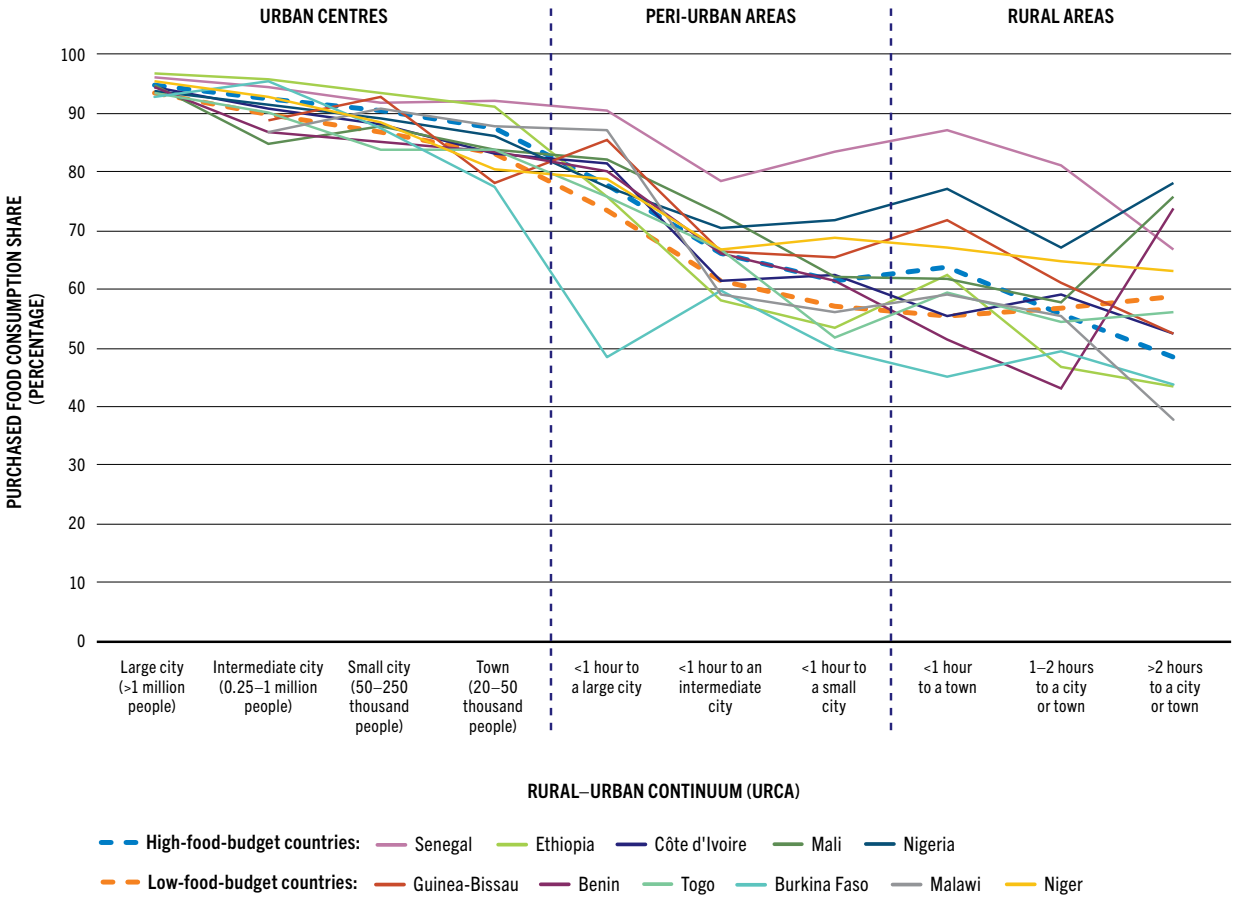
Although both outliers for higher purchases deeper in rural areas are in high-food-budget countries, overall, there is a lot of consistency across the two sets of nations, suggesting a convergence in their consumption patterns relative to the assumed distinct patterns between the two sets of countries.

Indeed, the diffusion of high levels of food purchases across the rural–urban continuum confirms that food markets and supply chains are important to rural areas in both high- and low-food-budget countries. Furthermore, the average food purchase share for populations living in rural areas is only slightly lower in high-food-budget countries (55 percent) than in low-food-budget countries (57 percent), indicating a convergence across different patterns of urbanization and income levels.

As expected, food purchase shares decline moving from urban to rural areas across the continuum. The decline is slightly steeper for low-food-budget countries moving from urban to peri-urban areas (32 percent decline, versus 27 percent in high-food-budget countries); whereas moving from peri-urban to rural areas the drop is significantly higher in high-food-budget countries (18 percent on average) than in low-food-budget countries (6 percent).

While this pattern over the rural–urban continuum applies on average, there are variations between countries depending on the density of urbanization patterns. For example, there is a notable increase in purchases in areas less than 1 hour from a town in Ethiopia, Guinea-Bissau, Nigeria, and Togo (Figure 3).

Figure 3. While high food purchases among households living in urban areas are expected, they are surprisingly high across the rural–urban continuum, even for rural households



Notes: The figure shows household food purchases as a percentage share of total household food consumption (at market value) across the rural–urban continuum (URCA) by country and high- and low-food-budget country group. URCA: Urban Rural Catchment Areas. Although URCA is a categorical variable, it is conceptualized as a spatial continuum, thus the use of a line graph, which also facilitates the presentation of the results. Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars.

Source: Authors' own elaboration.

Another striking finding is that, for four countries, there is an uptick in food purchases in the most remote rural areas (more than 2 hours travel to a city of any size). These countries are Mali and Nigeria (high-food-budget countries) and Benin and Togo (low-food-budget countries). This can be explained in several ways. First, farmers in remote areas tend to be poorer, meaning households often need purchases to "smooth consumption" or compensate for poor harvests. Second, in the farthest outlying rural areas (more than 2 hours travel to a city or town), local non-farm employment is scarce, as are services, and therefore households focus more on migration to bring in money, which can be used to buy food. This pattern affects both low- and high-food-budget countries.

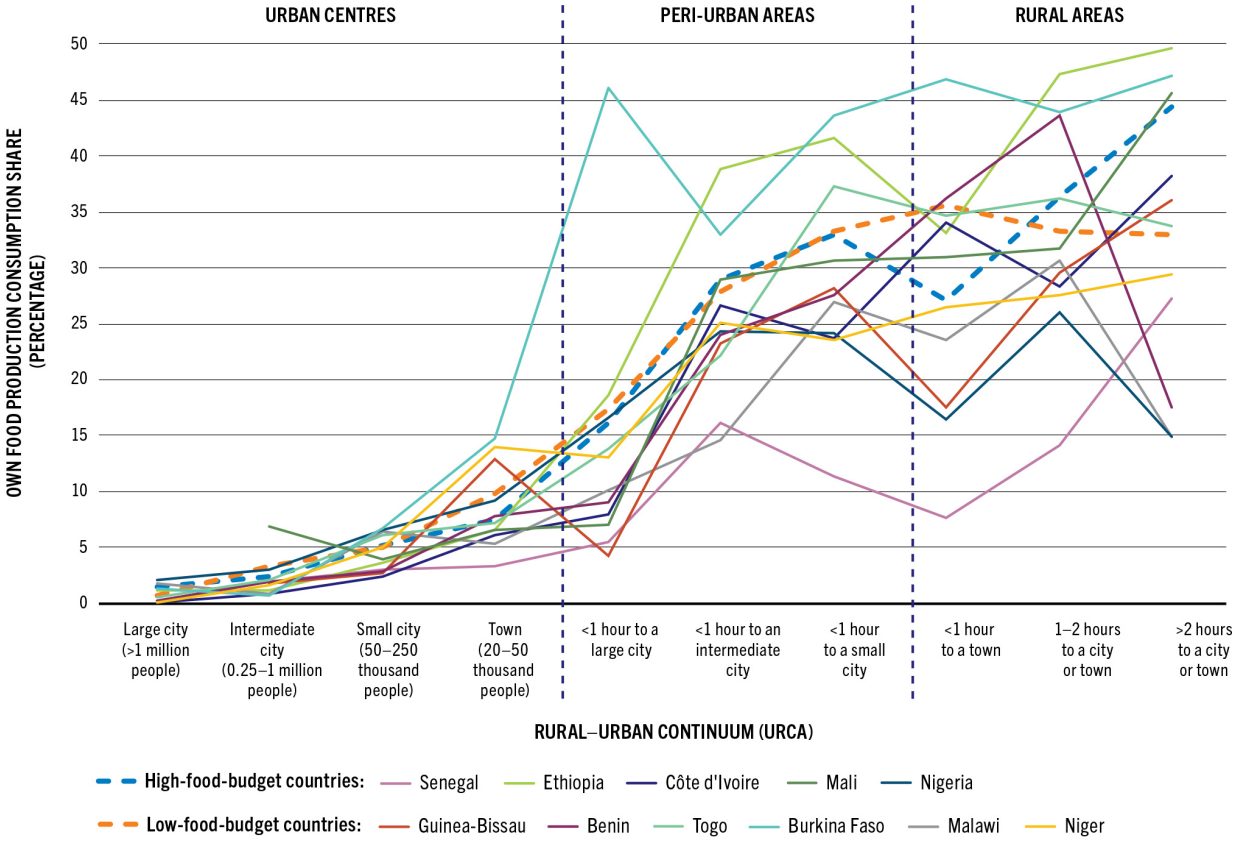
In any case, the finding that, in most of the countries analysed, the majority of household food consumption in rural households is coming from purchases (56 percent on average in the 11 countries analysed) is a major deviation from the traditional image of rural subsistence households.

Especially in the context of sub-Saharan Africa, there is a persistent view that households in rural areas are subsistence farmers who produce their own food, yet the analysis indicates that this does not hold true. Using market prices, the value of food consumption from own production is estimated; that is, the value that households would pay if they acquired the same quantity of that food from the market. Findings show that, moving from urban to rural areas across the continuum, food consumption shares of own production do indeed grow, with a sharp increase starting in areas less than 1 hour from a large city (Figure 4a). And yet, own production never becomes the main source for food – not even in rural areas. In rural areas, the average share of own production represents only 37 percent and 33 percent of total consumption in high- and low-food-budget countries, respectively. The shares range from 8 percent to 50 percent in high-food-budget countries, and from 18 percent to 47 percent in low-food-budget countries (Figure 4a).

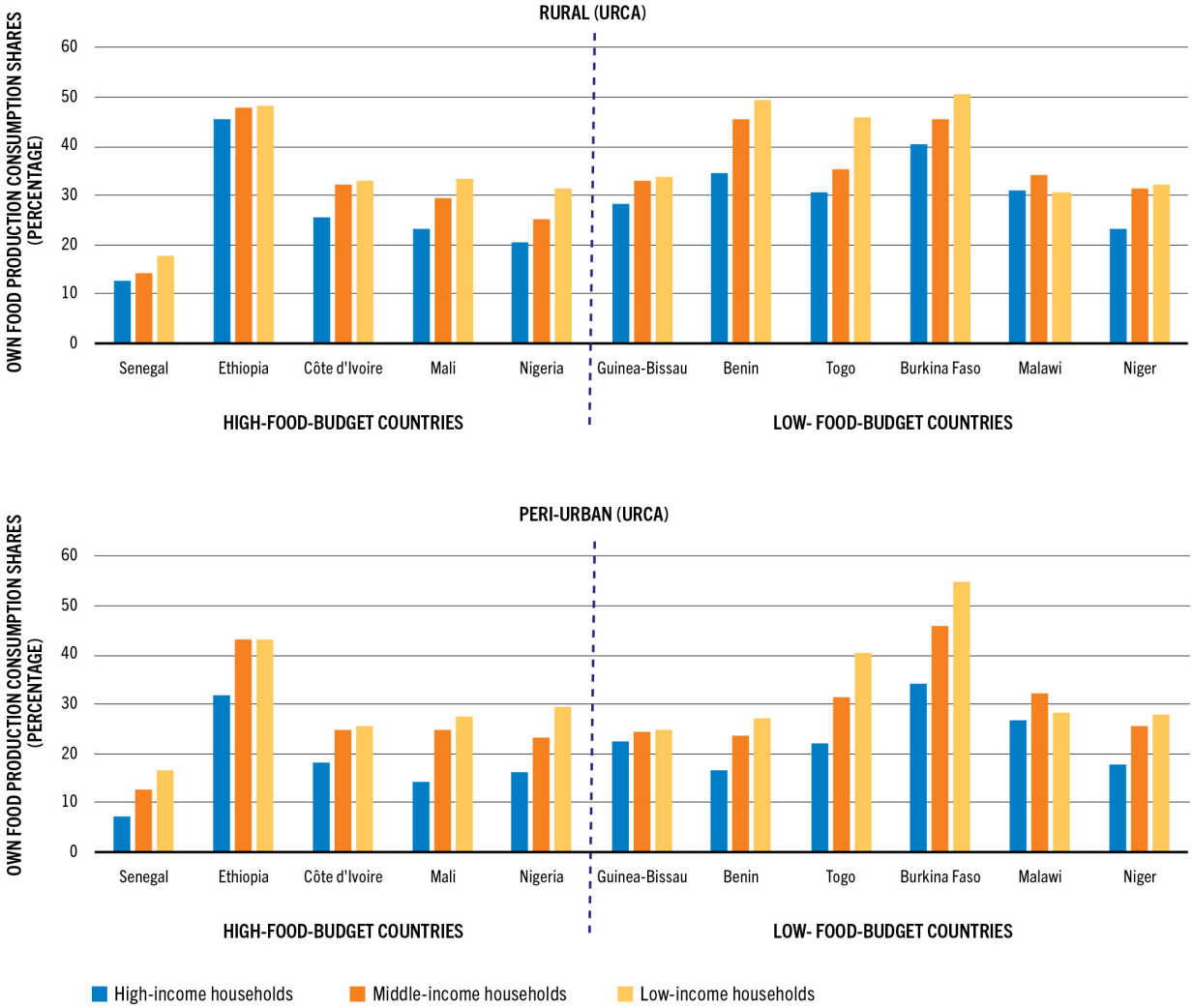
These surprising findings hold true even among poor rural households (Figure 4b), who obtain on average 40 percent and 36 percent of food consumption from own production in high- and low-food-budget countries, respectively. Furthermore, these shares of own production are not much higher than the shares found for poor peri-urban households (an average of 34 percent in both high- and low-food-budget countries). Given that rural households do not produce the majority of the food value they consume, their capacity to afford a healthy diet is a key factor to consider regarding their consumption of nutritious foods.

Figure 4. All households across the rural–urban continuum have food consumption shares from own food production that are less than 50 percent

a. Market-value-derived household food consumption shares from own food production – across the rural–urban continuum in selected countries in Africa



b. Market-value-derived household food consumption shares from own food production – for households living outside urban areas, by household income level in selected countries in Africa



Notes: The figures show household consumption from own production as a percentage share of total household food consumption (at market value) across the rural–urban continuum (URCA) (Figure 4a) and by rural and peri-urban area and household income group (Figure 4b). URCA: Urban Rural Catchment Areas. Although URCA is a categorical variable, it is conceptualized as a spatial continuum, thus the use of a line graph in Figure 4a, which also facilitates the presentation of the results. Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars.

Source: Authors' own elaboration.

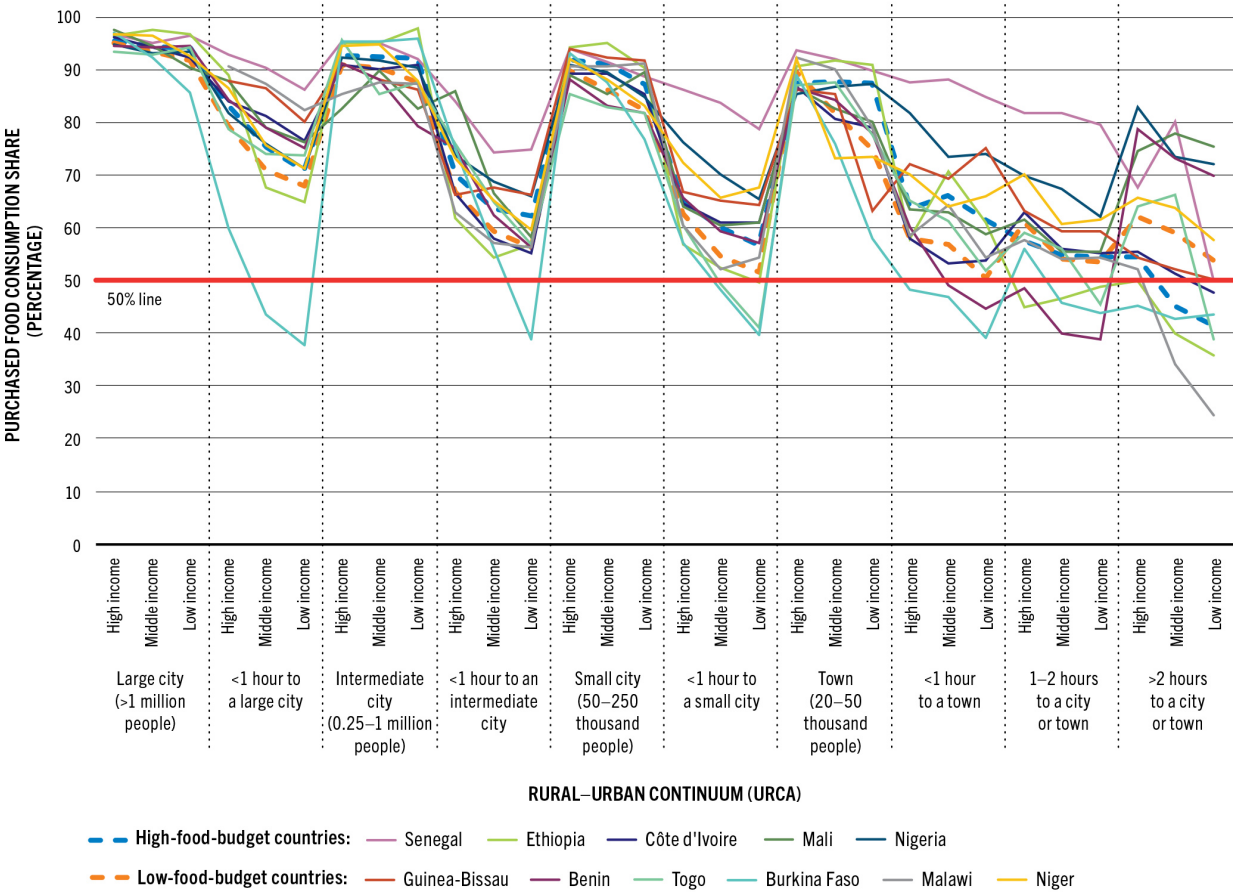
Dolislager *et al.* (2022) found that this adoption of purchases (including processed foods) is caused by the rural poor diversifying their income sources beyond farming so that they want to and can purchase more of their food (because of cash from off-farm jobs mainly).

Figure 5 shows purchased food consumption shares by household income terciles (high, middle and low) across URCAs. Here again there is a smooth transition along the rural–urban continuum.

Food purchase shares of low- and middle-income households are lower overall than the shares of high-income households across the rural–urban continuum (Figure 5). The differences are small in urban areas but become much bigger in peri-urban areas less than 1 hour from either

a large city or an intermediate city. This suggests that while these households still rely on food purchases, own food production is also important (Figure 4). The pattern holds for both high- and low-food-budget countries, although food purchase shares are slightly lower for the latter.

Figure 5. There is a marked drop in purchased food consumption shares for low- and middle-income households living in peri-urban areas, with levels similar to rural households in both high- and low-food-budget countries



Notes: The figure shows household food purchases as a percentage share of total household food consumption (at market value) across the rural–urban continuum (URCA) by household income group, country, and high- and low-food-budget country group. Income levels are calculated using terciles of total household expenditure per adult equivalent as proxy. URCA: Urban Rural Catchment Areas. Although URCA is a categorical variable, it is conceptualized as a spatial continuum, thus the use of a line graph, which also facilitates the presentation of the results. Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars.

Source: Authors' own elaboration.

In urban and rural areas, the dispersion of food purchase shares across household income groups is smaller than in peri-urban areas, indicating that household income is less of a factor driving food purchase shares for urban and rural households. The only exception is poor households in more remote rural areas (more than 2 hours travel to a city or town), whose food purchase shares are 31 percent and 15 percent less than high-income households in the same areas of high- and low-food-budget countries, respectively.

The descriptive analysis presented thus far is backed up by an econometric analysis that investigates the determinants of food purchase shares for the high- and low-food-budget countries. Determinants include location across the rural–urban continuum, household income,

non-farm employment, food prices, age, education, marital status and gender of the head of the household, household size, size of cultivated land, and ownership of assets and animal stocks. Note that while the focus is on non-price determinants, price variables are added as control variables to show the location effect across the rural–urban continuum. As expected, the marginal effect of own prices is statistically significant. Note that it is not surprising to see positive marginal effects for own prices on the determined variables, because the latter are shares, not levels. Table 9 shows the marginal effects of the determinants of purchased food value shares, with the following highlighted results.

First, in both sets of countries (ranked by high and low food budgets), the URCAs have effects that corroborate the descriptive findings: the farther from the large city, the lower the share of purchases in total food consumption. (Note that the differences are not abrupt and large but, rather, smooth, and continuous.) Second, the effect of income on the share of purchases is positive in both sets of countries (except for Ethiopia), with a somewhat higher effect in low-food-budget countries.

This can be interpreted as meaning that households start purchasing at lower incomes in the higher-income countries; that is, that transformation of diets in the form of purchasing has spread more into lower-income households. This coincides with the findings of Dolislager *et al.* (2021).

Third, in both sets of countries, more non-farm employment leads to a higher food purchase share. This is as expected, as non-farm income is the main source of cash income for rural households in Africa. This was found reliably (in all country cases) for male, rural non-farm employment. It is present, but less supported, for female employment in either budget country set, with a notable negative marginal effect in Guinea-Bissau.

Fourth, education, particularly secondary schooling, is correlated with a higher purchase share. This may reflect a variety of factors, such as greater opportunity cost of time (for home production) in the type of jobs held by those with more education.

Fifth, the household head being female has a strong, clear effect in high-budget countries, but not in lower. This could again be linked to opportunity cost of time for women in these households to both do their own farming and home-processing of food instead of buying food to free time for home chores and management.

Sixth, household size has a negative effect on purchases, with a similar effect in high- and low-food-budget countries. This is presumably because more own labour allows households to substitute for purchased food, such as in own processing and in own farming.

Seventh, the latter is reinforced with the expected negative effect of the size of cultivated land and owning animal stocks on food purchases.

Table 9. Non-price determinants of purchased food consumption shares (for home consumption and food away from home) in selected high- and low-food-budget countries

	Full sample	High-food-budget countries						Low-food-budget countries						
		All countries	Senegal	Ethiopia	Côte d'Ivoire	Mali	Nigeria	All countries	Guinea-Bissau	Benin	Togo	Burkina Faso	Malawi	Niger
Large city (>1 million people)	0.096***	0.095***	0.054***	0.162**	0.113***	0.066***	0.074***	0.118***		0.136***	0.098***	0.177***		0.131***
Intermediate city (0.25–1 million people)	0.047***		0.034***		0.074***		0.040**	0.080***	0.103***			0.235***	0.196***	0.102***
Small city (50–250 thousand people)					0.045***	0.046***		0.034**	0.169***	0.058***		0.136***	0.229***	0.065***
<1 hour to a large city	–0.103***	–0.115***	0.016**	–0.163***	–0.032**		–0.081***	–0.061***			–0.049***	–0.059***	0.256***	–0.002
<1 hour to an intermediate city	–0.143***	–0.151***	–0.040***	–0.101**	–0.123***		–0.109***	–0.116***	–0.059*	–0.042**	–0.101***		0.057**	–0.114***
<1 hour to a small city	–0.153***	–0.149***	–0.027***	–0.160***	–0.104***	–0.152***	–0.065***	–0.155***		–0.069***	–0.180***	–0.046***		–0.081***
<1 hour to a town	–0.146***	–0.135***			–0.165***	–0.160***		–0.177***						
1–2 hours to a city or town	–0.193***	–0.202***	–0.027**	–0.140***	–0.136***	–0.172***	–0.119***	–0.149***	–0.098***	–0.140***	–0.157***	–0.056***		–0.108***
>2 hours to a city or town	–0.194***	–0.215***		–0.142***		–0.044*		–0.149***	–0.139***			–0.118***		–0.129***
Total income (log of annual per capita expenditure)	0.025***	0.015***	0.019***	–0.038***		0.047***	0.051***	0.040***	0.037***	0.046***	0.049***	0.086***	0.020***	0.043***
Male full-time non-farm employment	0.044***	0.040***	0.009***	0.068***	0.051***	0.008*	0.032***	0.052***	0.015***	0.046***	0.044***	0.032***	0.045***	0.063***
Female full-time non-farm employment	0.021***	0.018***			0.023***		0.017***	0.028***	–0.013***	0.026***	0.011**	0.034***	0.078***	
Primary schooling of household head	0.020***	0.017***							0.018**	0.031***	0.011*			
Secondary schooling of household head	0.030***	0.028***	0.022***		0.037***	0.049***	0.015**				0.026***	0.039**		
Female-headed households	0.015***	0.019***	0.017***	0.022**	0.023***				0.028***	0.048***	0.023***		–0.037***	0.051***
Household size (adult equivalents)	–0.004***	–0.005***	–0.002***	–0.024***	–0.011***		–0.004**	–0.005***		–0.007***	–0.008***	–0.007***	–0.004**	–0.006***
Dependency ratio				–0.037*	–0.022**		0.021*			0.042***				
Cultivated land (ha)	–0.015***	–0.029***	–0.005**	–0.079***	–0.015***	–0.034***	–0.035***	–0.006***	–0.001*	–0.002*	–0.026***	–0.028***	–0.173***	–0.017***
Tropical livestock units	–0.017***	–0.014***		–0.020***		–0.005**		–0.015***	–0.022***	–0.011***	–0.014***	–0.009***	–0.099***	–0.008**

Notes: Regressions of the share of food purchases (for home consumption and food away from home) in total food consumption (at market value): marginal effects; significant results only (at 10 percent or lower); statistical significance is reported for *** p<0.01, **p<0.05, *p<0.1. As the focus is on non-price determinants, the marginal effects of prices and home assets are not shown. All surveys are 2018/19, except Malawi (2019/20). See Table 5 for the list of 11 Western, Eastern and Southern African countries, and Table 7 for the definition of high- and low-food-budget countries. Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars.

Source: Authors' own elaboration.

3.3 Findings: consumption of processed foods

From the perspective of understanding the effect of urbanization on food supply and value-added chains, as well as the employment generated by this agrifood system sector, it is important to look at the extent to which food demand for purchased processed foods varies across the rural–urban continuum.

In sub-Saharan Africa (SSA), there has been a 50-year evolution of consumption of processed and food away from home (Reardon *et al.*, 2021). On the demand side, increasing numbers of women working outside the home in both urban and rural areas and men increasingly commuting to urban jobs and to off-farm jobs in rural areas that influence the opportunity cost of time have driven the rise of processed food consumption. This has led first to a shift from home processing, for example, hand-pounding grain, to purchasing low processed products like milled grain and oil, and highly processed products, like traditional fritters, and then packaged foods, like cookies and bread. More recently, this trend has accelerated with a surge on the supply side of the processing sector and small and medium enterprises (SMEs) and large private companies making massive aggregate investments (Reardon *et al.*, 2021). Packaged, industrialized, highly processed foods and sugar-sweetened beverages (SSBs) are a growing proportion of the processed foods consumed.

While processed foods, especially highly processed foods that are energy-dense and high in fat, sugar and/or salt, can contribute to overweight and obesity, as well as NCDs, in general processed foods are a major and growing source of employment along the rural–urban continuum. Recent studies in Africa show that the growth in the food supply chains of the processing sector (processing, wholesale, transport and retail) is a major source of employment along the rural–urban continuum, especially for women and youth (Dolislager *et al.*, 2021). Latest estimates indicate that 20 percent of rural employment and 25 percent of urban employment are in agrifood system jobs, such as wholesale and processing (Dolislager *et al.*, 2021). Thus, examining the demand of processed purchased foods (low and highly processed) and food away from home also provides insights regarding how urbanization and changing food demand is affecting food supply chains across the rural–urban continuum.

In the analysis that follows, given the focus is on how urbanization is affecting agrifood systems and food supply chains, a modified NOVA food processing aggregation is used to classify all food items by level of food processing into two categories, namely “low processed” and “highly processed” (see Table 4 in Section 3.1). This modified NOVA food processing aggregation includes minimally process foods in the category of low processed foods, thus allowing the analysis to consider all low processed foods, even minimally processed foods like milled flour, as these foods can create opportunities for non-farm employment all along the food supply chains. (For results applying the standard NOVA classification, see Annex 2.) In addition to these two categories, food away from home was made a separate, single category of processed foods, because there is insufficient information to identify the extent of processing for all items involved, and it is therefore not possible to accurately categorize such food. Total processed foods in the analysis below therefore includes three categories: low processed foods, highly processed foods and food away from home.

The findings show that, as with purchased food, total processed food consumption (including low processed foods, highly processed foods and food away from home) is occurring across the entire rural–urban continuum (URCA). Table 10 shows how total processed food consumption comprises over a third of the total food consumption value in the entire sample (approximately 45 percent of urban food value, 34 percent of peri-urban food value and 31 percent of rural food value).

Table 10. Consumption shares of processed foods to total food consumption value by high- and low-food-budget countries across the rural–urban continuum (URCA)

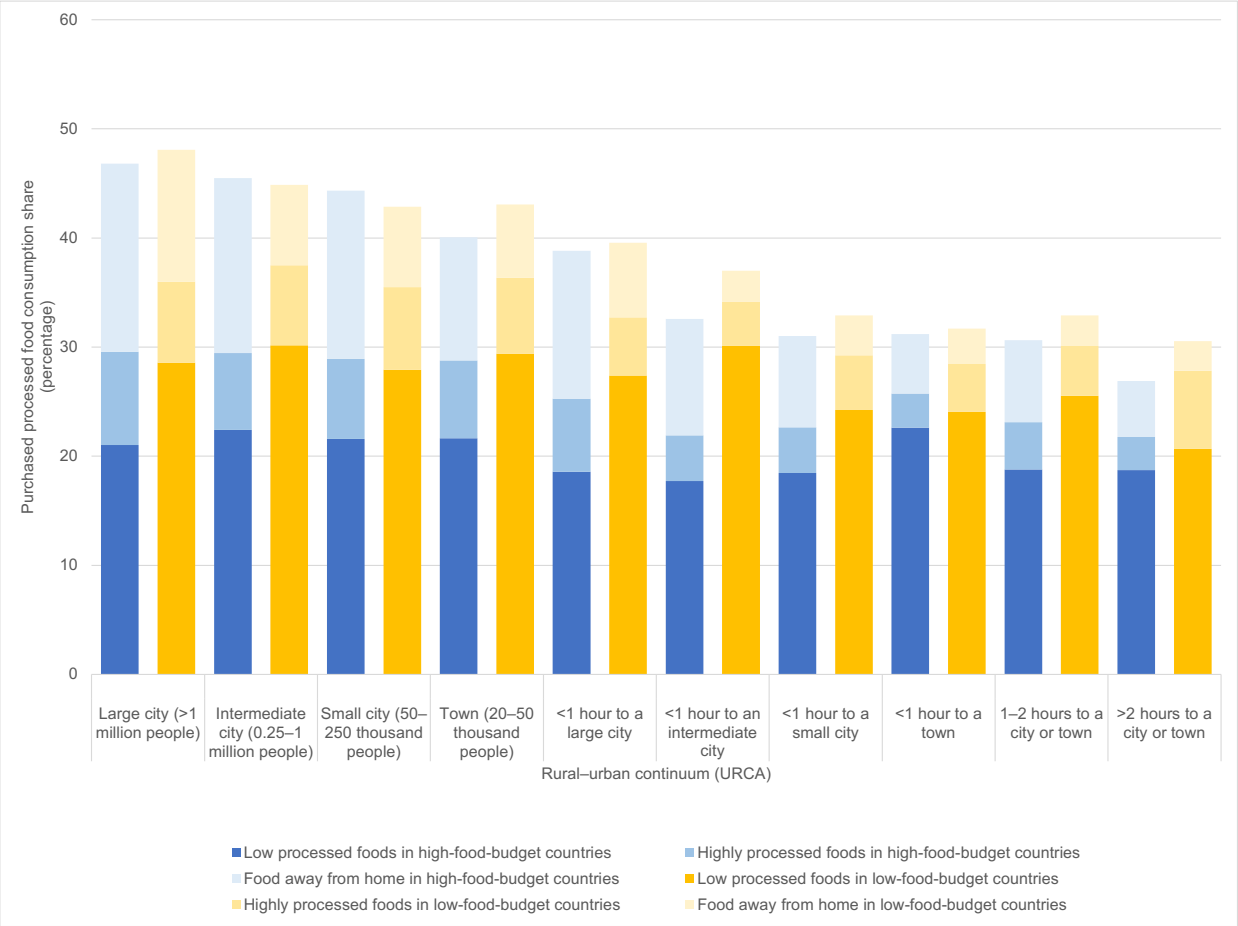
Modified - NOVA	National	Urban	Peri-urban	Rural	Large city (>1 million people)	Intermediate city (0.25–1 million people)	Small city (50–250 thousand people)	Town (20–50 thousand people)	<1 hour to a large city	<1 hour to an intermediate city	<1 hour to a small city	<1 hour to a town	1–2 hours to a city or town	>2 hours to a city or town
	(%)	(%)			(%)									
Full sample	36	45	34	31	47	45	44	41	39	33	31	31	31	28
High-food-budget countries	36	45	34	30	47	45	44	40	39	33	31	31	31	27
Senegal	46	49	44	45	50	48	46	47	48	40	44	53	45	36
Ethiopia	29	40	27	25	39	44	41	32	30	26	26	24	25	25
Côte d'Ivoire	38	44	36	32	44	44	44	42	43	33	35	30	33	32
Mali	37	38	37	36	38	38	37	39	40	40	35	38	35	36
Nigeria	40	48	37	36	51	46	47	44	40	36	36	31	36	39
Low-food-budget countries	37	46	35	32	48	45	43	43	40	37	33	32	33	31
Guinea-Bissau	32	41	27	26	n.a.	41	38	33	37	26	26	27	26	27
Benin	38	45	37	26	46	46	43	44	43	34	34	30	25	28
Togo	43	52	38	34	53	52	48	48	47	39	33	38	34	31
Burkina Faso	33	44	29	29	45	46	41	39	27	35	29	25	30	30
Malawi	40	48	40	38	n.a.	48	48	50	48	40	38	38	38	26
Niger	32	39	31	31	43	38	39	36	33	30	32	33	30	31

Notes: The table shows processed food consumption (including low processed foods, highly processed foods and food away from home) as a percentage share of total household food consumption (at market value), for high- and low-food-budget countries across the rural–urban continuum (URCA). The classification of food items by level of food processing uses a modified NOVA food processing classification system (see Table 4). For an analysis applying a standard NOVA food classification system, see Annex 2. Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars.

Source: Authors' own elaboration.

There is very little difference between high-food-budget countries and low-food-budget countries when comparing total processed food consumption (Figure 6). However, differences appear with a disaggregated view, by level of processing.

Figure 6. Comparison of consumption shares of processed foods to total food consumption value by level of processing in high- and low-food-budget countries across the rural–urban continuum (URCA)



Notes: The figure shows household food consumption of processed foods (low processed foods, highly processed foods and food away from home) as a percentage share of total household food consumption (at market value) across the rural–urban continuum (URCA). All surveys are for 2018/19, except Malawi (2019/20). The classification of food items by level of food processing uses a modified NOVA food classification system (see Table 4). For an analysis applying a standard NOVA food classification system, see Annex 2.

Source: Authors' own elaboration.

Table 11 and Figure 7 show the food value shares of the three subcategories of processed foods, (low processed foods, highly processed foods and food away from home). This table shows similar patterns of consumption of highly processed foods across the country types, but we see that high-food-budget countries consume greater shares of food away from home and lower shares of low processed foods than the low-food-budget countries.

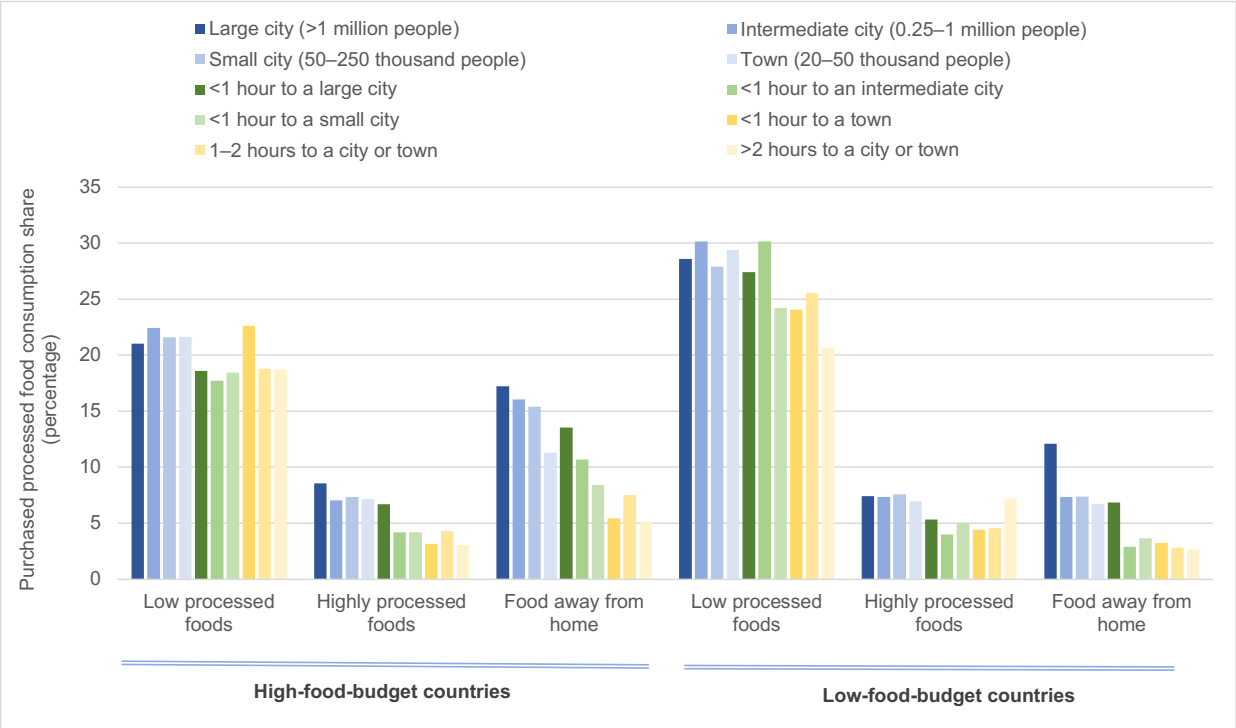
Table 11. Consumption shares of processed foods to total food consumption value by level of processing and by high- and low-food-budget countries across the rural–urban continuum (URCA)

Modified NOVA		National	Urban	Peri-urban	Rural	Large city (>1 million people)	Intermediate city (0.25–1 million people)	Small city (50–250 thousand people)	Town (20–50 thousand people)	<1 hour to a large city	<1 hour to an intermediate city	<1 hour to a small city	<1 hour to a town	1–2 hours to a city or town	>2 hours to a city or town
		(%)	(%)			(%)									
Full sample	Low processed	21	23	20	21	23	24	23	24	20	20	20	23	22	20
	Highly processed	5	8	4	4	8	7	7	6	7	4	4	4	4	4
	Food away from home	10	15	9	6	16	14	14	10	13	9	7	5	6	4
High-food-budget countries	Low processed	20	22	19	20	21	22	22	23	19	18	19	22	20	20
	Highly processed	5	8	4	3	9	7	7	6	7	4	3	3	3	2
	Food away from home	11	16	11	7	17	16	15	11	14	11	8	5	8	5
Low-food-budget countries	Low processed	27	29	27	25	29	30	28	29	27	30	24	24	26	21
	Highly processed	5	7	5	5	7	7	8	7	5	4	5	4	5	7
	Food away from home	5	9	4	3	12	7	7	7	7	3	4	3	3	3

Notes: The table shows processed food consumption as a percentage share of total household food consumption (at market value), by level of food processing (low processed, highly processed and food away from home) for high- and low-food-budget countries across the rural–urban continuum (URCA). The classification of food items by level of food processing uses a modified NOVA food classification system (see Table 4). For an analysis applying a standard NOVA food classification system, see Annex 2.

Source: Authors' own elaboration.

Figure 7. Composition of consumption shares of processed foods to total food consumption value by level of processing in high- and low-food budget countries across the rural–urban continuum (URCA)



Notes: The figure shows the composition of household food consumption of processed foods (low processed foods, highly processed foods and food away from home) as a percentage share of total household food consumption (at market value) across the rural–urban continuum (URCA). All surveys are for 2018/19, except Malawi (2019/20). The classification of food items by level of food processing uses a modified NOVA food classification system (see Table 4). For an analysis applying a standard NOVA food classification system, see Annex 2.

Source: Authors' own elaboration.

The share of low processed foods in total food consumption is strongly negatively correlated with total food budget levels; that is, the lower the food budget, the higher the share of low processed foods (Figure 7). As can be seen, low processed foods dominate in low-budget countries. The explanation is that when families start buying processed foods, they buy low processed items, like flour, that save women time they would otherwise have to spend in hand processing grains. As they get more income, and highly processed foods and pre-prepared food service foods become more accessible and abundant, households add highly processed and prepared foods (also usually highly processed foods) to their purchases.

The results also show that highly processed foods and prepared purchases (food away from home) shares in total processed foods are strongly positively correlated with total food budget levels and urban areas; that is, the higher the food budget and the more urban, the higher the share of highly processed foods and food away from home in total consumption value.

While highly processed foods are a small portion of total processed food consumption in both high- and low-food-budget countries, it is surprising that they are spread across the rural–urban continuum, even in rural areas 1–2 hours from a city or town. It is as expected that urban areas have approximately twice the consumption of highly processed foods than rural areas, particularly in high-food-budget countries. There appears to be a kink or drop in the consumption pattern of highly processed foods in the rural–urban continuum, especially in high-food-budget

countries, between the URCAs less than 1 hour from a large city and less than 1 hour from an intermediate city. This is the same URCA transition point along the rural–urban continuum where there is a kink in purchased food.

Table 12 shows processed food consumption shares by household income terciles (high, middle and low) by urban, peri-urban and rural areas and by country. These results again show the reach of markets into poor rural areas, as low-income households in rural areas consume on average 29 percent of the food value in the form of processed foods.

Table 12. Consumption shares of processed foods to total food consumption value by level of processing, by household income level and across the rural–urban continuum (URCA)

	National				Urban				Peri-urban				Rural			
	National	Low income	Middle income	High income	Urban	Low income	Middle income	High income	Peri-urban	Low income	Middle income	High income	Rural	Low income	Middle income	High income
	(%)				(%)				(%)				(%)			
Full sample	36	31	34	40	45	42	44	48	34	31	32	37	31	29	30	32
High-food-budget countries	36	30	34	41	45	41	44	49	34	30	31	37	30	28	29	32
Senegal	46	43	48	47	49	51	49	47	44	40	44	47	45	45	46	44
Ethiopia	29	24	26	33	40	36	37	44	27	24	25	29	25	23	24	27
Côte d'Ivoire	38	35	36	40	44	43	44	44	36	34	35	37	32	31	31	34
Mali	37	34	36	39	38	36	39	39	37	34	36	39	36	34	36	38
Nigeria	40	33	37	45	48	42	46	52	37	33	35	41	36	32	37	38
Low-food-budget countries	37	34	35	39	46	46	45	46	35	35	34	36	32	32	31	33
Guinea-Bissau	32	24	30	37	41	38	40	43	27	22	27	31	26	21	24	31
Benin	38	35	37	41	45	46	43	45	37	36	36	38	26	22	24	29
Togo	43	37	43	48	52	53	52	50	38	33	37	41	34	29	35	36
Burkina Faso	33	26	31	40	44	39	45	46	29	24	29	33	29	28	29	31
Malawi	40	43	38	39	48	54	47	44	40	44	38	37	38	42	37	36
Niger	32	30	31	34	39	37	38	40	31	30	31	32	31	29	29	32

Notes: The table shows processed food consumption (including low processed foods, highly processed foods and food away from home) as a percentage share of total household food consumption (at market value) across the rural–urban continuum (URCA) by household income group, country and high- and low-food-budget country group. Household income levels (low, middle and high) are calculated using terciles of total household expenditure per adult equivalent as proxy. URCA: Urban Rural Catchment Areas. The classification of food items by level of food processing uses a modified NOVA food classification system (see Table 4). For an analysis applying a standard NOVA food classification system see Annex 2. Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars.

Source: Authors' own elaboration.

Table 13. The non-price determinants of consumption shares of highly processed foods in selected high- and low-food budget countries in Africa

	Full sample	High-food-budget countries						Low-food-budget countries						
		All countries	Senegal	Ethiopia	Côte d'Ivoire	Mali	Nigeria	All countries	Guinea-Bissau	Benin	Togo	Burkina Faso	Malawi	Niger
Large city (>1 million people)			0.010**		0.011**	0.015***				0.013***		0.028***		
Intermediate city (0.25–1 million people)									0.030***			0.017**		
Small city (50–250 thousand people)					0.011***	0.008*			0.034**	0.015***		0.023***		
<1 hour to a large city			0.017**					–0.009***		0.007*	–0.008**	0.009**		–0.014***
<1 hour to an intermediate city	–0.011***	–0.010***	–0.024***					–0.013***		–0.009***			–0.007**	–0.022***
<1 hour to a small city	–0.007***	–0.007**				–0.008**		–0.006**				0.010***	–0.011***	–0.009**
<1 hour to a town	–0.015***	–0.013***			–0.011***	–0.010**		–0.012***					–0.010***	
1–2 hours to a city or town	–0.006**	–0.007**	–0.020***		–0.005*	–0.014***		–0.007***				0.012***	–0.010***	–0.020***
>2 hours to a city or town		–0.014***			0	–0.023***		0.019***	0.021**					–0.010**
Total income (log of annual per capita expenditure)	0.015***	0.015***	–0.006*	0.011***	0.009***	0.017***	0.004**	0.019***	0.046***	0.015***	0.006***	0.015***	0.028***	
Male full-time non-farm employment	0.005***	0.005***	0.003***	0.008***	0.005***	0.002**		0.004***		0.004***		0.003**	0.006***	0.005***
Female full-time non-farm employment	0.003***	0.004***	0.005***			0.002**	0.002**				0.002**		0.005***	0.007***
Primary schooling of household head	0.004***	0.006***	0.012***					–0.003**			–0.009***		0.004**	
Secondary schooling of household head	–0.004***	–0.004**												
Female-headed households	0.005***	0.007***	0.016***	0.005*	0.004*	0.006**	0.005**	–0.004***		0.007***			–0.008***	
Household size (adult equivalents)	–0.000*		–0.001*		–0.003***		–0.003***	0.000**	0.002***	–0.001*		–0.001***	0.003***	–0.003***
Dependency ratio	0.013***	0.012***	0.023***		0.009**	0.018***	0.012***	0.014***	0.028***	0.017***	0.006*	0.015***	0.007**	
Cultivated land (ha)	0.002***	0.003***	–0.005**		–0.001**							–0.005***	–0.009**	
Tropical Livestock Units	–0.002***	–0.003***				–0.001***		–0.001*	–0.003**		–0.003**			

Notes: Food consumption shares are for home consumption only. Regressions of the share of highly processed foods in total food consumption (at market value): marginal effects; significant results only (at 10 percent or lower); statistical significance is reported for *** p<0.01, ** p<0.05, * p<0.1. As the focus is on nonprice determinants, the marginal effects of prices and home assets are not shown. All surveys are 2018/19, except Malawi (2019/20). See Table 4 for full definition of highly processed foods; Table 5 for the list of 11 Western, Eastern and Southern African countries; and Table 7 for the definition of high- and low-food-budget countries. Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars.

Source: Authors' own elaboration.

Table 13 shows the marginal effects of the determinants on highly processed foods for at home consumption in high- and low-food budget countries, with the following results highlighted.

First, when significant, in both high-food-budget and low-food-budget countries, the location effect across the rural–urban continuum (URCA) has effects that corroborate the descriptive findings: the farther from a large city, the smaller the share of highly processed foods in total food consumption, but the "steps" are not abrupt and large but rather smooth and continuous. However, the distance effect is lower in the most distant rural areas (1–2 hours to a city or town).

Second, the effect of income on the share of highly processed foods is positive in both sets of countries, with an only slightly higher effect in low-food-budget countries (negative in Senegal). This corroborates the findings, for example, in the United Republic of Tanzania of Sauer *et al.* (2021).

Third, in both sets of countries, more non-farm employment leads to a higher share of highly processed foods.

Fourth, the household head being female has a positive effect in high-food-budget countries, but a dampening effect in low-food-budget countries. In the former, this can be explained by women seeking processed foods to substitute for their labour to make way for other household chores and management and for off-farm work. But in poorer low-food-budget countries it could be that women managing alone have less time and access to buy these foods. This needs further exploration.

Fifth, the higher the dependency ratio, the greater the share of highly processed foods purchased for consumption.

Table 14 shows the marginal effects of the determinants of demand for purchased food away from home with the following key findings.

Table 14. The non-price determinants of the consumption shares of food away from home in selected high- and low-food-budget countries

	Full sample	High-food-budget countries						Low-food-budget countries						
		All countries	Senegal	Ethiopia	Côte d'Ivoire	Mali	Nigeria	All countries	Guinea-Bissau	Benin	Togo	Burkina Faso	Malawi	Niger
Large city (>1 million people)	0.022***	0.024**	0.044***		0.038***	0.008**		0.030***			0.035***	0.027***		0.057***
Intermediate city (0.25–1 million people)	0.020**	0.030**			0.016**				0.033**	0.036***		0.023**		
Small city (50–250 thousand people)				0.096**	0.014**				0.040*		–0.013*	0.015***		0.014**
<1 hour to a large city				0.070*	0.010*	0.013***					–0.012*	0.013**	0.024**	
<1 hour to an intermediate city				0.082***	–0.009*	0.012**	–0.029**	–0.021***			–0.032***	0.015*		
<1 hour to a small city	–0.013**			0.089***	–0.017***			–0.019***		–0.024***	–0.047***			–0.009***
<1 hour to a town	–0.033***	–0.036***		0	–0.033***			–0.018***						
1–2 hours to a city or town	–0.022***	–0.020**		0.219***	–0.023***			–0.024***		–0.028***	–0.040***			–0.009**
>2 hours to a city or town	–0.041***	–0.042***				–0.005*	0	–0.017***				–0.019*		–0.007*
Total income (log of annual per capita expenditure)	0.025***	0.026***	–0.017***	0.028***	–0.018***	0.012***	0.093***	0.002**	–0.014***	–0.014***	–0.014***	0.013***	0.010***	–0.010***
Male full-time non-farm employment	0.015***	0.016***	0.008***	0.013**	0.012***	0.004***	0.016***	0.009***	0.008***	0.010***	0.014***	0.011***	0.002**	0.007***
Female full-time non-farm employment				–0.011*	0.003**		–0.009***	0.004***						0.005***
Primary schooling of household head	0.031***	0.032***	0.007*		0.007***	0.003*		0.004***	0.011***	0.010***		0.007**		0.005**
Secondary schooling of household head					0.005*								–0.002*	
Female-headed households	–0.022***	–0.026***		–0.014***			–0.035***	–0.003***			–0.017***	–0.009***	–0.002***	0.006**
Household size (adult equivalents)	–0.004***	–0.005***	–0.006***	–0.004***	–0.007***	0.000**		–0.003***	–0.002***	–0.002***	–0.006***	–0.003***	–0.001***	–0.003***
Dependency ratio	–0.023***	–0.025***	–0.076***	–0.013*	–0.058***	–0.015***		–0.020***	–0.054***	–0.028***	–0.047***	–0.034***		–0.014***
Cultivated land (ha)	–0.003*	–0.007**			–0.003**		–0.017**				–0.012***	–0.011***	–0.015***	
Tropical livestock units	–0.014***	–0.017***		–0.005**		–0.001***				–0.006***				

Notes: Regressions of the share of food purchases (for home consumption and food away from home) in total food consumption (at market value): marginal effects; significant results only (at 10 percent or lower); statistical significance is reported for *** p<0.01, **p<0.05, *p<0.1. As the focus is on non-price determinants, the marginal effects of prices and home assets are not shown. All surveys are 2018/19, except Malawi (2019/20). See Table 3 for the definition of food away from home; Table 5 for the list of 11 Western, Eastern and Southern African countries; and Table 7 for the definition of high- and low-food-budget countries. Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars.

Source: Authors' own elaboration.

First, in both high- and low-food-budget countries, the locational effects are more discontinuous over the rural–urban continuum than most other behaviours that have been examined. The general overall trend is positive correlation with urban URCAs and negative with peri-urban and rural URCAs, but simply not as consistent across countries. However, considering only low-food-budget countries, the pattern is clearer. It shows that the consumption value share of food away from home is much greater in large cities than in towns, decreasing incrementally in peri-urban areas the larger the size of the closest city, and decreasing from towns to rural areas, with the largest decrease occurring in areas 1 to 2 hours from any urban centre. These results corroborate the descriptive findings: the larger the urban city, the higher the share of food away from home in total consumption; the greater the distance from a large city, the smaller the share. The consumption of food away from home is often linked to commuting for work. Therefore, these patterns reflect how much farther workers have to commute from home in cities, compared to rural areas.

Second, the effect of income on the share of food away from home is mixed across high- and low-food budget countries. On average it is high and positive in high-food-budget countries and low and positive in low-food-budget countries. This is an interesting result for food-history reasons. The high-positive result corroborates recent findings, such as from the United Republic of Tanzania in Sauer *et al.* (2021) where food away from home and income are strongly correlated. But the low impact of income links to earlier literature such as Reardon, Thiombiano and Delgado (1989) and others reviewed in Reardon *et al.* (2021). In the former piece, based on a study in Ouagadougou, Burkina Faso in the mid-1980s, the urban poor tended to consume a lot of food away from home (millet and rice dishes) because they commuted to work. The middle-class households consumed little food away from home because they did not commute or commuted and had long lunch times during which they went home to eat. The latter may be the pattern in the lower budget countries now.

Third, in both sets of countries, more non-farm employment leads to a higher share of food away from home. The effect was almost twice as high in high-food-budget countries than in low-food-budget countries for male non-farm employment, although it was insignificant for female non-farm employment in high-food-budget countries. This may reflect employment that is more spatially dispersed, with longer commutes, and thus a greater need for food away from home. It may also mean that food vendors, such as small restaurants, are more plentiful in the high-budget countries. Note that, on the supply side, food service in Africa has grown quickly in the past several decades (Reardon *et al.* [2021] for a review).

Fourth, education, especially primary schooling, is correlated with a higher share of food away from home in both sets of countries, with the effect being greater in the high-food-budget countries.

Fifth, the household head being female has a strong negative effect in high-food-budget countries, and a lesser but still negative effect in low-food-budget countries, except for Niger, which shows a slightly positive effect. It may be that female household heads commute less to their outside jobs because they must care for the family at home.

Sixth, household size has a negative effect on food away from home in both high- and low-food-budget countries. This is presumably because more own labour allows households to substitute own labour for home processing and meal preparation, and the larger family may require less commuting and, thus, have less need for food away from home.

Seventh, the higher the dependency ratio, the lower the share of food away from home. This could be because households with more children are seeking the cheapest and simplest in-house meal solutions and also need to stay home to care for children. Dependency ratio takes into account the consumption needs of young and elderly people, and the productivity of middle-aged people.

Eighth, as expected, the larger the holding of farmland, the lower the share of food away from home, perhaps because of *in situ* labour requirements reducing commuting to jobs.

3.4 Findings: food consumption composition by commodity type

Urbanization is implicitly associated with shifts in household food consumption, in which urban households purchase a more varied diet, one that is less dominated by staple foods and comprises a larger variety of foods from other food groups, including more expensive foods such as meat and dairy (see Chapter 2). However, some studies suggest that it is higher income in urban areas, rather than urbanization per se, that is causing these shifts (Stage, Stage and Mcgranahan, 2010). This section provides further analysis of these issues.

Table 15 confirms, as expected, that staple foods are the largest of the commodity aggregates, but also shows that they do not comprise half of all food consumption value in any location across the rural–urban continuum (URCA). There is diet diversity across the rural–urban continuum. Urban areas consume considerably lower value shares of staple foods (30 percent) than peri-urban (40 percent) and rural households (43 percent).

Table 15. Consumption shares of different food groups to total household food consumption value across the rural–urban continuum (URCA)

		National	Urban	Peri-urban	Rural	Large city (>1 million people)	Intermediate city (0.25–1 million people)	Small city (50–250 thousand people)	Town (20–50 thousand people)	<1 hour to a large city	<1 hour to an intermediate city	<1 hour to a small city	<1 hour to a town	1–2 hours to a city or town	>2 hours to a city or town
		(%)	(%)			(%)									
Full sample	Staple foods	38	30	40	43	26	32	31	34	34	41	43	45	42	46
	Pulses, seeds and nuts	7	5	8	8	5	6	6	6	7	8	8	6	8	8
	Animal source foods	16	20	14	14	23	19	18	18	18	13	13	16	14	12
	Vegetables	11	12	11	11	12	12	12	12	12	12	11	10	11	11
	Fruits	2	3	2	2	3	3	3	3	3	2	2	2	2	1
	Fats and oils	5	5	6	5	5	6	5	6	5	6	6	5	5	5
	Sweets, condiments and beverages	10	10	9	12	10	9	10	10	8	8	10	12	12	13
	Food away from home	10	15	9	6	16	14	14	10	13	9	7	5	6	4

		National	Urban	Peri-urban	Rural	Large city (>1 million people)	Intermediate city (0.25–1 million people)	Small city (50–250 thousand people)	Town (20–50 thousand people)	<1 hour to a large city	<1 hour to an intermediate city	<1 hour to a small city	<1 hour to a town	1–2 hours to a city or town	>2 hours to a city or town
		(%)	(%)			(%)									
High-food-budget countries	Staple foods	38	30	41	42	26	32	31	34	34	41	44	45	41	47
	Pulses, seeds and nuts	7	6	8	8	5	6	6	7	7	8	8	6	8	10
	Animal source foods	15	19	14	14	22	17	17	17	18	13	12	16	14	10
	Vegetables	11	12	11	10	12	12	12	11	11	11	10	9	11	10
	Fruits	2	3	2	2	3	2	3	3	3	2	2	1	2	1
	Fats and oils	6	6	6	5	5	6	6	7	6	6	6	5	5	5
	Sweets, condiments and beverages	9	9	8	11	9	8	9	10	7	8	9	12	11	12
	Food away from home	11	16	11	7	17	16	15	11	14	11	8	5	8	5
Low-food-budget countries	Staple foods	38	28	40	43	25	31	30	34	33	43	40	44	43	44
	Pulses, seeds and nuts	7	4	8	8	3	4	4	5	6	8	8	8	8	6
	Animal source foods	17	23	16	14	25	23	22	20	19	15	16	15	15	14
	Vegetables	13	13	13	13	14	14	14	13	14	14	13	11	13	12
	Fruits	3	4	3	2	4	3	4	3	4	2	3	3	3	2
	Fats and oils	5	5	5	4	5	5	5	5	5	4	5	4	4	5
	Sweets, condiments and beverages	12	13	12	13	13	12	13	13	12	11	12	11	12	15
	Food away from home	5	9	4	3	12	7	7	7	7	3	4	3	3	3

Notes: The table shows household food consumption by food group as a percentage share of total household food consumption (at market value) across the rural–urban continuum (URCA) for high- and low-food-budget countries. All surveys are for 2018/19, except Malawi (2019/20). See Table 5 for the list of 11 Western, Eastern and Southern African countries, and Table 7 for the definition of high- and low-food-budget countries.

Source: Authors' own elaboration.

Diet diversification is quite similar between high- and low-food-budget countries, suggesting a measure of convergence. Staple foods are a minority of food consumption (in value terms) in both high-food-budget (30 percent) and low-food-budget (28 percent) countries in urban areas (Table 15). It is interesting to note that these shares are only slightly above the share of 25 percent in Asia (Reardon *et al.*, 2015). Bennett's law notes that the share of staple foods declines as incomes rise. Although incomes are still low in the low-budget countries, they have risen enough (perhaps combined with non-staple foods such as fruits, vegetables and animal

products becoming more accessible) that even these relatively poor countries have substantially diversified diets.

It is striking that the diversification of household food consumption, which is the inverse of dependence on staple foods, is similar in urban areas of both high- and low-food-budget country groups. Indeed, the ratio of the shares of staple foods in rural areas to urban areas is nearly the same for both high- and low-food budget countries (1.4 and 1.5, respectively), suggesting an intercountry convergence.

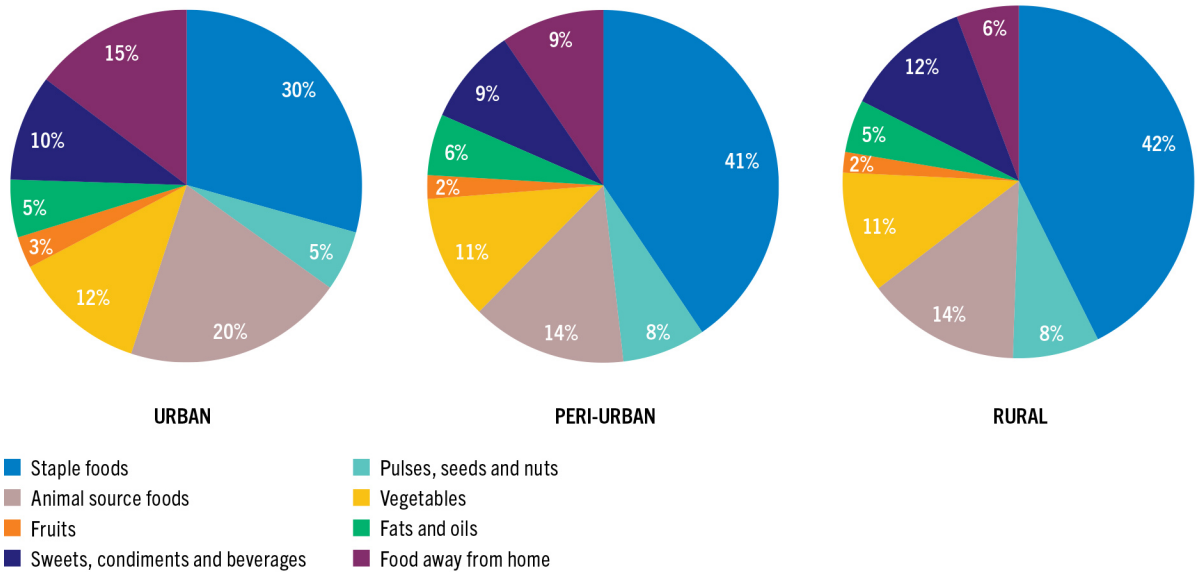
Looking across all countries analysed, the smaller staple food shares in urban areas are generally offset by larger shares of animal source foods and food away from home (Figure 8a). On average across the countries analysed, animal source food consumption value shares (which include milk, eggs, meat, fish, shellfish and insects) in urban areas are 40 percent higher than in peri-urban areas and 44 percent higher than in rural areas. This is expected, as urbanization is generally associated with urban households procuring more varied foods, including more expensive foods such as meat, but also eating outside the home more often.

Figure 8b shows that the share of animal source foods in total food consumption drops more or less smoothly and rapidly moving across the rural–urban continuum, from large cities to the most remote rural areas. The figure also shows that the share of pulses and nuts in total food consumption rises, moving across the rural–urban continuum, from large cities to remote rural areas. This can be interpreted as a cheaper protein substitute for animal products.

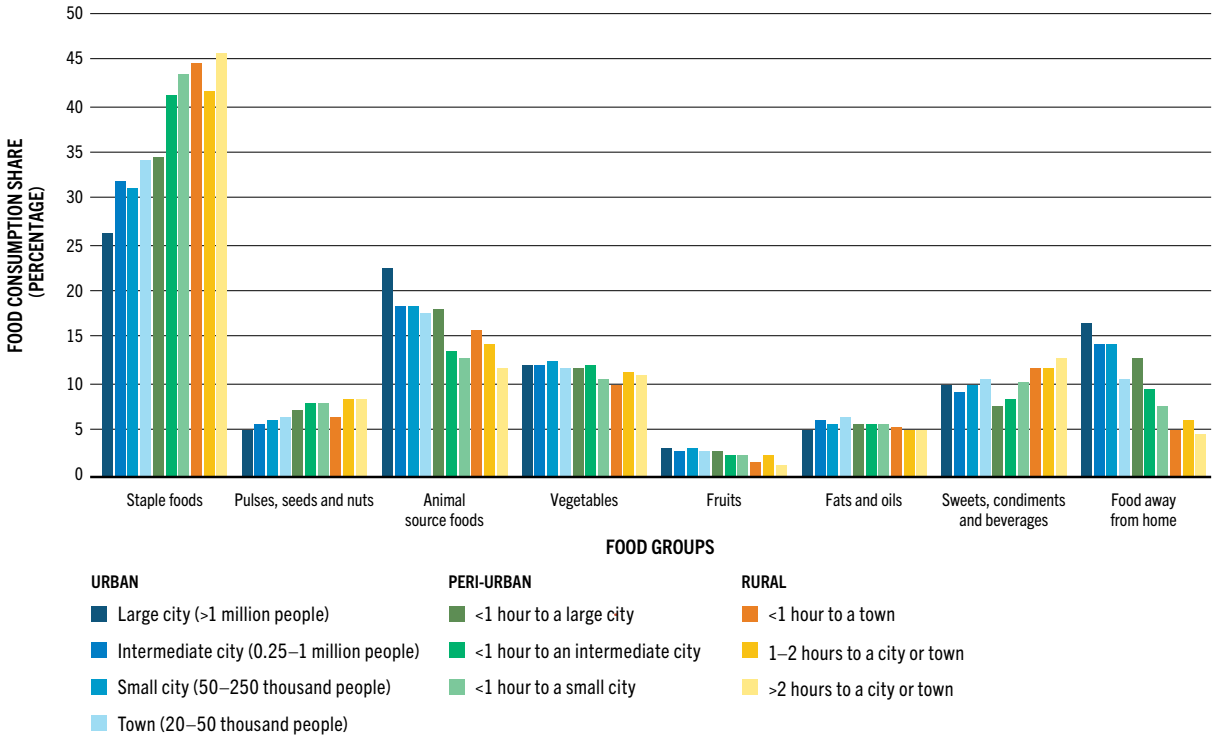
Vegetables and fruits have similar patterns of gradually declining shares of food value as households are more rural, albeit that vegetables have considerably higher consumption shares.

Figure 8. Consumption shares of different food groups to total household food consumption value across the rural–urban continuum (URCA)

a. Average shares of household food consumption values by food group and urban, peri-urban and rural areas (URCA)



b. Average shares of household food consumption by food group across the rural–urban continuum (URCA)



Notes: The figures show for the full sample of countries analysed average household food consumption by food group as a percentage share of total household food consumption (at market value), by urban, peri-urban and rural area (URCA) (Figure 8a), and by rural–urban continuum (URCA) (Figure 8b).

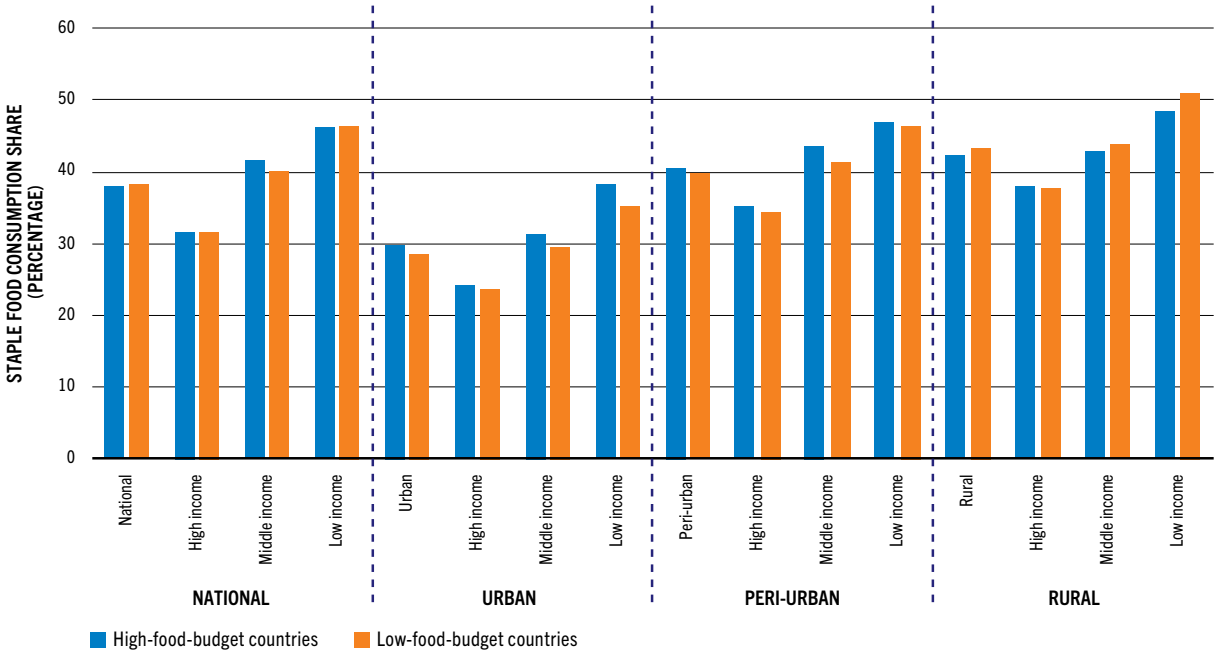
Source: Authors' own elaboration.

Across all countries, shares of food away from home are higher in urban areas and decline steeply moving to peri-urban and rural areas. On average, shares in urban areas are 1.6 times higher than in peri-urban areas and 2.6 times higher than in rural areas.

Overall, the analysis indicates there is no abrupt rural–urban divide across the continuum. Again, this is a surprise, as it is generally assumed that there is a marked difference between urban and rural areas. Instead, moving across the continuum from urban to rural areas, there is an increasing share of staple foods, pulses, seeds and nuts, and a decreasing share of animal source foods and food away from home. In contrast, shares for vegetables, fruits and fats and oils are fairly uniform across the rural–urban continuum. Although there are some variations, sweets, condiments and beverages also are uniform.

Table 16 shows how households of different levels of income (low-, middle- and high-income households) have different diet diversity patterns comparing urban, peri-urban and rural areas. As expected (following Bennett's law), as household income falls, the share of staple foods in total household food consumption rises in both high- and low-food budget countries (Figure 9). This holds true whether looking at urban, peri-urban or rural aggregate categories (as shown in Figure 9) or at more disaggregated rural–urban continuum (URCA) categories (not shown).

Figure 9. Consumption shares of staple foods to total household food consumption value by household income level across the rural–urban continuum (URCA)



Notes: The figure shows staple food consumption as a percentage share of total household food consumption (at market value) by national, urban, peri-urban and rural area (URCA), and by household income level (low, middle and high).

Source: Authors' own elaboration.

Other food group consumption share patterns also follow the expectation of Bennet's law. This includes consumption patterns of pulses (declining), animal proteins (rising) and food away from home (rising) (Table 16). Vegetables and fruits were surprisingly consistent across expenditure terciles.

Table 16. Consumption shares of different food groups to total household food consumption value by household income level across the rural–urban continuum (URCA)

		National				Urban				Peri-urban				Rural			
		National	Low income	Middle income	High income	Urban	Low income	Middle income	High income	Peri-urban	Low income	Middle income	High income	Rural	Low income	Middle income	High income
		(%)				(%)				(%)				(%)			
Full sample	Staple foods	38	46	41	32	30	38	31	24	40	47	43	35	43	49	43	38
	Pulses, seeds and nuts	7	8	8	6	5	7	6	5	8	8	8	7	8	7	9	8
	Animal source foods	16	10	14	20	20	14	20	23	14	9	13	18	14	9	12	18
	Vegetables	11	12	11	11	12	13	13	11	11	12	11	11	11	11	11	11
	Fruits	2	2	2	3	3	2	3	3	2	2	2	3	2	2	2	2
	Fats and oils	5	6	6	5	5	6	6	5	6	6	6	5	5	5	5	5
	Sweets, condiments and beverages	10	10	9	10	10	9	9	10	9	9	9	9	12	12	12	12
	Food away from home	10	6	8	13	15	10	13	18	9	6	8	12	6	5	6	6
High-food-budget countries	Staple foods	38	46	42	32	30	38	31	24	41	47	44	35	42	48	43	38
	Pulses, seeds and nuts	7	8	8	7	6	7	6	5	8	8	8	7	8	8	9	8
	Animal source foods	15	10	14	19	19	14	19	22	14	9	12	17	14	10	11	18
	Vegetables	11	11	11	11	12	13	12	11	11	11	11	11	10	10	10	10
	Fruits	2	2	2	3	3	2	2	3	2	2	2	2	2	2	2	2
	Fats and oils	6	6	6	5	6	7	6	5	6	7	6	5	5	5	5	5
	Sweets, condiments and beverages	9	10	9	9	9	9	9	9	8	9	8	8	11	11	12	11
	Food away from home	11	7	9	15	16	10	14	20	11	7	9	13	7	6	7	7
Low-food-budget countries	Staple foods	38	47	40	32	28	35	29	24	40	47	41	34	43	51	44	38
	Pulses, seeds and nuts	7	7	8	6	4	5	4	3	8	8	8	7	8	7	8	8
	Animal source foods	17	11	15	23	23	17	23	28	16	10	14	21	14	9	14	19
	Vegetables	13	14	13	13	13	14	15	12	13	14	14	13	13	13	13	12
	Fruits	3	3	3	3	4	3	3	5	3	3	3	3	2	2	2	2
	Fats and oils	5	4	5	5	5	6	5	4	5	4	5	5	4	4	4	4
	Sweets, condiments and beverages	12	11	12	13	13	12	12	14	12	11	11	13	13	12	12	13
	Food away from home	5	4	4	6	9	9	9	10	4	4	4	4	3	2	3	3

Notes: The table shows food consumption of different food groups as a percentage share of total household food consumption (at market value) across the rural–urban continuum (URCA) by household income group, country, and high- and low-food-budget country group. Household income levels (low, middle and high) are calculated using terciles of total household expenditure per adult equivalent as proxy. URCA: Urban Rural Catchment Areas.

Source: Authors' own elaboration.

Table 17 shows the marginal effects of the determinants of demand for animal source foods, illustrating six key points.

First, in both high- and low-food-budget countries, the rural–urban continuum locations (URCA) marginal effects generate mixed effects, suggesting little in the effect of URCAs on animal protein consumption. Note that these are not absolute levels but rather shares. This implies that other sources of diet diversification, such as fruits and vegetables, have higher shares in large cities, reducing the share of animal products.

Second, the effect of income on the share of animal source foods is high and positive in both high- and low-food-budget countries, as expected from Bennett's law. The lowest marginal effect is in Nigeria, which might be explained by the plethora of other diet diversification options.

Third, in both sets of countries (except for Mali), more female non-farm employment leads to a higher consumption share of animal source foods. It is not immediately clear why this is. Perhaps it is linked to women's off-farm activities, such as poultry production, which provides greater income (and opportunity) to consume more costly animal source foods (see Liverpool-Tasie *et al.* [2018] for Nigeria).

Fourth, household size has a positive effect on animal source food shares in both sets of countries. The interpretation is not obvious after controlling for income.

Fifth, the higher the dependency ratio, the higher the share of animal source foods. This might be because mothers seek to maximize protein for child development.

Sixth, as expected, the effect of livestock holdings on animal source food consumption share is strong and positive, more so in low-food-budget countries where perhaps these products tend to be more home produced, while in high-food-budget countries animal product markets might be more developed and households may be less dependent on having their own livestock.

Table 17. Non-price determinants of animal source food consumption shares (for home consumption only) in selected high- and low-food-budget countries

	Full sample	High-food-budget countries						Low-food-budget countries						
		All countries	Senegal	Ethiopia	Côte d'Ivoire	Mali	Nigeria	All countries	Guinea-Bissau	Benin	Togo	Burkina Faso	Malawi	Niger
Large city (>1 million people)	0.014**	0.017**	–0.014*			–0.028***				0.021**				–0.024*
Intermediate city (0.25–1 million people)										0.023**				
Small city (50–250 thousand people)						–0.017*	0.019*			0.018**				
<1 hour to a large city			–0.016**		0.024**		0.015*					–0.032***		
<1 hour to an intermediate city	0.013**	0.011*	–0.025***	0.030**		–0.024**	0.023**					0.025**	–0.026***	
<1 hour to a small city	0.010*	0.012*		0.039***			0.025**				–0.028***			
<1 hour to a town	0.038***	0.045***			–0.027***					0				
1–2 hours to a city or town	0.021***	0.028***				–0.018*	0.036**			0.020*				
>2 hours to a city or town	0.020***	0.064***						–0.015**		0				
Total income (log of annual per capita expenditure)	0.061***	0.056***	0.113***	0.051***	0.108***	0.112***	0.035***	0.081***	0.105***	0.069***	0.057***	0.058***	0.083***	0.123***
Male full-time non-farm employment	0.002*				0.006**								0.005**	
Female full-time non-farm employment	0.009***	0.009***	0.004**			–0.005*	0.005**	0.007***		0.005***	0.006**	0.008***	0.005*	
Primary schooling of household head	0.014***	0.012***						0.011***			0.009**			
Secondary schooling of household head							0.008**	0.006***	–0.010*	0.010**	–0.009*	0.015**		
Female-headed households			0.008**			–0.012*		–0.013***		–0.010**			–0.018***	–0.019***
Household size (adult equivalents)	0.003***	0.004***	0.004***	0.013***	0.007***	0.003***		0.002***	0.003***	0.002***	0.002**		0.008***	0.004***
Dependency ratio	0.043***	0.045***	0.073***	0.047***	0.076***	0.052***	0.016**	0.033***	0.022**	0.042***	0.048***	0.048***	0.026***	0.046***
Cultivated land (ha)	0.004***	0.009***	–0.007***	–0.034***		–0.005**							–0.024**	
Tropical Livestock Units	0.004***	0.004***		0.011***		0.008***		0.006***	0.003*	0.005***	0.011***	0.008***	0.023**	0.012***

Notes: Regressions of the share of highly processed foods in total food consumption (at market value): marginal effects; significant results only (at 10 percent or lower); statistical significance is reported for *** p<0.01, ** p<0.05, * p<0.1. As the focus is on non-price determinants, the marginal effects of prices and home assets are not shown. All surveys are 2018/19, except Malawi (2019/20). See Table 4 for full definition of highly processed foods; Table 5 for the list of 11 Western, Eastern and Southern African countries; and Table 7 for the definition of high- and low-food-budget countries. Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars.

Source: Authors' own elaboration.

Table 18 shows the marginal effects of the non-price determinants of consumption shares of vegetables to total household consumption, illustrating six key points. In contrast to animal source foods, the analysis of the determinants of the consumption share of vegetables in total household food consumption suggests that this is driven more by access and availability than by income.

First, considering all countries together, there are statistically significant location effects on the share of vegetables in total household food consumption across the rural–urban continuum, after controlling for income. Large, intermediate, and small cities and areas less than 1 hour from large and intermediate cities have higher shares of vegetable consumption than towns. For low-food-budget countries, there is also a notable decrease in the share of vegetable consumption in rural areas. These findings may reflect the presence of major horticultural commercial zones near cities, or in well-watered areas near highways and rivers, in both low- and high-food-budget countries.

Second, the effect of income on vegetable consumption is mixed, but overall, it is negative and statistically significant, indicating a reduction in vegetable consumption shares as income increases. In both high- and low-food-budget countries, the effect of non-farm employment is mostly non-significant.

Third, if the household is headed by a woman, there is a positive effect on the share of vegetable consumption in both country food-budget groups. Since the effect of income is taken into consideration at the same time, this can be interpreted as an indication that female diet choices for households make a difference, as women, for example, choose foods with greater nutrient and vitamin content (Larson, Castellanos and Jensen, 2019; Njuki *et al.*, 2023; Wardle *et al.*, 2004).

Table 18. Non-price determinants of vegetable food consumption shares (for home consumption only) in selected high- and low-food-budget countries

	Full sample	High-food-budget countries						Low-food-budget countries						
		All countries	Senegal	Ethiopia	Côte d'Ivoire	Mali	Nigeria	All countries	Guinea-Bissau	Benin	Togo	Burkina Faso	Malawi	Niger
Large city (>1 million people)	0.025***	0.027***		0.096***		0.022***	0.031***	0.016***				0.027***		
Intermediate city (0.25–1 million people)	0.017***	0.015*					0.023***	0.020***	0.020*					0.036***
Small city (50–250 thousand people)	0.021***	0.024***				0.018***	0.027***	0.013***	0.031**			0.021***		
<1 hour to a large city	0.012**	0.019***					0.024***	0.009**	0.036***	0.006*		0.031***		0.026**
<1 hour to an intermediate city	0.013**	0.020***	0.008*			0.029***	0.023***					0.018*	0.021*	
<1 hour to a small city			–0.008**			0.012**								
<1 hour to a town					0.011*			–0.022***						
1–2 hours to a city or town			–0.020***				–0.003	–0.009**		–0.017***				–0.014*
>2 hours to a city or town								–0.012***				0.039***		
Total income (log of annual per capita expenditure)	–0.016***	–0.012***		–0.033***	–0.013***	0.007**	–0.017***	–0.023***	0.009***	–0.015***	–0.023***		–0.059***	0.024***
Male full-time non-farm employment	–0.003***	–0.004***			–0.005***	0.004***	–0.004***							
Female full-time non-farm employment			0.002***			0.002*			0.002**	0.003***	0.003**			
Primary schooling of household head	–0.006***	–0.003*					0.007***		–0.006**					
Secondary schooling of household head	–0.006***	–0.004**						–0.007***						
Female-headed households	0.013***	0.012***		0.009***	0.007***		0.009***	0.017***	0.006**	0.011***	0.013***	0.014***	0.007***	0.017***
Household size (adult equivalents)	–0.004***	–0.003***	0.001***	–0.011***	–0.001***	–0.002***	–0.003***	–0.003***	–0.002***	–0.004***	–0.002***		–0.011***	
Dependency ratio			0.027***		0.013***	0.011*		–0.008***		–0.010***			–0.022***	0.016**
Cultivated land (ha)				0.019***		0.002**						0.005*	0.028***	
Tropical livestock units				-0.004*	-0.001***	-0.003***		-0.003***			-0.004***	-0.004***		-0.012***

Notes: Regressions of the share of vegetable consumption in total food consumption (at market value): marginal effects; significant results only (at 10 percent or lower); statistical significance is reported for *** p<0.01, ** p<0.05, * p<0.1. As the focus is on non-price determinants, the marginal effects of prices and home assets are not shown. All surveys are 2018/19, except Malawi (2019/20). See Table 3 for full definition of vegetables; Table 5 for the list of 11 Western, Eastern and Southern African countries; and Table 7 for the definition of high- and low-food-budget countries. Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars.

Source: Authors' own elaboration.

4 Macro view: cross-region food availability, import shares and adequacy over time

4.1 Data and methods

Data from the FAO Food Balance Sheets (FBS) from 2010 to 2020 (FAO, 2023b) was used to explore the trends in food availability for six food groups and the main sources of their supply (whether they are largely provided by domestic supply chains or by imports). This chapter presents food availability and source information globally and for five regions:[5] Africa, Asia, Latin America and the Caribbean, Europe and Northern America. The six food groups considered are staple foods, animal source foods, legumes, nuts and seeds, vegetables, fruits, and fats and oils. This classification is based on the food groups in the Healthy Diet Basket (HDB) used in the calculation of the FAO global monitoring indicator of the Cost and Affordability of a Healthy Diet (CoAHD) (see FAO [2023c]).

Food availability is defined in each year as the total food supply quantity (kg per capita per year) defined in FAOSTAT. It is important to note that the FBS provides information on quantities expressed in terms of primary equivalents for crops and animal source products. This information is at the national aggregate level and does not include information on actual individual food or nutrient intake. This information also does not factor in the distribution of available foods across different population groups in each region or country.

While the total food supply quantity accounts for food loss (during processing and movement from production to retail) and for non-edible portions of foods such as peels, bones, seeds etc., these estimates do not account for potential food waste within households. These caveats should be considered when interpreting FBS data (see FAO [2018] for an expanded description of the methodology and limitations of FBS data).

As a measure of the adequacy of available food, the per capita available quantities (in grams per capita per day) for each food group are compared to the daily requirement for a healthy diet noted in Herforth *et al.* (2022). To identify the main source of each food group, the import shares of the total domestic supply of a particular food group are derived. The domestic supply quantity used is the total supply for domestic utilization equal to production, plus imports and any changes in stocks (decrease or increase), minus exports, measured in tonnes. The total domestic supply of a food group is used, rather than the total food supply (used for the availability analysis), as it is not possible to distinguish what share of total imports goes into food for domestic utilization. In addition, the total domestic supply is focused on clear supply elements. For each food group, the import share is calculated as the quantity of imports (in tons) in the total supply for domestic utilization.

4.2 Findings

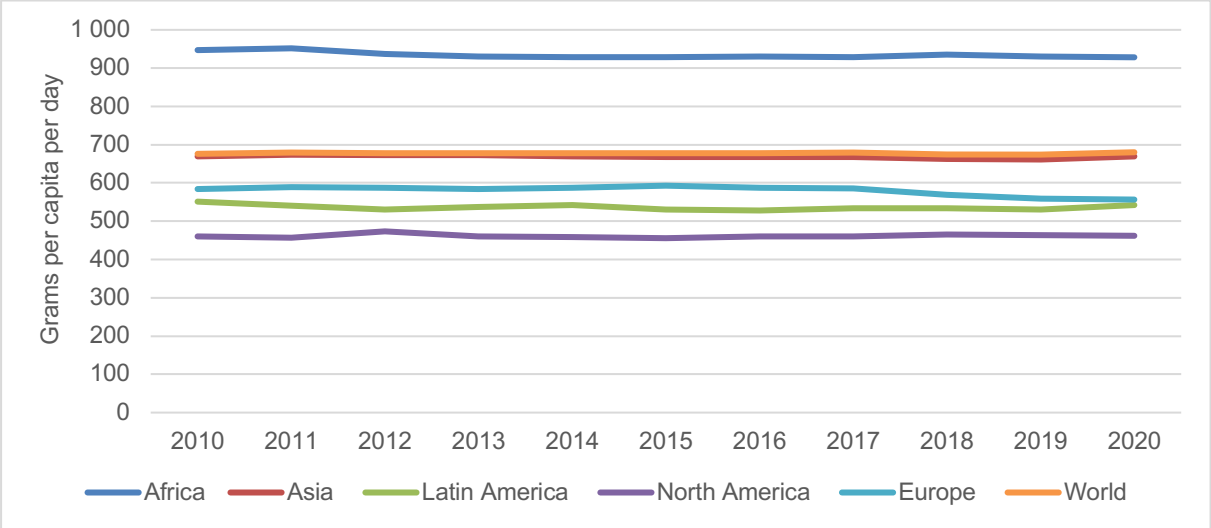
Key message 1: Though global per capita availability of all six food groups has increased between 2010 and 2020, this increase masks concerning regional differences, including the decline in the availability of nutrient-rich food groups such as animal source foods and plant-based proteins in Africa; and fruits, vegetables and plant-based proteins in Latin America and the Caribbean.

[5] Note: Due to data constraints Oceania is not included in this analysis.

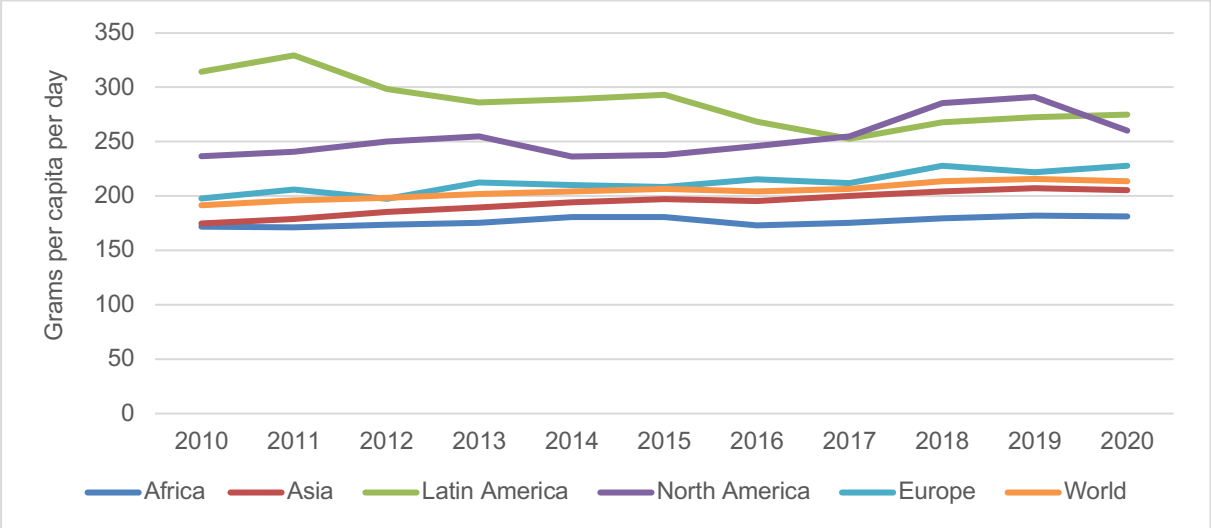
Figure 10 shows trends in per capita per day availability of the six different food groups (staple foods; animal source foods; legumes, nuts and pulses; fruits; vegetables; and fats and oils) by region from 2010 to 2020. Relatedly, Table 19 presents trends in per capita per day availability over the ten-year period, measured as the ratio of the difference in per capita availability between 2020 and 2010 relative to per capita availability in 2010. A key message that emerges is that, while global per capita availability of all food groups has increased, this increase masks concerning regional differences, as per capita availability has declined for important food groups such as animal source foods and plant-based proteins in Africa, and fruits, vegetables, and plant-based proteins in Latin America and the Caribbean. Only Asia has seen increases in the per capita availability of all six food groups over the ten-year period. Five key points are related to this key message.

Figure 10. Trends in global and regional food availability by food group

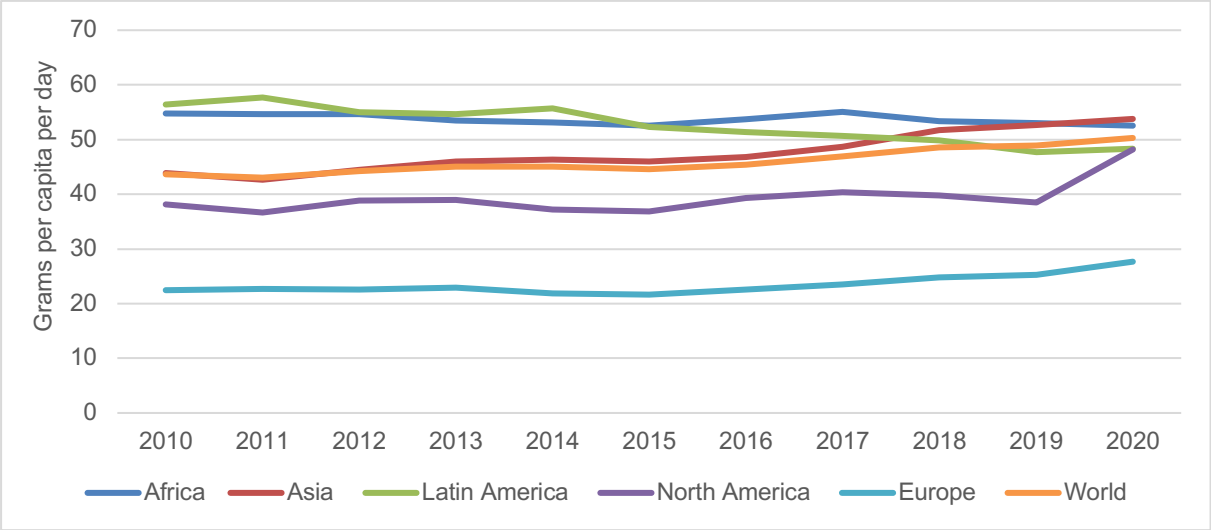
a. Availability of staple foods



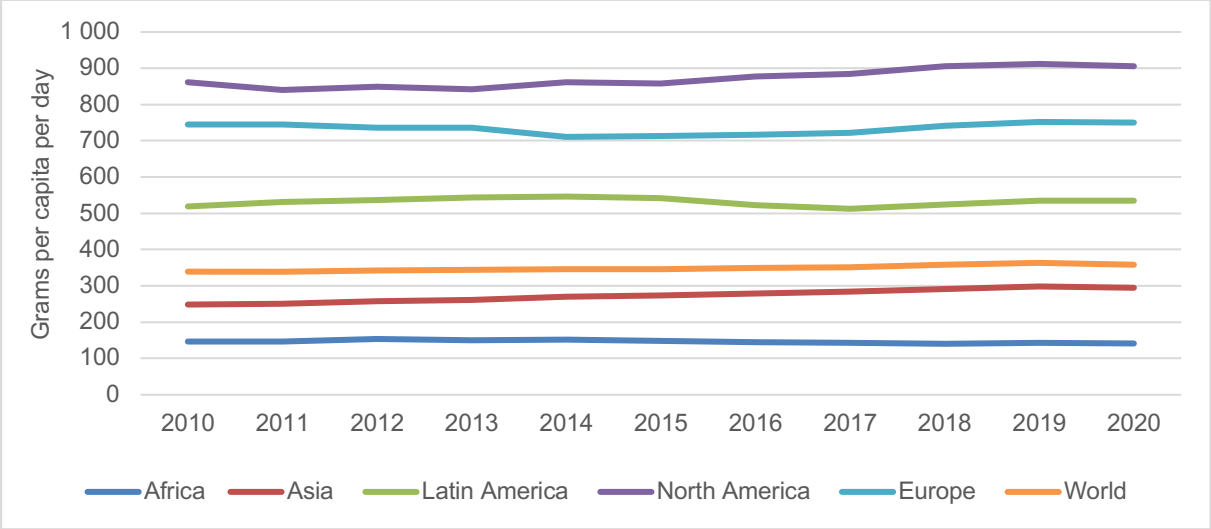
b. Availability of fruits



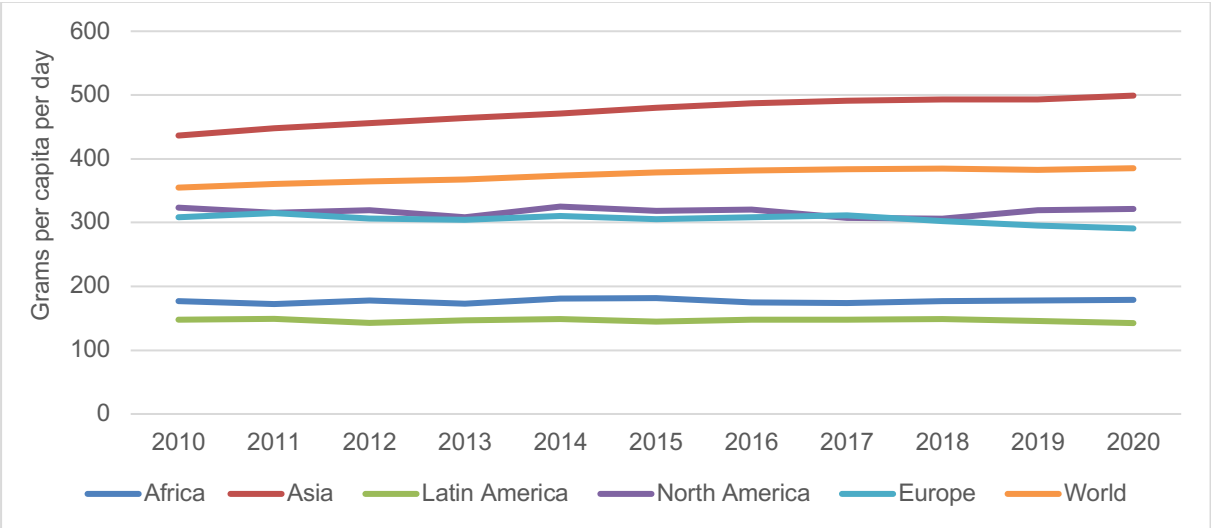
c. Availability of legumes, pulses and nuts



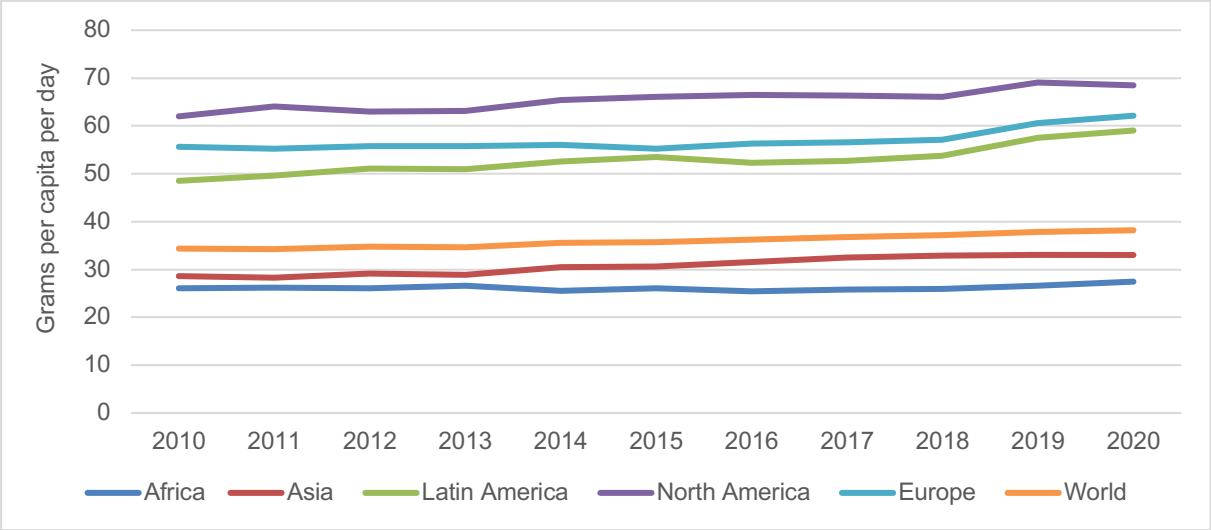
d. Availability of animal source foods



e. Availability of vegetables



f. Availability of fats and oils



Note: The per capita per day availability for Latin America and the Caribbean is a weighted average (based on population) of the per capita availability of South America and the Caribbean.

Source: Authors' own calculation based on FAO. 2023. FAOSTAT: Food Balance Sheets. In: *FAO*. [Cited 11 May 2023]. www.fao.org/faostat/en/#data/FBS.

First, the global availability of staple foods remained high and relatively stable between 2010 and 2020. This global stability masks slight declines in per capita availability in Africa (2 percent), Latin America and the Caribbean (3 percent) and Europe (5 percent) (see Table 19).

Second, global availability of animal source foods increased slightly (6 percent) between 2010 and 2020. This masks key regional differences, such as the 4 percent decline in Africa versus the 18 percent increase in Asia. For Europe, Northern America and Latin America and the Caribbean, per capita increases over the same period ranged between 0.8 percent and 5 percent.

Third, the growth in global per capita availability of fruits (12 percent) reflects a consistent growth in per capita availability in all regions except Latin America and the Caribbean, where there has been a 9 percent decline in per capita availability. The growth rate varies across regions experiencing growth and is much higher in Asia (18 percent) and Europe (15 percent) compared to Africa (6 percent) and Northern America (10 percent).

Fourth, for legumes, nuts and pulses, global per capita availability growth (15 percent) reflects significant growth in per capita availability in Northern America (26 percent), Europe (23 percent) and Asia (23 percent), but masks the per capita availability decline of about 4 percent and 13 percent in Africa and Latin America and the Caribbean, respectively, over the same period (see Figure 10 and Table 19).

Fifth, the global per capita availability of fats increased significantly (11 percent) between 2010 and 2020. This increase is consistent across all regions, though at different rates. Latin America and the Caribbean and Asia have recorded higher growth rates (21 percent and 15 percent respectively) compared to Africa (5 percent), Northern America (10 percent) and Europe (12 percent).

Table 19. Growth rates of per capita availability for different food groups across regions between 2010 and 2020 (percentage)

	Africa	Asia	Latin America and the Caribbean	Northern America	Europe	World
Staple foods	–2.0	0.1	–2.6	0.5	–4.6	0.6
Animal source foods	–4.2	18.3	3.6	5.0	0.8	5.9
Legumes, nuts and seeds	–4.0	22.6	–12.5	26.3	23.0	15.1
Vegetables	0.9	14.3	–2.2	–0.8	–5.6	8.6
Fruits	5.6	17.6	–8.6	9.8	15.4	11.6
Fats and oils	5.3	15.3	20.5	10.4	11.6	11.3

Note: The per capita per day availability for Latin America and the Caribbean is a weighted average (based on population) of the per capita availability of South America and the Caribbean.

Source: Authors' own calculation based on FAO. 2023. FAOSTAT: Food Balance Sheets. In: *FAO*. [Cited 11 May 2023]. www.fao.org/faostat/en/#data/FBS

Key message 2: In almost every region of the world, the availability of vegetables and fruits is insufficient to meet the daily dietary requirements. Particularly concerning is the insufficiency of all food groups, apart from staple foods, in Africa – a trend that has persisted or worsened over time.

Next, the per capita per day availability of the six food groups was compared to the daily required amounts for a healthy diet in 2020, and the trends in this caloric sufficiency over time and across regions were depicted. The daily required amounts, based on Herforth *et al.* (2022), are: 322 g for staple foods; 270–400 g for vegetables; 230–300 g for fruits; 210 g for animal source foods; 85 g for legumes, nuts and seeds; and 34 g for fats and oils.

Table 20 presents the level of sufficiency or insufficiency of the per capita per day availability for each food group relative to the daily requirement – globally and for different regions of the world. Negative values note a shortfall; that is, the percentage shortfall of the grams per capita per day that are available relative to the required amount. Positive values note sufficiency; that is, the percentage above the required amount that is available for each food group.

Table 20. Adequacy of available food to meet a Healthy Diet Basket, by region, 2020 (% deviations from adequacy levels in grams per capita per day)

	Africa	Asia	Latin America and the Caribbean	Northern America	Europe	World
Staple foods	188	108	68	44	73	111
Animal source foods (except oil)	–33	40	143	331	258	71
Legumes, nuts and seeds	–38	–37	–42	–43	–67	–41
Vegetables	–55	25	–63	–20	–27	–4
Fruits	–40	–31	–2	–13	–24	–29
Fats and oils	–21	–3	67	100	82	12

Notes: Yellow highlights emphasize where amounts of food available are insufficient to meet a Healthy Diet Basket. Food availability is based on FAO Food Balance Sheets data, and healthy diet requirements by food group are those of the Healthy Diet Basket used in the cost and affordability of a healthy diet in *The State of Food Security and Nutrition in the World 2023.* The per capita per day availability for Latin America and the Caribbean used in this analysis is a weighted average (based on population) of the per capita availability of South America and the Caribbean.

Source: Authors' own calculation based on FAO. 2023. FAOSTAT: Food Balance Sheets. In: *FAO*. [Cited 11 May 2023]. www.fao.org/faostat/en/#data/FBS

Table 21 presents the trends in the level of sufficiency between 2010 and 2020. As the table illustrates, the availability of vegetables and fruits is insufficient to meet the daily dietary requirements in almost every region of the world. Particularly troubling is the insufficiency of all food groups, apart from staple foods, in Africa. Four key points related to the key message are described in the next paragraphs.

Table 21. Trends in the sufficiency levels of food groups to meet a Healthy Diet Basket, by region, 2010 to 2020 (per capita per day, percentage)

	Staple foods					Animal source foods					Fats and oils				
	Africa	Asia	Latin America and the Caribbean	Northern America	Europe	Africa	Asia	Latin America and the Caribbean	Northern America	Europe	Africa	Asia	Latin America and the Caribbean	Northern America	Europe
2010	194	108	73	43	81	–30	18	134	310	255	–23	–16	39	82	64
2011	196	109	70	42	83	–31	20	139	300	255	–23	–17	42	88	62
2012	191	109	66	47	82	–27	22	142	304	251	–23	–14	46	85	64
2013	189	109	68	43	81	–28	24	145	301	250	–22	–15	46	86	64
2014	189	108	70	43	82	–28	28	146	310	239	–25	–10	50	92	65
2015	189	107	67	42	84	–30	30	144	309	240	–24	–10	52	94	63
2016	189	107	65	43	82	–31	33	137	318	241	–25	–7	49	96	66
2017	188	107	67	43	82	–32	36	133	321	244	–24	–4	50	95	66
2018	190	106	66	44	77	–33	39	138	331	253	–24	–3	53	94	68
2019	189	105	65	44	73	–32	42	143	334	258	–22	–3	63	103	78
2020	188	108	68	44	73	–33	40	143	331	258	–19	–3	67	101	83

	Fruits					Vegetables					Legumes/pulses/nuts				
	Africa	Asia	Latin America and the Caribbean	Northern America	Europe	Africa	Asia	Latin America and the Caribbean	Northern America	Europe	Africa	Asia	Latin America and the Caribbean	Northern America	Europe
2010	–43	–42	7	–21	–34	–56	9	–62	–19	–23	–36	–48	–33	–55	–74
2011	–43	–40	13	–20	–31	–57	12	–62	–21	–21	–36	–50	–31	–57	–73
2012	–42	–38	4	–17	–34	–55	14	–63	–20	–23	–36	–48	–34	–54	–73
2013	–42	–37	0	–15	–29	–57	16	–62	–23	–24	–37	–46	–34	–54	–73
2014	–40	–35	2	–21	–30	–55	18	–62	–19	–22	–38	–45	–34	–56	–74
2015	–40	–34	3	–21	–31	–55	20	–63	–20	–24	–38	–46	–37	–57	–75
2016	–42	–35	–4	–18	–28	–56	22	–62	–20	–23	–37	–45	–38	–54	–73
2017	–42	–33	–9	–15	–29	–56	23	–62	–23	–22	–35	–43	–39	–53	–72
2018	–40	–32	–4	–5	–24	–56	23	–61	–23	–24	–37	–39	–40	–53	–71
2019	–39	–31	–2	–3	–26	–56	23	–62	–20	–26	–38	–38	–42	–55	–70
2020	–40	–31	–2	–13	–24	–55	25	–63	–20	–27	–38	–37	–42	–43	–67

Notes: Sufficiency is based on the per capita per day availability relative to the required amount. Negative values note a shortfall and the values presented are the percentage shortfalls of the grams per capita per day that are available relative to the required amount. Positive values note sufficiency and are the percentage that is available for each food group above the required amount. The per capita per day availability for Latin America and the Caribbean is a weighted average (based on population) of the per capita availability of South America and the Caribbean.

Source: Authors' own calculation based on FAO. 2023. FAOSTAT: Food Balance Sheets. In: *FAO*. [Cited 11 May 2023]. www.fao.org/faostat/en/#data/FBS

First, per capita per day availability for staple foods is sufficient to meet the daily requirements for a healthy diet across all regions of the world. However, the availability of healthy food groups such as fruits, vegetables and legumes, nuts and pulses are insufficient to meet the daily dietary requirements in almost every region of the world (Table 20). Per capita availability of fruits is inadequate in all regions – ranging from a 2 percent deficit in Latin America and the Caribbean to a 40 percent deficit in Africa. The levels of inadequacy in Europe and Northern America are substantial, at 24 percent and 13 percent respectively. For vegetables, the only region with adequate availability is Asia. All other regions have inadequate levels, ranging from shortfalls of 20 percent and 27 percent in Northern America and Europe, respectively, to 63 percent in Latin America and the Caribbean. The deficiency in legumes, nuts and seeds is also stark in all regions, ranging from 37 percent in Asia to 67 percent in Europe.

Second, the levels of inadequacy in per capita availability in Africa for all other food groups have remained high and persistent over the last decade (2010–2020). Furthermore, while the level of inadequacy for fruits has reduced over time in most regions, it has remained high and stagnant in Africa (around 40 percent) and it has deteriorated in Latin America and the Caribbean, dropping from a 7 percent surplus in 2010 to a 2 percent deficiency between 2010 and 2020. For Europe and Northern America, though levels of inadequacy of fruits remain significant, at 24 percent and 13 percent respectively, this is a decline from 34 percent and 21 percent (Table 21).

Third, the level of inadequacy for vegetables has generally remained stagnant or gotten worse in all regions except Asia. For Europe, the level of inadequacy increased from a 23 percent shortfall in 2010 to a 27 percent shortfall in 2020. For Northern America, it has remained stagnant, at about 20 percent. For Africa, the level of inadequacy has not changed since 2010. Asia is the only region where the adequacy of vegetables has increased from 9 percent to 25 percent.

Fourth, for legumes, pulses and nuts, the inadequacy levels in Africa and Latin America and the Caribbean increased between 2010 and 2020 (from 36 percent and 33 percent to 38 percent and 42 percent respectively. In Europe, Northern America and Asia, the levels of inadequacy dropped by 7, 12 and 11 percentage points respectively.

Key message 3: Domestic supply chains account for the major share of total food supplies globally for all product groups, and this dominance has largely persisted between 2010 and 2020 even as total quantities supplied rose.

Finally, the main sources of food across the globe were explored to determine the extent to which food groups are largely dependent on imports or supplied by domestic supply chains. Table 22 presents the import shares for different food groups for 2020 across different regions of the world, and Figure 11 presents the trends in import shares between 2010 and 2020 for the same food groups and regions.

The key findings that emerge from this are that, for almost all food groups, domestic supply chains comprise the major share of global food supplies and that this dominance has persisted, though at varying degrees for different products and in different regions. As total quantities of the different food groups increase, domestic supplies continue to grow, preserving the dominance of domestic supply chains. Three key points stand out related to this key message.

Table 22. Import shares for food groups across regions, 2020

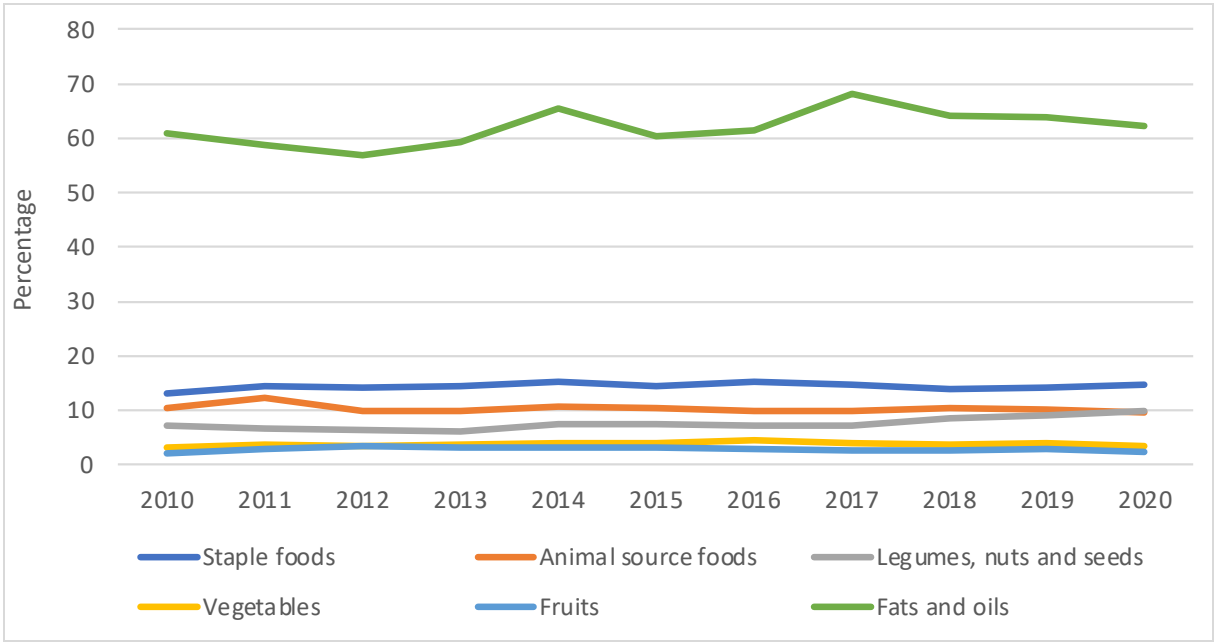
	Africa	Asia	Europe	Northern America	Latin American and the Caribbean	World
	(%)					
Staple foods	15	14	26	5	21	16
Animal source foods	10	8	28	7	7	12
Legumes, nuts and seeds	10	22	44	5	11	21
Vegetables	4	2	37	31	6	6
Fruits	2	7	59	59	4	16
Fats and oils	62	38	80	26	23	45

Notes: The table shows the share of imported foods to total food supply, by food groups, across regions (percent). The import shares for each food group for Latin America and the Caribbean are a weighted average (based on population) of the import shares of South America and the Caribbean.

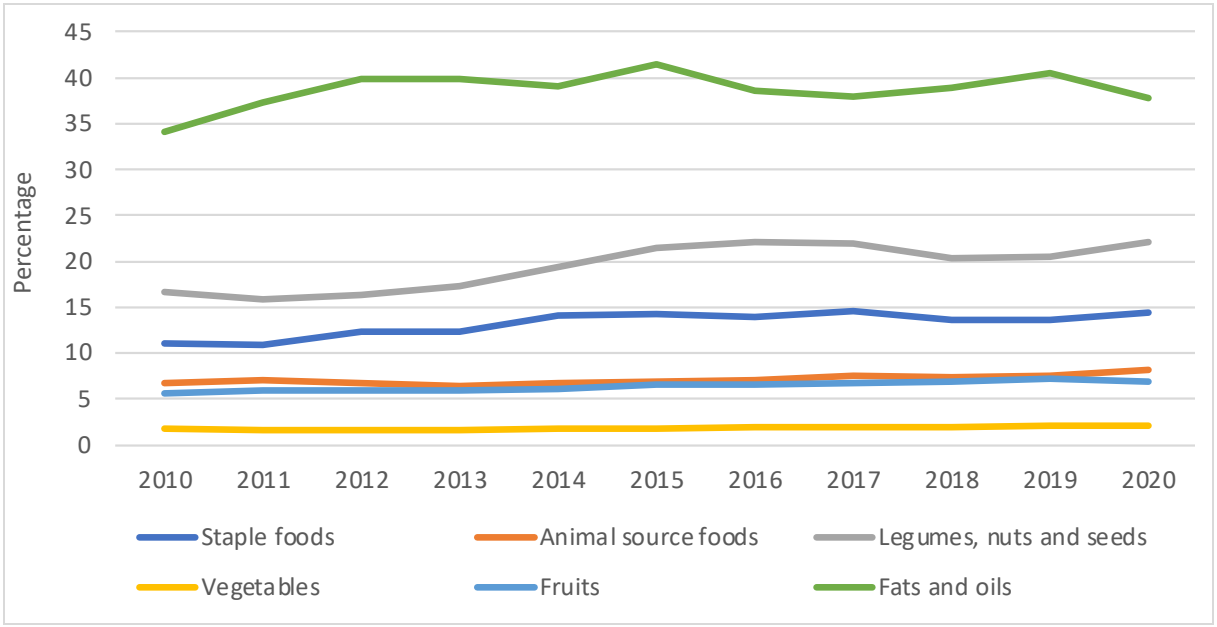
Source: Authors' own calculation based on FAO. 2023. FAOSTAT: Food Balance Sheets. In: *FAO*. [Cited 11 May 2023]. www.fao.org/faostat/en/#data/FBS

Figure 11. Trends in import shares to total food availability for food groups across regions and the world, 2010–2020

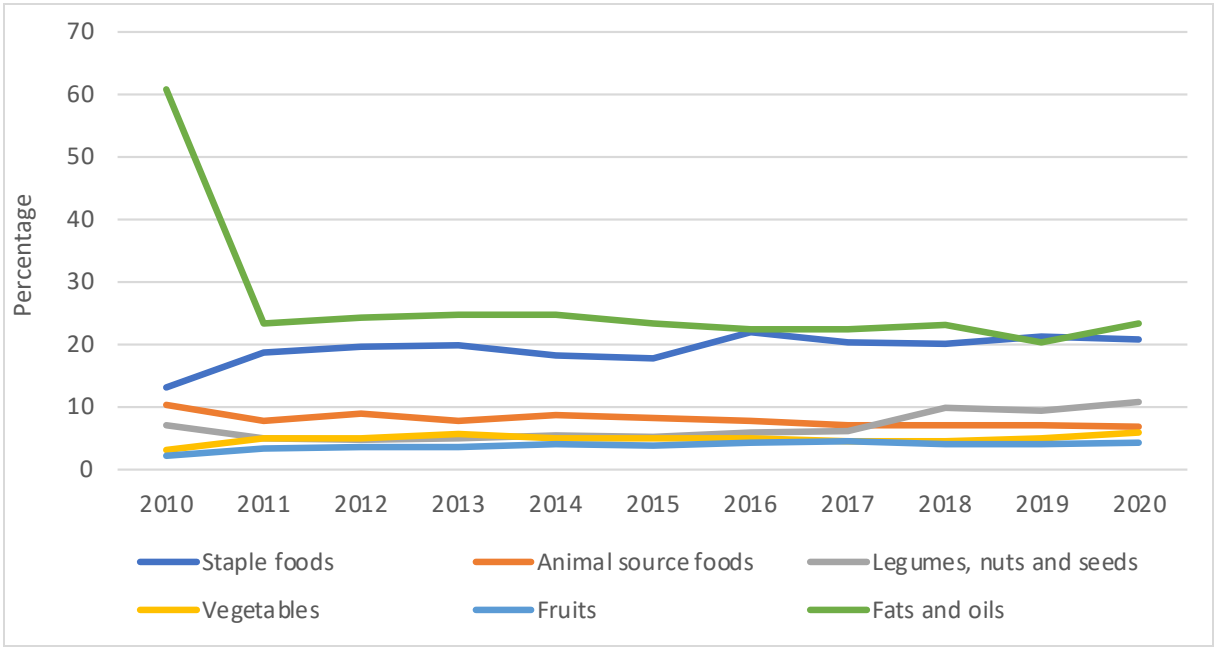
a. Africa



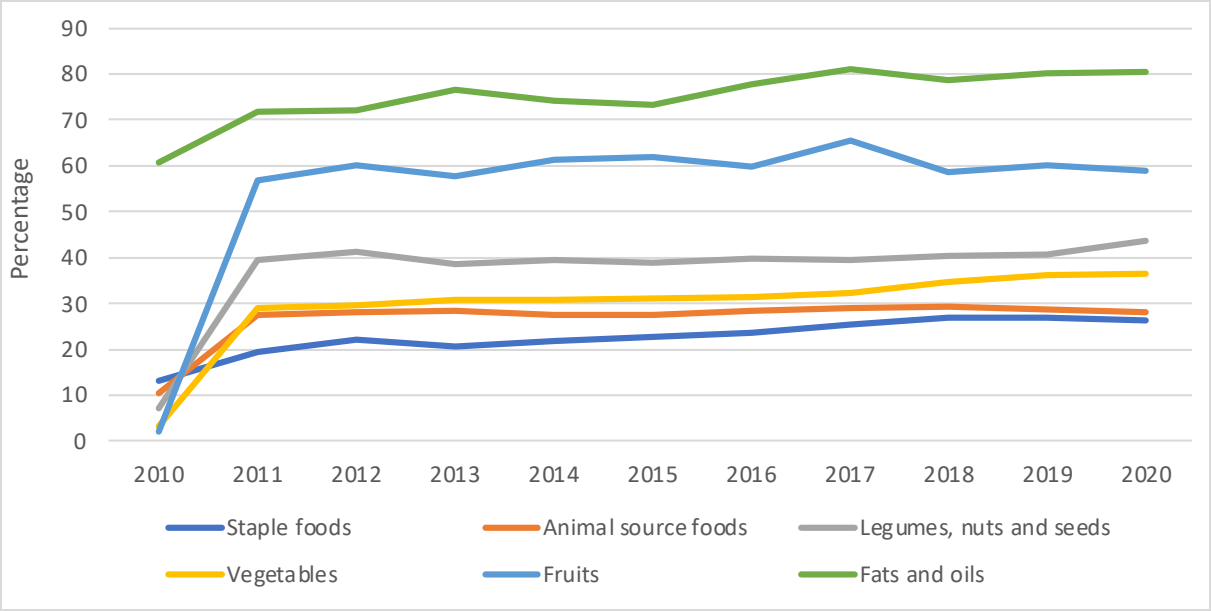
b. Asia



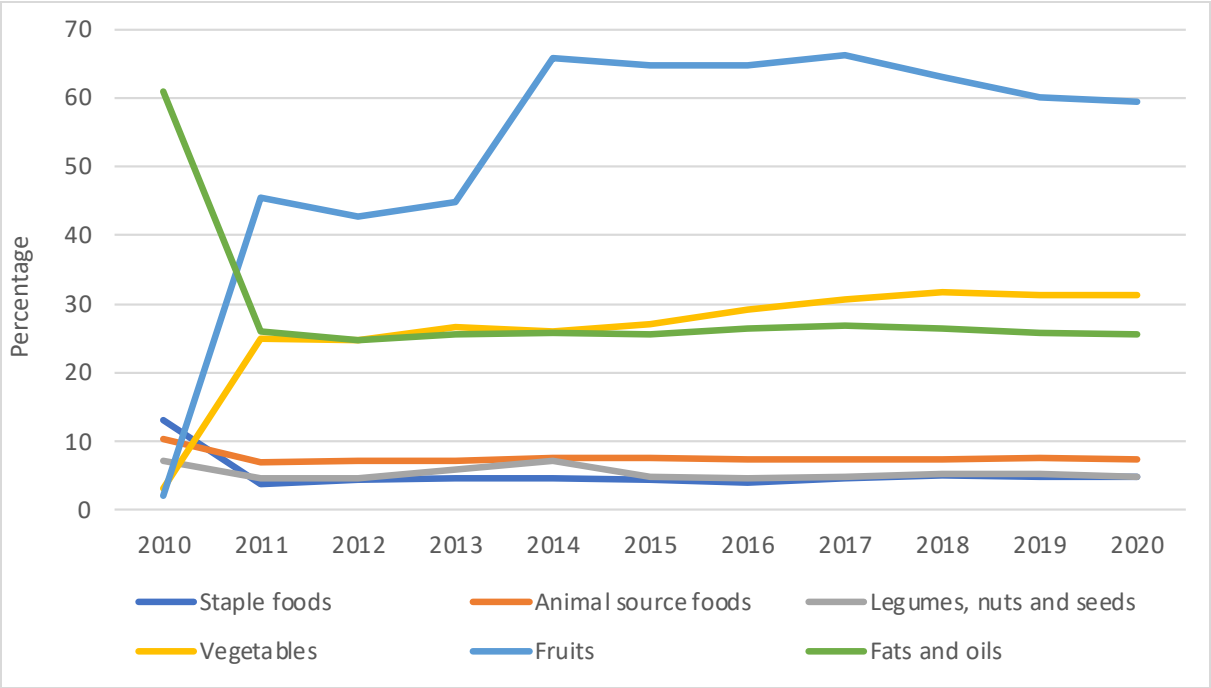
c. Latin America and the Caribbean



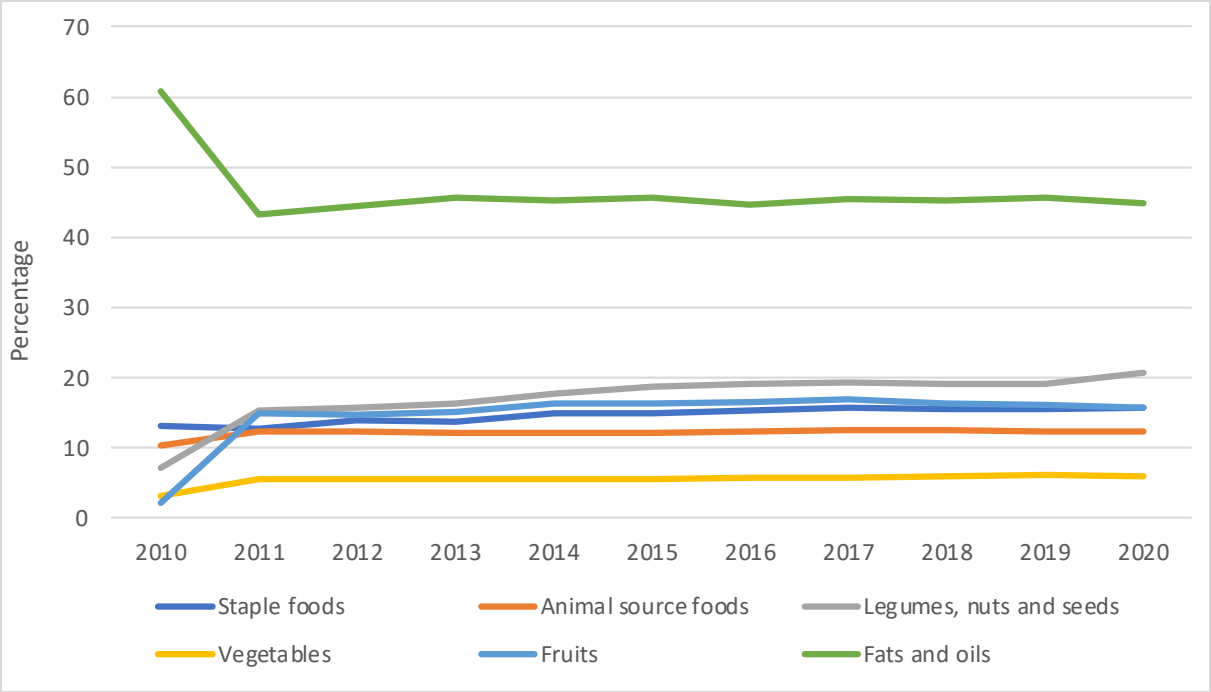
d. Europe



e. Northern America



f. World



Notes: Figures show the trends in food import shares as a percent of total food supply by region and globally. The import shares for each food group for Latin America and the Caribbean are a weighted average (based on population) of the import shares of South America and the Caribbean.

Source: Authors' own calculation based on FAO. 2023. FAOSTAT: Food Balance Sheets. In: *FAO*. [Cited 11 May 2023]. www.fao.org/faostat/en/#data/FBS

First, the majority of food across all regions is supplied by domestic supply chains. The only exceptions are fats and oils (largely imported in Africa and Europe), with shares at 62 percent and 80 percent, respectively, and fruits (sourced more from imports in Europe and Northern America, at about 60 percent). Europe and Northern America, supported by good infrastructure, processing and preservation technologies and high agricultural productivity, enjoy huge movements of fruits across borders and over long distances. In Africa, the import shares for all products (apart from fats and oils) are extremely low. Fruits and vegetables are overwhelmingly supplied by domestic supply chains, with import shares for both at less than 5 percent. For staple foods and legumes, nuts and seeds, import shares are 15 percent and 10 percent respectively. Domestic supply chains also account for the majority of all food groups in Asia and Latin America and the Caribbean. In Asia, the highest import shares were noted for fats and oils, and legumes, nuts, and seeds (38 percent and 22 percent respectively); while for animal source foods, fruits and vegetables, domestic supply chains account for over 90 percent of the total supply. For Latin America and the Caribbean, import shares are generally low, with domestic supply chains supplying over 80 percent of staple foods and fats and oils, and over 90 percent of animal source foods, legumes, nuts and seeds, fruits and vegetables.

Second, over time, import shares in Africa, Asia and Latin America and the Caribbean have largely been low and stable over the last decade for all food groups, except fats and oils in Latin America and the Caribbean and Africa. In Latin America and the Caribbean, there was a significant drop in import shares for fats and oils between 2010 and 2011, but this remained stable at the lower levels (around 20 percent) between 2011 and 2020 (see Figure 11); while

in Africa the import shares for fats and oils were significantly higher (around 60 percent) in the period analysed. In Europe, import shares seem to have increased quite significantly between 2010 and 2011 for many food groups and then remained largely stable between 2011 and 2020. For fats and oils and fruits, these higher levels have been at higher than 50 percent while, for all other products, the higher levels are still below half, indicating that domestic supply chains still provide most of the total supply of food. Similar to Europe, Northern America has also seen an increase in import shares for fruits and vegetables since 2010. For fruits, the increase has moved imports to a major source (at 60 percent by 2020), while for vegetables, the domestic supply accounts for about 70 percent of total supply. For all other products, the domestic supply chain remains the overwhelming source of food, accounting for over 80 percent of foods available in Northern America; increasing its role in fats and oils, pulses and staple foods between 2010 and 2020.

Third, in Africa between 2010 and 2020, though growth in per capita availability of nutrient-rich foods declined (for animal source foods and legumes) or increased only marginally (for fruits and vegetables), total quantities supplied of those products (largely domestic) soared. The ten-year growth rate in domestic supply of animal source foods between 2010 and 2020 was 29 percent in the region, similar to the growth rate in Asia over the same period (31 percent) (Table 23). For fruits and vegetables, growth rates in Africa, at 42 percent and 36 percent respectively, superseded those for Asia, at about 25 percent for both. For legumes, nuts and seeds, as well, domestic supply grew rapidly, at 34 percent in Africa, compared to 28 percent in Asia. This demonstrates that, despite the challenges faced by small-scale enterprises all along Africa's food systems, domestic supply booms continue to feed the growing population.

Table 23. Trends in the quantity of the total availability of key food groups from domestic supply chains across regions of the world, 2010–2020

	Staple foods					Animal source foods					Fats and oils				
	Africa	Asia	Latin America and the Caribbean	Northern America	Europe	Africa	Asia	Latin America and the Caribbean	Northern America	Europe	Africa	Asia	Latin America and the Caribbean	Northern America	Europe
	(million tonnes)					(million tonnes)					(million tonnes)				
2010	457	1434	141	389	389	58	479	74	125	205	6	61	11	14	12
2011	454	1473	143	380	428	58	488	82	126	204	6	60	12	14	11
2012	477	1473	144	372	377	66	507	75	127	203	6	61	12	15	11
2013	476	1479	143	398	418	65	527	83	127	202	7	62	12	15	9
2014	521	1453	159	377	413	67	549	78	129	208	5	65	13	15	10
2015	537	1523	166	386	399	67	560	82	130	208	6	68	13	16	11
2016	556	1560	143	436	399	68	573	79	134	206	6	69	14	17	9
2017	571	1574	166	402	388	68	595	78	136	205	6	77	15	17	8
2018	583	1608	166	378	374	69	617	85	137	209	7	76	15	18	9
2019	588	1616	166	401	381	74	636	83	139	212	7	79	18	19	9
2020	601	1639	175	415	383	75	629	84	141	214	8	83	16	19	9

	Fruits					Vegetables					Legumes, nuts and seeds				
	Africa	Asia	Latin America and the Caribbean	Northern America	Europe	Africa	Asia	Latin America and the Caribbean	Northern America	Europe	Africa	Asia	Latin America and the Caribbean	Northern America	Europe
	(million tonnes)					(million tonnes)					(million tonnes)				
2010	73	299	53	20	38	67	763	21	33	69	58	453	94	69	55
2011	74	306	55	20	38	67	791	21	32	73	59	476	102	70	57
2012	80	320	51	22	33	74	813	21	33	69	66	499	96	69	53
2013	83	331	50	22	39	73	835	21	31	69	66	486	97	69	62
2014	89	341	51	13	34	79	854	22	34	69	63	490	105	75	62
2015	91	347	52	13	34	82	880	22	33	68	67	489	112	80	65
2016	90	345	47	14	37	80	900	22	32	68	68	482	117	82	66
2017	93	356	45	13	30	82	916	23	31	68	71	552	118	86	70
2018	98	367	49	16	41	86	927	23	30	63	75	570	113	87	73
2019	101	377	50	18	37	88	933	23	32	60	77	578	113	78	71
2020	104	378	49	16	40	91	952	22	32	58	78	580	105	79	68

Note: The total availability for Latin America and the Caribbean is a weighted average (based on population) of the total availability of South America and the Caribbean.

Source: Authors' own calculation based on FAO. 2023. FAOSTAT: Food Balance Sheets. In: *FAO*. [Cited 11 May 2023]. www.fao.org/faostat/en/#data/FBS

5 Macro-meso view: the supply distribution of food consumption – illustrations focusing on Burkina Faso and Nigeria and main imports of wheat and rice

Chapter 3 analysed the shares of total food consumption by food groups across the rural–urban continuum (URCA) and household income levels, providing a micro view of food demand and consumption behaviour. This chapter changes the perspective and analyses how the shares in the total pie of the consumption of each of the particular food products are distributed across the rural–urban continuum (URCA) and over household income strata.

This chapter particularly focuses on the supply (= demand) distribution of imported versus domestically supplied shares, with special focus on rice and wheat. Three reasons underly these two interests.

First, there is considerable policy interest in imports (although Chapter 4 demonstrates that these are a small share of overall food consumption in the LMICs, including sub-Saharan Africa), and an assumption that the bulk of these imports goes to cities, i.e. biased in their supply (and demand) toward the cities. This is an important issue for the urban food transformation debate.

Second, there are no data in either the macro data sources or the LSMS data sets to analyse where domestic supplies of products come from and how they are distributed across the rural–urban continuum; nor do we know – except for the cases of rice and wheat – the destination of supply of imports versus domestic volumes to particular locations across the rural–urban continuum. The LSMS data do not (except for rice explicitly, and for wheat implicitly as it is nearly all imported) show what shares of the consumption of a product in a particular location across the rural–urban continuum (URCA) or household income stratum come from imports versus domestic supply. LSMS data also do not show what (domestic) areas supply the food that is consumed in a given location across the rural–urban continuum (URCA) or across the household income strata.

Finally, only in the cases of rice and wheat can LSMS data be used with confidence to determine where imports versus domestic supplies fulfil demand. In those cases, the LSMS demand data are equivalent to “supply to consumers” data.

The analysis provided in this chapter shows, for example, how the total consumption (= supply) of wheat is distributed across the rural–urban continuum (URCA) and over household income strata. As wheat is nearly all imported in our case-study countries – Nigeria and Burkina Faso (chosen to compare high- and low-food-budget countries, see Table 8 in Chapter 4), this analysis is equivalent to knowing how wheat imports supply the different locations across the rural–urban continuum (URCA) and household income strata; that is, where wheat imports go.

This issue is important in not only in Nigeria and Burkina Faso, but also in other African countries where wheat imports are important. In the case of rice, rice consumption data for both Burkina Faso and Nigeria indicate whether the rice is imported or domestic. In Burkina Faso, total consumption (hence supply) of rice equals 135 000 tonnes imported, and 446 000 tonnes domestically produced (hence the total consumption by disappearance is 581 000 tonnes, and the import share in the latter is 23 percent of total supply). In Nigeria, 1 351 000 tonnes of rice are imported, and 8 172 000 tonnes are produced (hence 14 percent of rice consumption by disappearance comes from imports).

Seen from the lens of shares of the total food import pie, rice and wheat are the largest food import items by share of tonnes. In Nigeria, rice and wheat comprise a majority of the tonnage of food imports, at 58 percent (wheat at 47 percent and rice at 11 percent). These are followed by sugar, at 16 percent; palm oil, at 10 percent; and fish, at 6 percent; with diverse products comprising the remaining 11 percent. In Burkina Faso, wheat and rice imports comprise 38 percent of the tonnage of food imports (wheat at 25 percent and rice at 13 percent); while fish comprises 16 percent; sugar and other sweeteners comprise 12 percent, and other diverse products comprise 34 percent.

5.1 Data and methods

The distribution of food supply in a country, for instance across the rural–urban continuum (URCA) and by household income strata (low, middle and high), is derived directly by applying household food consumption shares by product to total national imports and domestic supply per product. This methodology thus implies food supply distribution shares in imports and in domestic supply per product, by aggregate of consumer groups across the rural–urban continuum (URCA) and by household income strata applying the food item consumption shares estimates in the food demand analysis presented in Chapter 3. See Chapter 3.1 for the data and methodology for the estimation of food item food consumption shares. See Chapter 4.1 for the data and methodology for estimations of food supply per food item/product.

5.2 Findings

Table 24 and Table 25 present rice and wheat import shares juxtaposed with consumption shares across the rural–urban continuum (URCA) and by household income terciles for Nigeria and Burkina Faso, respectively. The following are the main findings for rice and wheat, comparing Nigeria as a case of a high-food-budget country and Burkina Faso as a case of a low-food-budget country.

5.2.1 Rice

In Nigeria, imported rice is disproportionately consumed by urban consumers (who consume 47 percent of the imported rice, but comprise just 24 percent of the LSMS national population in Nigeria, a ratio of about 2 to 1). Note that in the large, intermediate and small city categories, the ratio is about 2 to 1, but in the peri-urban areas of intermediate and small cities (<1 hour to an intermediate or small city), and in towns, the relation inverts: they consume disproportionately (to their share in the population) less imported rice.

In Burkina Faso, the patterns for imported rice consumption are similar to those in Nigeria. The urban share of national rice consumption is roughly twice the urban population share (in the LSMS national sample).

In Nigeria, domestic rice is disproportionately consumed by peri-urban and rural consumers (who consume 83 percent of the domestic rice while comprising 76 percent of the LSMS total national population), while the share of total domestic rice consumption by urban consumers is below their share in the LSMS national population (17 percent versus 24 percent). This may be explained by domestic rice being perhaps of lower quality and locally more accessible (in production areas) than imported rice.

In Burkina Faso, the urban share of the domestic rice consumed is below the urban share of the population (15 percent versus 22 percent), as it is in the peri-urban areas (39 percent

versus 50 percent). The rural share of domestic rice consumption, however, is far above the respective rural population share (46 percent versus 28 percent). High income households in rural areas consume 24 percent of the nation's domestic rice consumption, even at only 9 percent of the population. But it should be considered that Nigeria produces 22 times more rice than Burkina Faso, while Nigeria has only 10 times the population of Burkina Faso. That is, domestic rice production is a minor phenomenon in Burkina Faso.

In Nigeria, the shares of imported rice consumption rise and the shares of domestic rice consumption generally fall over household income strata in each location across the rural–urban continuum. What is noteworthy is the extent to which this trend occurs across peri-urban household income strata. The high household income strata in peri-urban areas consumes 32 percent of the national imported rice, whereas the low household income strata in peri-urban areas consumes only 3 percent of the national imported rice.

By contrast, in Burkina Faso, the shares in rice consumption by household income level – overall as well as for imports – increase rapidly from low to high household income levels in rural areas. Over the rural–urban continuum (URCA), the disproportion of the share of total national rice consumption declines with city size and over rural areas moving toward the more remote hinterland. The overall pattern is one of rice being more of a luxury and an urban product in Burkina Faso, versus a necessity and an urban and rural product in Nigeria.

Table 24. Rice and wheat product level import shares juxtaposed with consumption shares (food supply cum demand) across the rural–urban continuum (URCA) and by household income terciles for Nigeria (in national kg consumption pies by product)

	Import shares	National				Urban				Peri-urban				Rural				URCA									
		National	Low-income household	Middle-income household	High-income household	Urban	Low-income household	Middle-income household	High-income household	Peri-urban	Low-income household	Middle-income household	High-income household	Rural	Low-income household	Middle-income household	High-income household	Large city (>1 million people)	Intermediate city (0.25–1 million people)	Small city (50–250 thousand people)	Town (20–50 thousand people)	<1 hour to a large city	<1 hour to an intermediate city	<1 hour to a small city	<1 hour to a town	1–2 hours to a city or town	>2 hours to a city or town
Number of households surveyed	n/a	4 972	1 120	1 498	2 354	1 441	335	429	677	3 261	724	1 041	1 496	270	78	75	117	589	340	377	135	1 299	1 094	868	36	196	38
Estimated represented population (thousands)	n/a	149 364	49 797	49 795	49 772	36 478	12 206	12 125	12 147	101 507	33 903	33 783	33 820	11 379	3 877	3 721	3 780	13 047	10 248	9 685	3 498	34 512	37 151	29 843	737	10 207	435
Estimated share of total population (%)	n/a	100	33	33	33	24	8	8	8	68	23	23	23	8	3	2	3	9	7	6	2	23	25	20	0	7	0
Average daily total expenditure per capita (USD)	n/a	3.81	1.26	2.37	5.89	5.30	2.10	3.69	8.05	3.23	1.13	2.08	4.92	3.12	1.27	1.93	4.99	5.96	4.48	5.53	3.93	4.11	2.90	2.30	2.59	2.95	5.77
Average daily food consumption per capita (USD)	n/a	2.26	0.88	1.57	3.32	2.84	1.28	2.11	4.14	2.03	0.80	1.42	2.97	1.99	0.90	1.39	3.03	3.04	2.44	3.08	2.32	2.51	1.85	1.52	1.59	1.88	3.80
Share of national market annual kilograms of consumption																											
Rice – domestic	–	100	34	39	27	17	7	6	5	76	21	30	25	7	3	3	2	3	7	6	1	20	30	25	1	6	0
Rice – imported	–	100	6	29	65	47	11	17	20	47	3	12	32	5	0	1	4	19	11	11	7	29	13	5	0	5	1
Rice – unspecified	7	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Wheat	95	100	13	29	58	36	6	11	19	58	8	17	33	5	1	1	3	14	9	10	2	29	18	12	0	5	1

Notes: The table shows the distribution of food supply across the rural–urban continuum (URCA) and by household income level. Food supply shares are derived directly from realized consumption and shares of imports in total national consumption for each product, implying shares in imports and shares in domestic supply per product and aggregate of these consumer groupings. Household income levels (low, middle and high) are calculated using terciles of total household expenditure per adult equivalent as proxy. URCA: Urban Rural Catchment Areas.

Source: Authors' own elaboration.

Table 25. Rice and wheat product level import shares juxtaposed with consumption shares (food supply cum demand) across the rural–urban continuum (URCA) and by household income terciles for Burkina Faso (in national kg consumption pies by product)

	Import shares	National				Urban				Peri-urban				Rural				URCA									
		National	Low-income household	Middle-income household	High-income household	Urban	Low-income household	Middle-income household	High-income household	Peri-urban	Low-income household	Middle-income household	High-income household	Rural	Low-income household	Middle-income household	High-income household	Large city (>1 million people)	Intermediate city (0.25–1 million people)	Small city (50–250 thousand people)	Town (20–50 thousand people)	<1 hour to a large city	<1 hour to an intermediate city	<1 hour to a small city	<1 hour to a town	1–2 hours to a city or town	>2 hours to a city or town
Number of households surveyed	n/a	6 601	1 437	2 015	3 149	2 117	598	660	859	3 237	677	943	1 617	1 247	372	394	481	576	270	951	320	751	440	2 046	84	1 031	132
Estimated represented population (thousands)	n/a	19 095	6 366	6 364	6 365	4 281	1 429	1 443	1 409	9 559	3 192	3 185	3 182	5 255	1 760	1 746	1 749	2 233	1 005	809	235	1 317	747	7 495	430	3 962	862
Estimated share of total population (%)	n/a	100	33	33	33	22	7	8	7	50	17	17	17	28	9	9	9	12	5	4	1	7	4	39	2	21	5
Average daily total expenditure per capita (USD)	n/a	3.70	1.31	2.31	6.12	6.40	2.36	4.19	10.06	2.70	1.22	2.00	4.12	2.69	1.21	1.97	4.28	7.50	4.93	5.41	4.35	2.91	3.25	2.60	4.04	2.61	2.41
Average daily food consumption per capita (USD)	n/a	1.57	0.65	1.10	2.44	2.32	0.98	1.62	3.51	1.25	0.60	0.97	1.87	1.34	0.61	0.99	2.11	2.64	1.83	2.12	1.76	1.31	1.38	1.23	2.35	1.25	1.24
Share of national market annual kilograms of consumption																											
Rice – domestic	–	100	17	37	46	15	4	5	6	39	5	11	23	46	7	15	24	5	6	3	1	2	4	33	2	38	7
Rice – imported	–	100	9	26	65	48	10	17	21	36	4	11	21	16	1	4	11	28	10	8	2	7	3	26	5	9	2
Rice – unspecified	70	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Wheat	84	100	3	15	82	63	7	17	39	22	1	4	17	16	1	2	13	33	19	9	2	3	4	15	1	10	4

Notes: The table shows the distribution of food supply across the rural–urban continuum (URCA) and by household income levels. Food supply is derived directly from realized consumption and shares of imports in total national consumption for each product, implying shares in imports and shares in domestic supply per product and aggregate of these consumer groupings. Household income levels (low, middle, and high) are calculated using terciles of total household expenditure per adult equivalent as proxy. URCA: Urban Rural Catchment Areas.

Source: Authors' own elaboration.

5.2.2 Wheat

In Nigeria, wheat consumption is somewhat over-represented (ratio of 1.5 to 1) in urban areas (compared to the urban population share) and under-represented (ratio of 0.6 to 1) in rural areas. This is expected as highly processed foods were shown to have penetrated rural areas less to date (see Chapter 3). In rural and urban areas, high income households have thrice the share of low income households (and the household income groups have equal population shares in both urban and rural population), indicating a strong luxury consumed by few of the poor (echoing Liverpool-Tasie *et al.* [2023] for Nigeria).

In Burkina Faso, the Nigerian patterns are present but sharply accentuated in urban areas. Urban consumers' share in national consumption of wheat, at 63 percent, is a ratio of 3 to 1 of their shares in the national population. On the other hand, rural consumers' wheat consumption share is similar to their share of the population, at a ratio of 0.6 to 1. The patterns across household income terciles are likewise similar to Nigeria, but again highly magnified. The urban high income household group consumes almost six times the share of wheat as compared to urban low income households, and in rural areas, high income households the share of wheat consumed is thirteen times that of the low income households. These patterns are expected as Burkina Faso is poorer than Nigeria and the luxury status of wheat divides consumers more than it would in a wealthier country.

In Nigeria, the urban URCAs show a declining trend in national consumption and population shares as over city size. Interestingly, the largest share of any URCA is that of the peri-urban area of large cities, which comprise 29 percent of the national consumption of wheat, compared with 23 percent of the population. It is possible that this is due to intense commuting from peri-urban to urban areas and the reliance on bread and other commuting or food service foods. Overall, the Burkina Faso URCA patterns are roughly similar to those of Nigeria.

6 Conclusions

Several key findings have emerged from this literature review and the macro, meso and micro data analysis.

First, agrifood value chains have been transforming rapidly over recent decades in LMICs. The dominant stage at present in Africa and South Asia is the transitional stage, characterized by increasingly long domestic agrifood systems value chains criss-crossing the rural–urban continuum, and dominated by SMEs, with the modern sector just emerging and the traditional stage now very minor. The modern stage has come to dominate in Latin America and the Caribbean and parts of Southeast Asia and East Asia, with emerging dominance of large firms.

Second, food consumption and diets have transformed along with the several-decade transformation of agrifood value chains and is discernible in the micro data that was analysed. Across the rural–urban continuum, among all household income groups, food purchase shares of food consumption have risen to be the majority of consumption, and processed foods at all processing levels are now important. Furthermore, diets have transformed as Bennett's law predicts, with the majority of consumption is non-cereals. The data analysis showed that, in Africa, these changes are occurring not only in high-food-budget countries, but also in low-food-budget countries; and not only in urban areas, but also in peri-urban and rural areas, just moderately less advanced. Furthermore, rather than being a middle-class phenomenon, these changes are also shared by the poor. These spatial, country and income group findings complement a handful of other new studies showing similar patterns. However, this report is the first analysis applying a disaggregated rural–urban continuum lens and a detailed data from 70 000 households in 11 countries, all with the same method of spatial and income stratifications, have been analysed to these hypotheses.

Third, employing a supply-cum-demand perspective, it was found that imports of rice and wheat are widely distributed over the rural–urban continuum (URCA) and household income strata in two African countries, but with some bias towards urban and higher household income strata. By contrast, domestic rice is more distributed towards peri-urban and rural areas. This type of analysis is new, or at least rare, in the literature and can be extended to other products and countries to study distribution over the rural–urban continuum and income strata, not only of mainly imported (wheat) or partially imported (rice) items, but also of purely domestic items, such as teff.

And last, but importantly, the macro data analysis showed that the availability of foods that are essential to a healthy diet, including vegetables, fruits, and pules, nuts and seeds, are insufficient to meet the daily dietary requirements in almost every region of the world, regardless of their level of development. Particularly concerning is the insufficient availability of all food groups apart from staple foods in Africa. The persistent insufficiency in supply of nutritious foods points to the need to persist at policy and public investment measures to spur further supply.

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Annexes

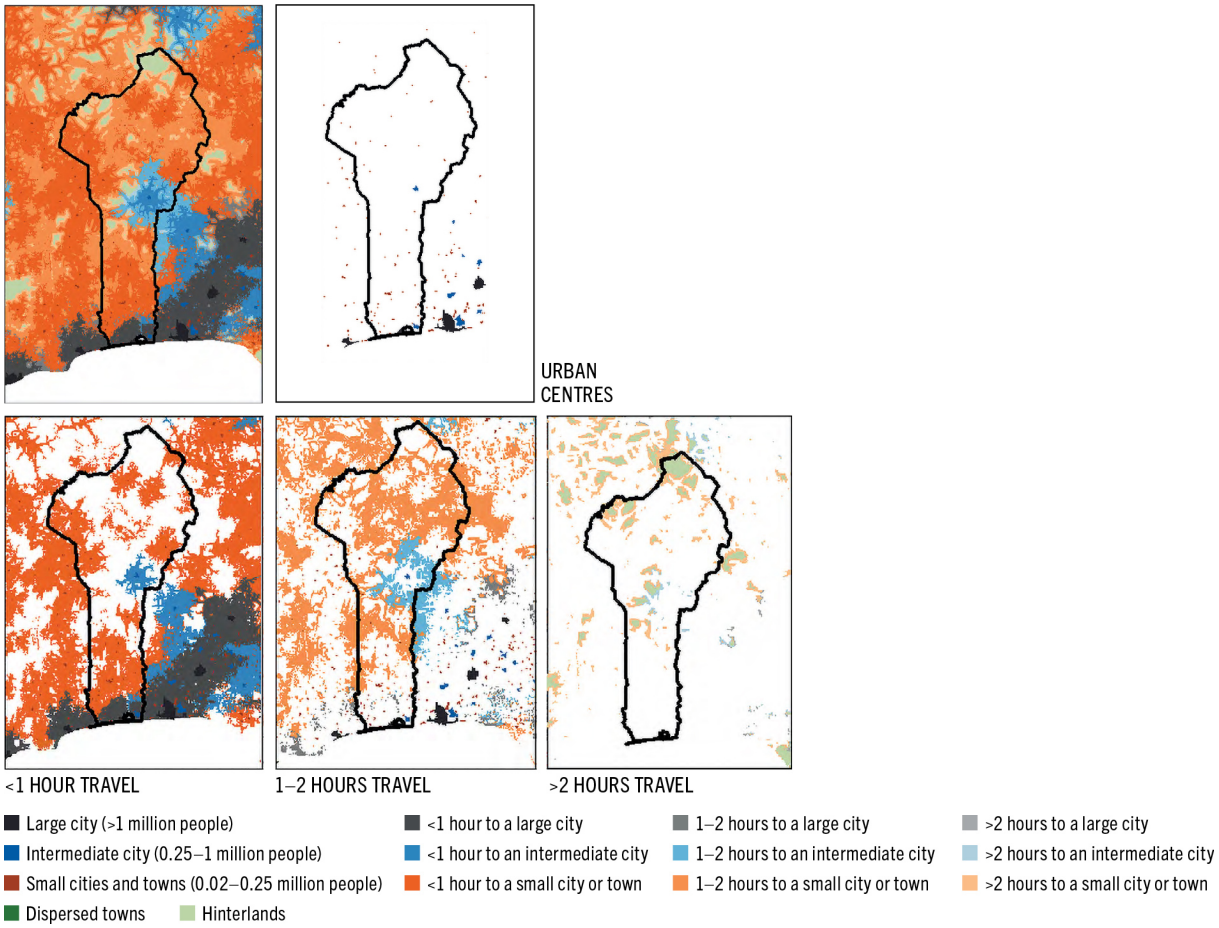
Annex 1. URCA maps showing patterns of urbanization for countries analysed

Figure A1 presents URCA maps for 9 of the 11 Western, Eastern and Southern African countries analysed in Chapter 3, Chapter 4 and Chapter 5. The other two countries are presented in Figure 1 in Chapter 3.

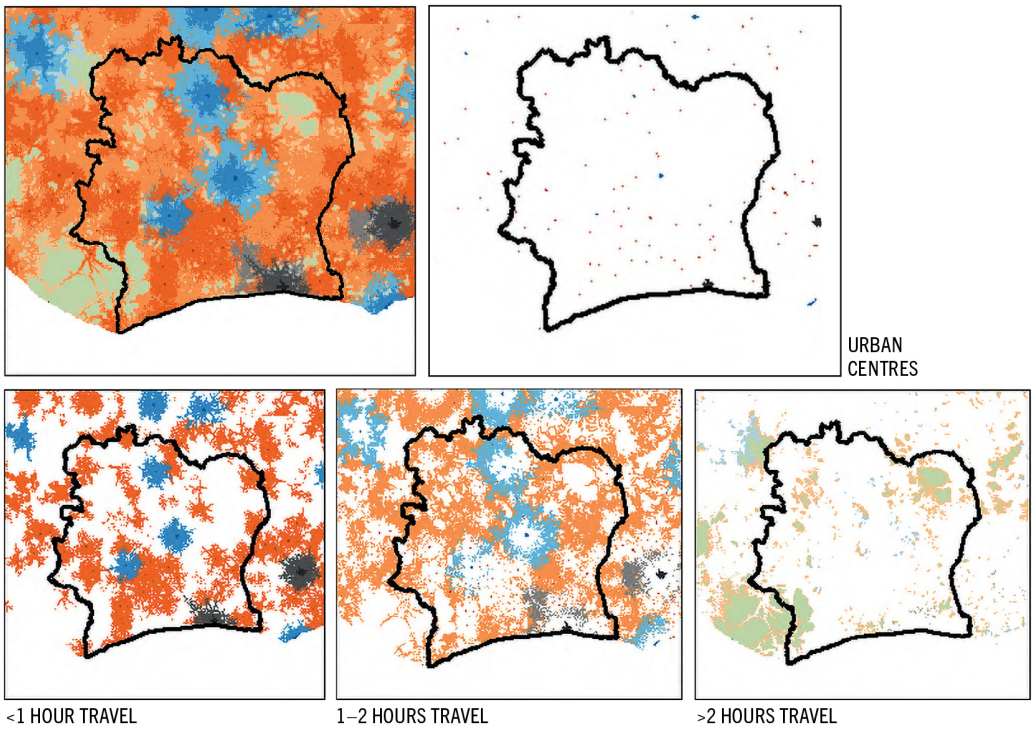
The maps show different patterns of urbanization, from a denser metropolitan urbanization pattern (example Senegal) to a small city or town dispersed urbanization pattern (example Ethiopia). For each figure, the top left map shows the overlay of all URCA categories, and the top right map shows the location of urban centres. The bottom maps show, moving left to right, the areas that are less than 1 hour, 1 to 2 hours, and more than 2 hours travel to any urban centre.

Figure A1. Urban–rural catchment areas

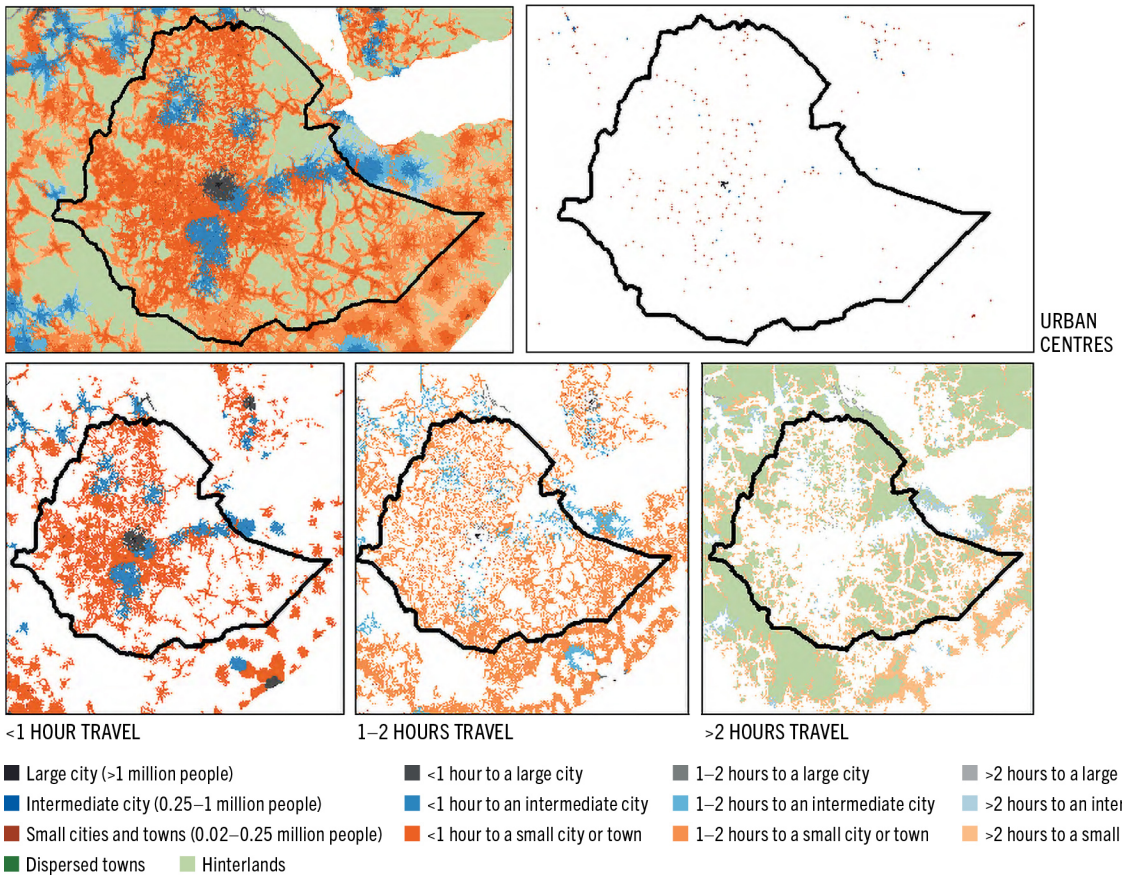
a. Benin



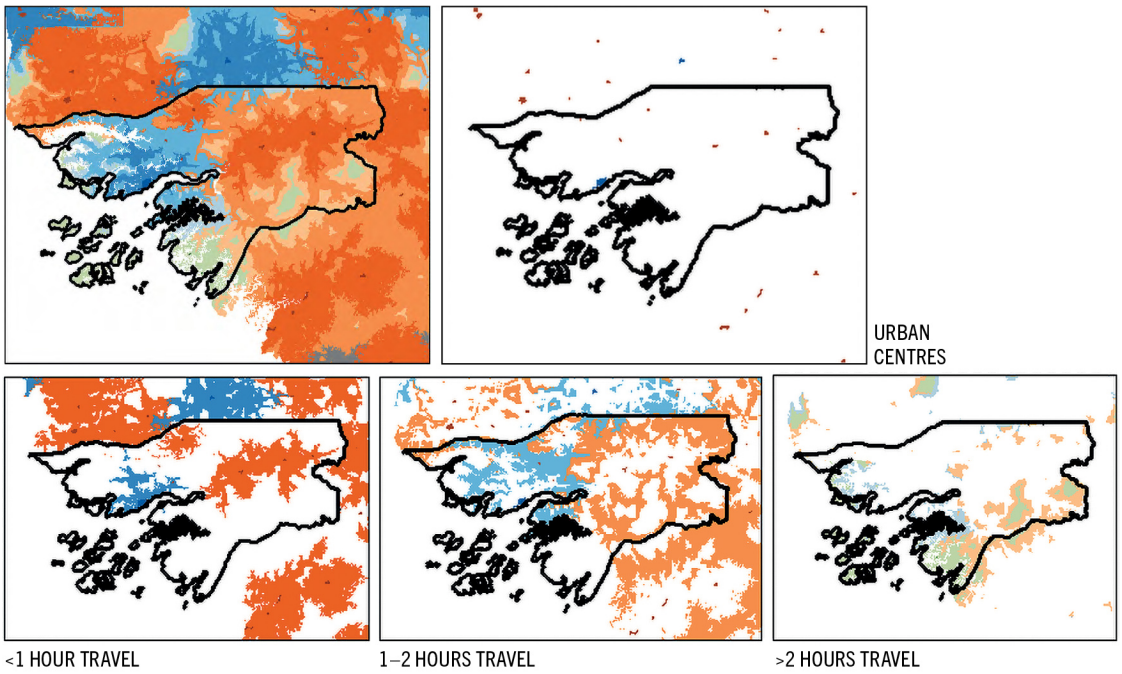
b. Côte d'Ivoire



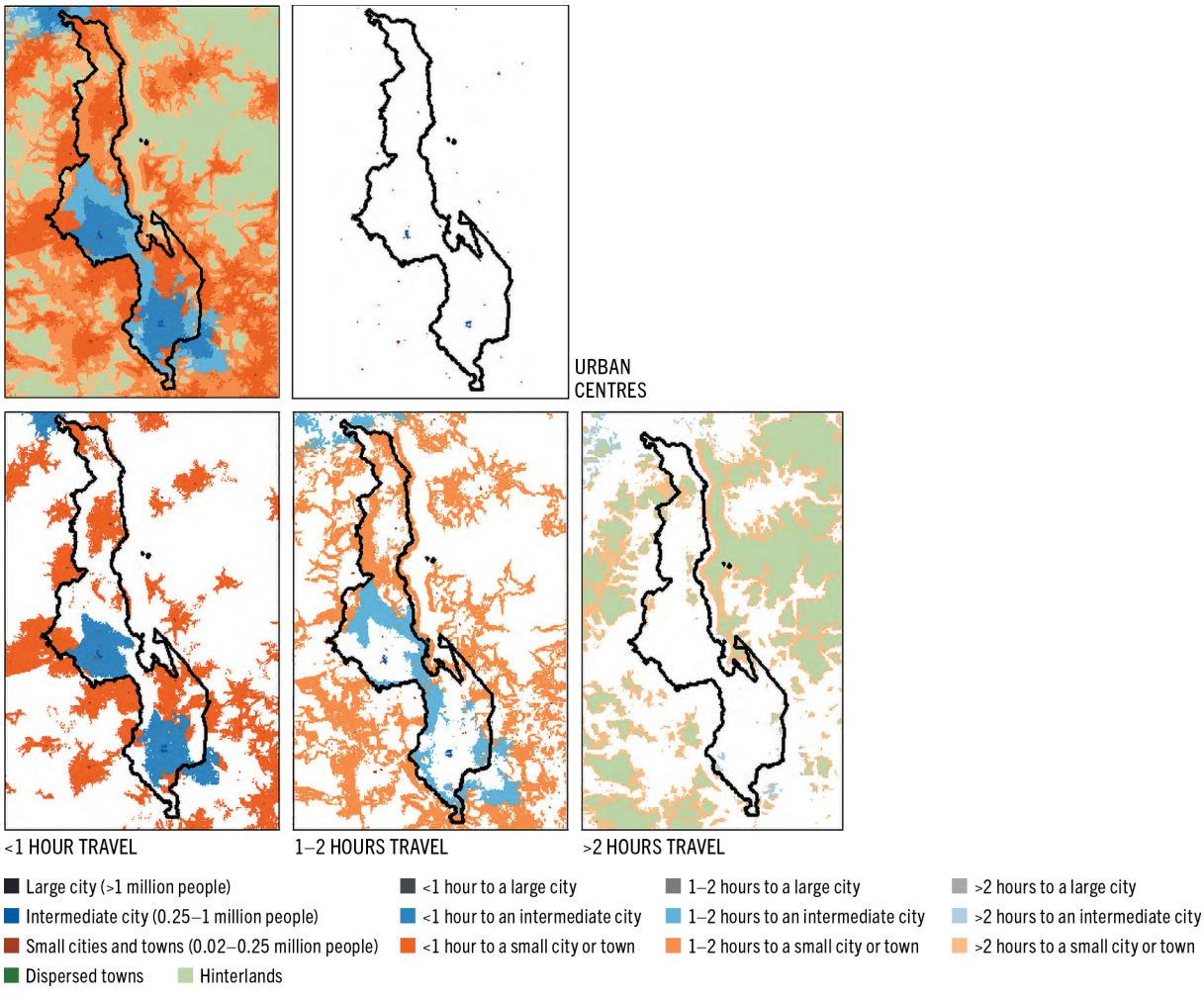
c. Ethiopia



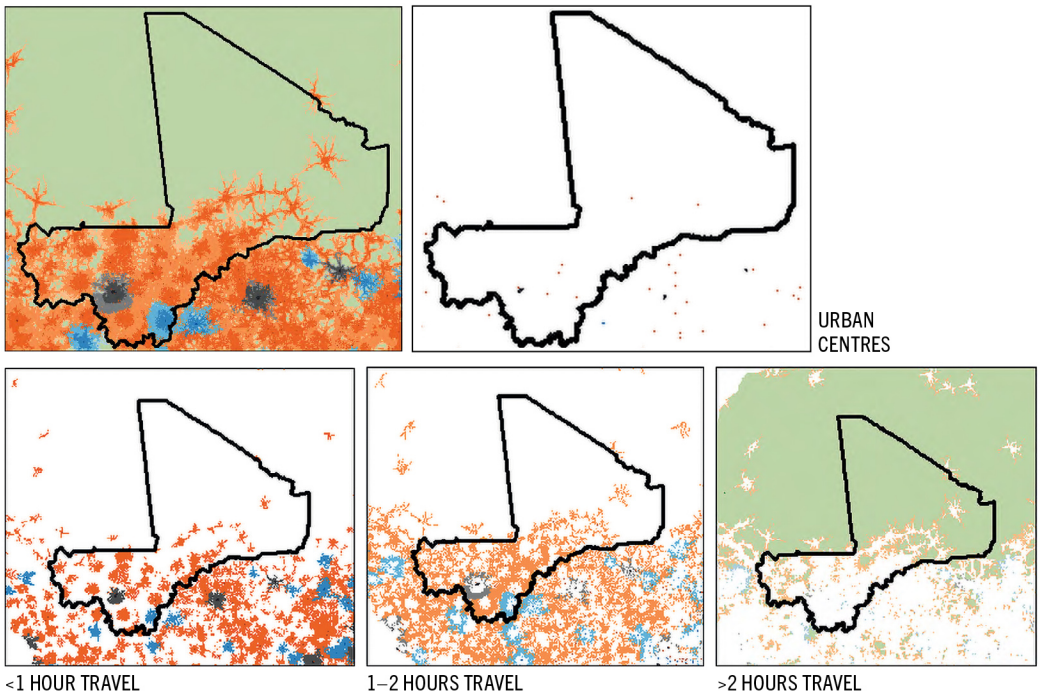
d. Guinea-Bissau



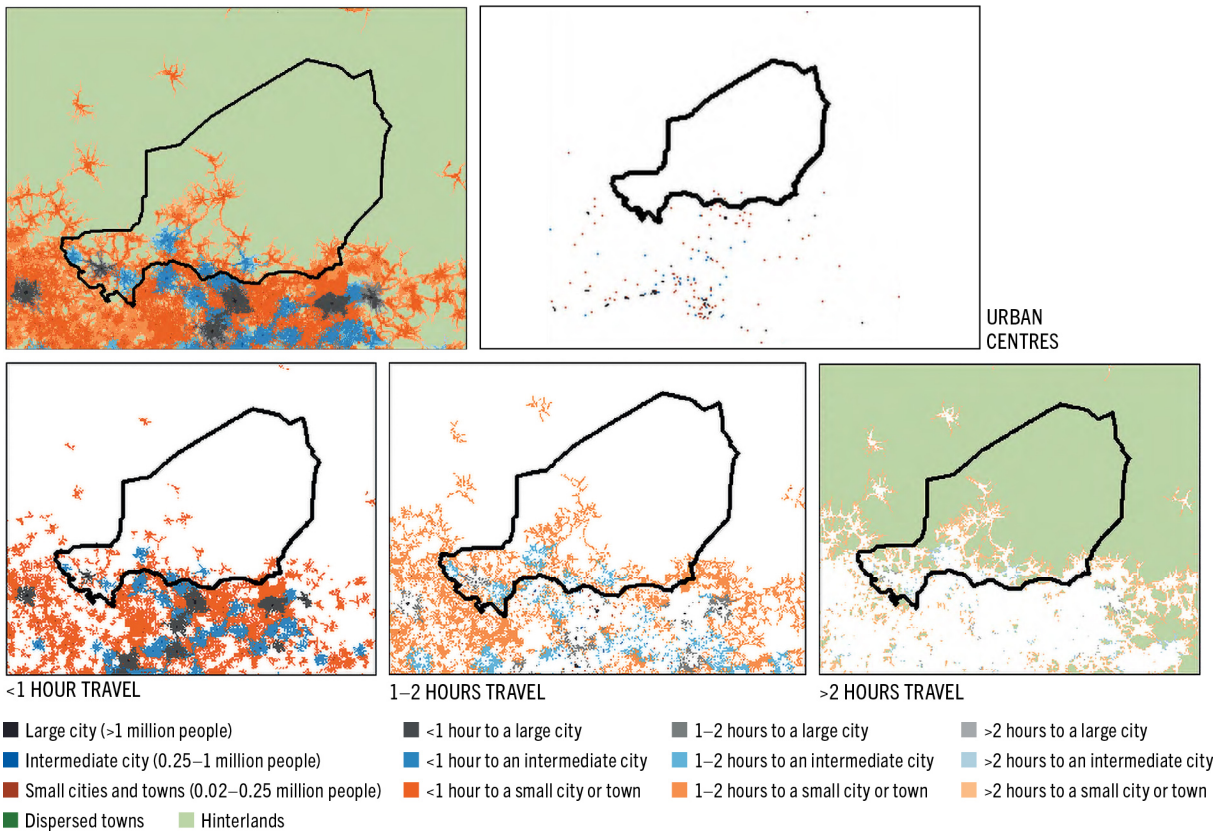
e. Malawi



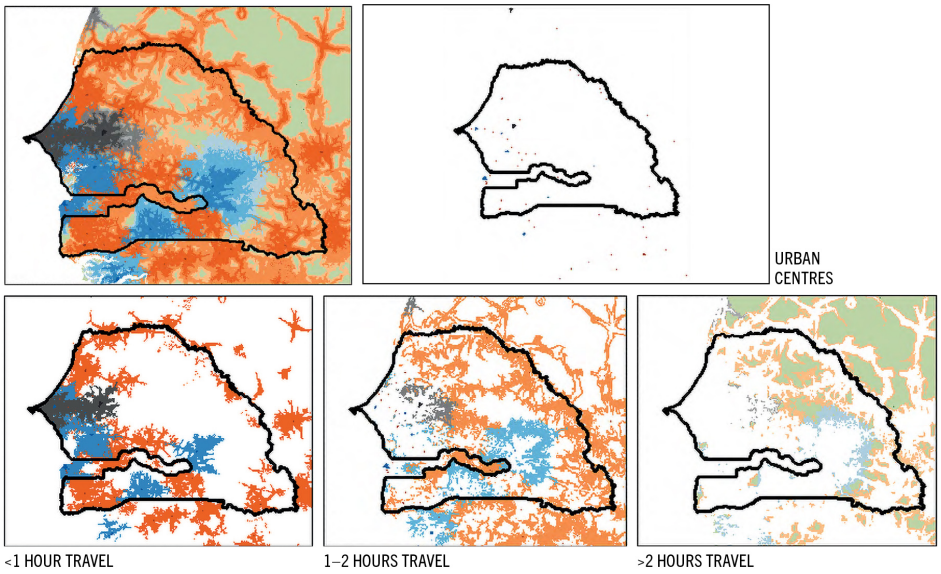
f. Mali



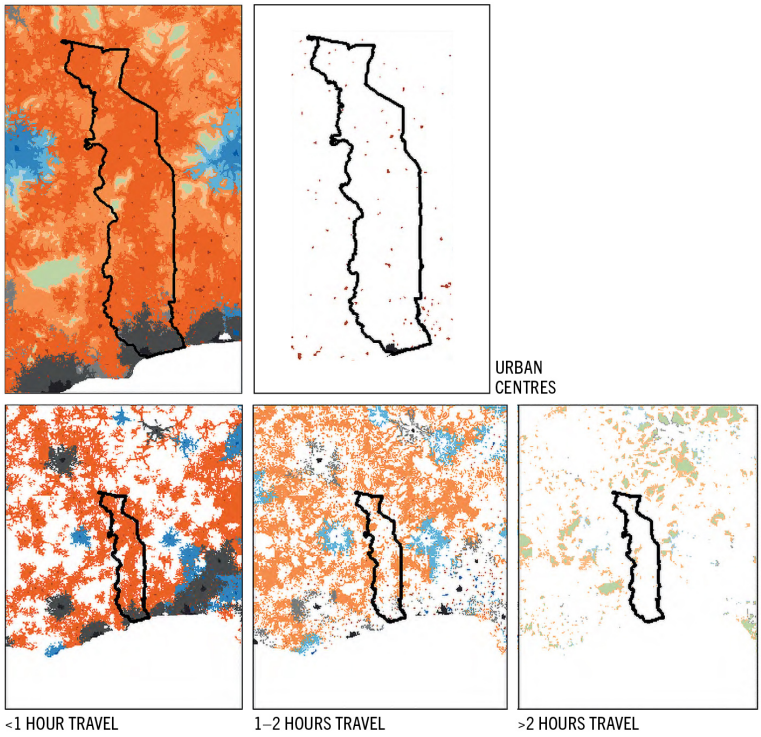
g. Niger



h. Senegal



i. Togo



Notes: In all panels, the top left map displays all urban–rural catchments areas. The top right map shows only the three categories of urban centres (large, intermediate, and small city or town). The bottom left map displays areas 1 hour travel or less to any urban centre, roughly corresponding to what are defined as peri-urban areas in Chapter 3. The bottom centre map displays areas 1 to 2 hours travel to any urban centre, and the bottom right map displays areas more than 2 hours travel to any urban centre. The bottom centre and bottom right maps roughly correspond to what are defined as rural areas in Chapter 3.

Source: Authors' own elaboration based on FAO. 2021. Global Urban Rural Catchment Areas (URCA) Grid – 2021. In: *FAO*. [Cited 12 June 2023]. https://data.apps.fao.org/?share=g-3c88219e20d55c7ce70c8b3b0459001a for URCA categories.

Annex 2. Analysis of processed food consumption shares applying the standard NOVA processing classification system

Section 3.3 presents an analysis of processed consumption applying a modified NOVA processing classification (see Table 4). This modified NOVA is more suitable for an understanding of how urbanization is affecting agrifood systems and food supply chains. However, a second parallel analysis was undertaken applying the standard NOVA processing classification without modification (see FAO [2015]), as widely used when considering different scenarios related to health and nutrition. The results applying the standard NOVA processing classification are presented here and are reported in detail in *The State of Food Security and Nutrition in the World 2023* (FAO *et al.*, 2023).

The term "food processing" involves applying scientific and technological principles to preserve foods by slowing down or stopping the natural processes of decay (Fellows, 2004). The degree of food processing can vary from unprocessed raw foods (such as fresh fruit eaten as such) to food products whose ingredients are derived from food but contain little or no whole food (such as extruded cereals) (FAO, 2015). Certain food processing methods can help to increase food availability by allowing transport of foods across the globe, thus extending seasonal availability beyond what is produced locally in a specific season, and also making food safer to eat (GLOPAN, 2016). Foods and food products processed in industrial settings differ from those prepared manually at home or in artisanal settings, employing different ingredients and methods (FAO, 2015).

The NOVA food classification is one of the available food processing classification systems that has been considered in different scenarios for public health, nutrition and epidemiological research. However, there are important limitations in this classification. The definition of levels of food processing, as proposed by NOVA, is complex and multidimensional, which increases the risk of misclassification of food items (Braesco *et al.*, 2022). In addition, the first category combines unprocessed and minimally processed foods, which makes it difficult to unambiguously interpret the findings.

In the analysis presented below, food items were classified according to the four standard NOVA processing aggregation groups (Monteiro *et al.*, 2019); but for the purposes of presentation, these were reduced to three groups, with groups 2 and 3 combined as one group. The three main groups (with food item examples in each) and the names used in this report are shown in Table A1.

Table A1. Food processing aggregation used in *The State of Food Security and Nutrition in the World 2023*

NOVA processing groups	Processing aggregation and names applied for *The State of Food Security and Nutrition in the World 2023*	Food items – examples					
1. Unprocessed and minimally processed	**Unprocessed and minimally processed**	**Fresh/raw:** cereals, roots, tubers, plantains, pulses, seeds, nuts, animal proteins, vegetables, fruits	**Dried:** cereals (rice, maize, wheat, barley, millet, sorghum), pulses (groundnut, soybean, cowpea), tubers, vegetables, fruits	**Flour from starches:** wheat, maize, cassava	**Unsweetened drinks:** bottled water, tea, coffee, fruit juice, milk (fresh, fermented, tinned, powder)		
2. Processed culinary ingredients **3. Processed foods**	**Low processed**	**Fats and oils:** cooking oil, butter, margarine, ghee, shea butter, groundnut oil, coconut oil	**Seasonings:** spices, salt, sugars, honey	**Pastes and purees:** groundnut, tomato, sesame	**Dried/smoked:** fish (including tinned)	**Flour-based goods:** bread, chapati, pasta	**Beer and wine**
4. Ultra-processed	**Highly processed**	**Sweets and confectionary:** biscuits, cakes, pastries, jams	**Industrial products:** modern bread, breakfast cereals, infant formula	**Canned/ processed meats:** sausage	**Other drinks:** soft drinks, spirits	**Meals at restaurants**	

Source: Adapted from FAO. 2015. Guidelines on the collection of information on food processing through food consumption surveys. Rome. www.fao.org/3/i4690e/i4690e.pdf

The tables and figures that follow provide the results of the analysis of the processed food consumption shares to total household food consumption, applying the applying the standard NOVA processing classification system (Table A1). For a full discussion of these results, see their presentation and discussion in *The State of Food Security and Nutrition in the World 2023*.

Table A2. Consumption shares of processed foods to total food consumption value across the rural–urban continuum (URCA) based on the standard NOVA processing classification

NOVA		National	Urban	Peri-urban	Rural	Large city (>1 million people)	Intermediate city (0.25–1 million people)	Small city (50–250 thousand people)	Town (20–50 thousand people)	<1 hour to a large city	<1 hour to an intermediate city	<1 hour to a small city	<1 hour to a town	1–2 hours to a city or town	>2 hours to a city or town
		(%)	(%)			(%)									
Full sample	Low processed	13	14	13	12	14	14	14	15	13	12	13	13	13	11
	Highly processed	5	8	4	4	8	7	7	6	7	4	4	4	4	4
	Food away from home	10	15	9	6	16	14	14	10	13	9	7	5	6	4
High-food-budget countries	Low processed	12	13	12	12	12	13	13	14	12	12	12	14	13	11
	Highly processed	5	8	4	3	9	7	7	6	7	4	3	3	3	2
	Food away from home	11	16	11	7	17	16	15	11	14	11	8	5	8	5
Low-food-budget countries	Low processed	15	19	15	12	21	18	18	18	19	13	15	12	13	11
	Highly processed	5	7	5	5	7	7	8	7	5	4	5	4	4	7
	Food away from home	5	9	4	3	12	7	7	7	7	3	4	3	3	3

Notes: The table shows processed food consumption as a percentage share of total household food consumption (at market value), by level of food processeding (low processed, highly processed and food away from home) for high- and low-food-budget countries across the rural–urban continuum (URCA). The classification of food items by level of food processing uses a standard NOVA food processing classification system (see Table A1). For an analysis applying a modified NOVA food classification system, see Section 3.3.

Source: Authors' own elaboration.

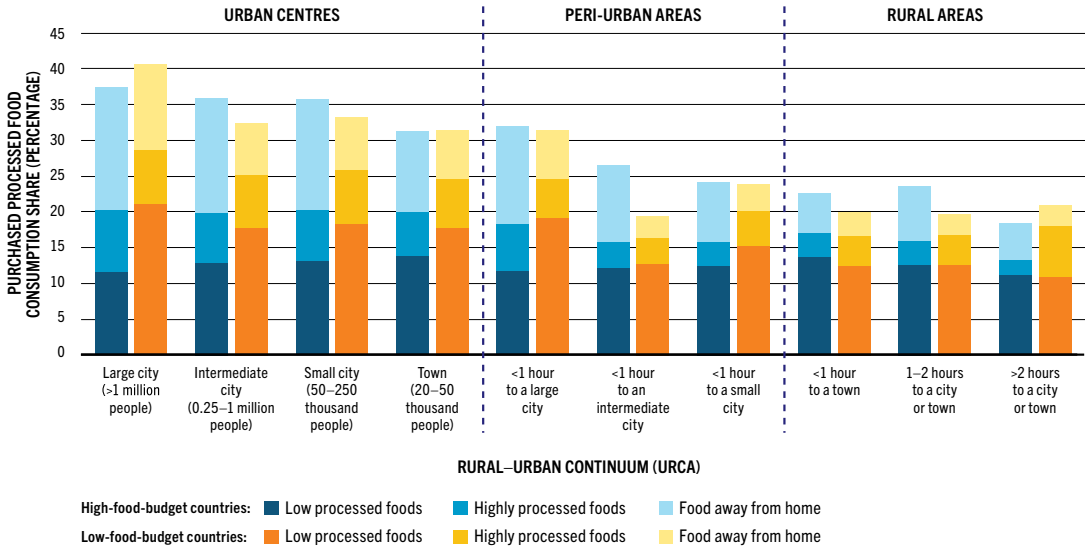
Table A3. Consumption shares of processed foods to total food consumption value by level of processing, by household income level and across the rural–urban continuum (URCA) based on the standard NOVA food processing classification

	National				Urban				Peri-urban				Rural			
	National	Low Income	Middle Income	High Income	Urban	Low Income	Middle Income	High Income	Peri-urban	Low Income	Middle Income	High Income	Rural	Low Income	Middle Income	High Income
NOVA	(%)				(%)				(%)				(%)			
Full sample	28	23	26	32	36	32	35	39	26	22	24	30	22	20	21	24
High-food-budget countries	29	23	26	33	36	31	34	40	27	23	25	31	23	20	22	24
Senegal	35	34	37	35	37	41	38	34	33	31	34	35	32	32	34	31
Ethiopia	21	16	18	26	31	25	28	37	20	16	18	23	17	15	17	19
Côte d'Ivoire	29	26	28	31	34	33	34	35	28	26	27	29	24	23	23	26
Mali	27	25	27	29	29	29	30	30	27	25	27	28	25	24	25	26
Nigeria	34	28	31	39	39	33	37	44	32	27	29	36	32	29	34	33
Low-food-budget countries	25	21	24	29	36	35	36	37	24	20	23	26	20	18	19	22
Guinea-Bissau	27	21	26	32	35	34	35	36	24	20	23	26	23	19	21	26
Benin	32	28	31	35	38	38	36	39	30	28	29	31	22	19	21	25
Togo	38	31	37	42	45	46	46	45	32	28	32	36	29	24	30	31
Burkina Faso	28	22	26	33	36	32	37	38	25	20	25	28	25	23	24	26
Malawi	18	13	16	23	28	25	27	31	17	13	16	22	16	13	15	20
Niger	21	20	20	22	26	27	26	26	21	20	20	21	20	19	19	20

Notes: The table shows processed food consumption (including low processed, highly processed and food away from home) as a percentage share of total household food consumption (at market value) across the rural–urban continuum (URCA) by household income group, country, and high- and low-food-budget country group. Household income levels (low, middle and high) are calculated using terciles of total household expenditure per adult equivalent as proxy. URCA: Urban Rural Catchment Areas. The classification of food items by level of food processing uses a standard NOVA food classification system (see Table A1). For an analysis applying a modified NOVA food classification system, see Section 3.3. Countries are sorted in descending order by food budget, which is the market value of the average total household food consumption per capita per day in purchasing power parity (PPP) dollars.

Source: Authors' own elaboration.

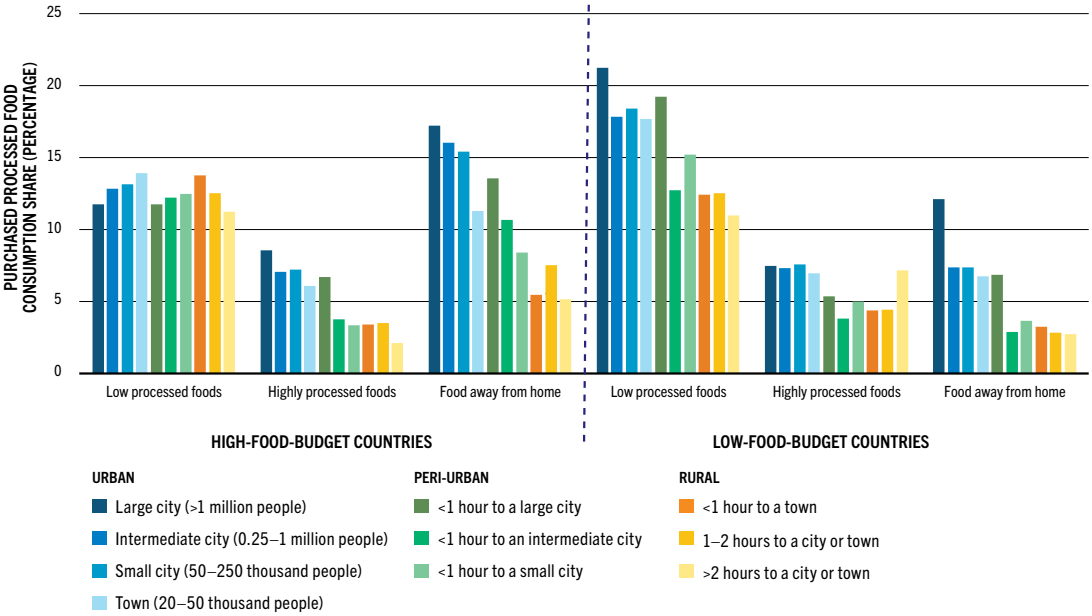
Figure A2. Consumption of processed foods as a share of total household food consumption value across the rural–urban continuum (URCA) for high- and low-food-budget countries



Notes: The figure shows food consumption of processed foods (low processed foods, highly processed foods and food away from home) as a percentage share of total household food consumption (at market value) across the rural–urban continuum (URCA). All surveys are the same as those used in the Chapter 3 analysis and are for 2018/19, except Malawi (2019/20). The classification of food items by level of food processing was the standard NOVA food classification system (Table A1).

Source: Authors' own elaboration.

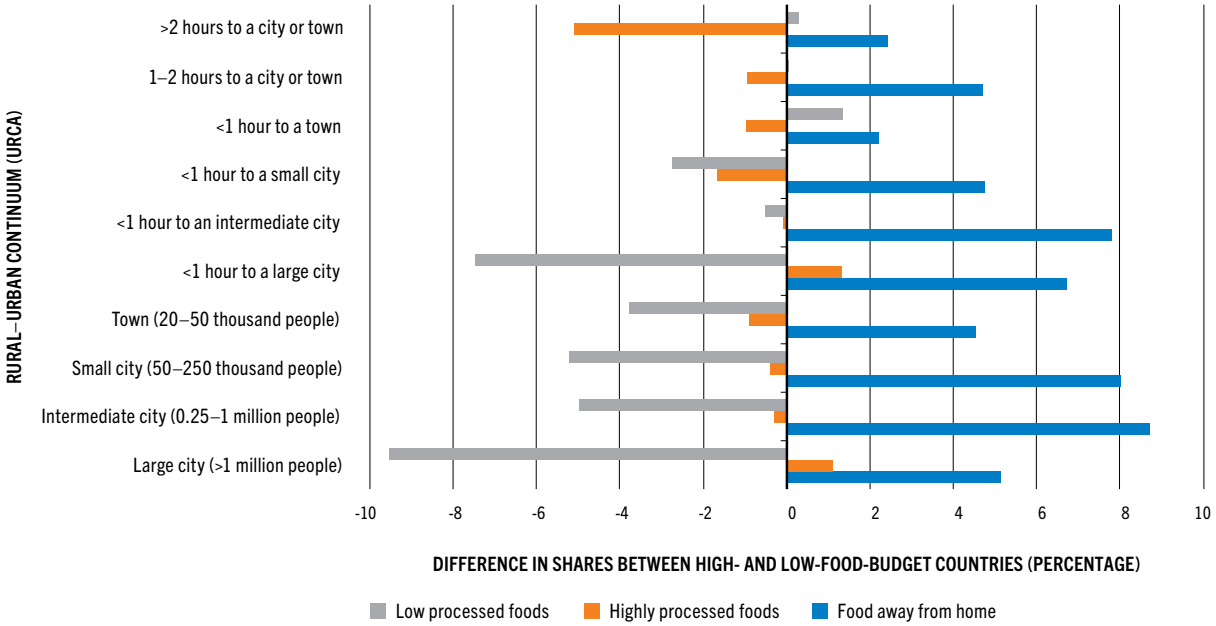
Figure A3. Consumption of processed foods as a share of total household food consumption value by level of processing across the rural–urban continuum (URCA) for high- and low-food-budget countries



Notes: The figure shows food consumption of processed foods as a percentage share of total household food consumption (at market value) by level of food processing across the rural–urban continuum (URCA). All surveys are the same as those used in the Chapter 3 analysis and are for 2018/19, except Malawi (2019/20). The classification of food items by level of food processing was the standard NOVA food classification system (Table A1).

Source: Authors' own elaboration.

Figure A4. Difference in consumption of processed food shares comparing high- and low-food-budget countries across the rural–urban continuum (URCA)



Notes: The figure shows the difference in household food consumption percentage shares (at market value) of low processed foods, highly processed foods, and food away from home, comparing high-food-budget countries with low-food-budget countries across the rural–urban continuum (URCA). The classification of food items by level of food processing was the standard NOVA food classification system (Table A1). All surveys are the same as those analyzed in Chapter 3, and for 2018/19, except Malawi (2019/20).

Source: Authors' own elaboration.

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