PART 1

An Overview of the Kenyan Food System

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Food systems are made up of complex webs of actors, cut across sectors, and include diverse sets of economic activities. They function differently across different geographies and change over time, making them challenging to measure and understand. Further, food systems operate within a broader economic system, and their contribution to economic growth and employment must be understood in addition to their impacts on health, productivity, resilience, inclusivity, and sustainability. Contextualizing the Kenyan food system is the first step in identifying pathways to food system transformation and understanding how specific policies and programs can drive change effectively.

Part 1 of this book gives an overview of the Kenyan food system with a focus on its contributions to gross domestic product (GDP), employment, and food supply. Chapter 1 presents an overview of the food system, showing that it is critical to the Kenyan economy, providing a third of GDP and over half of employment directly and indirectly. The chapter highlights the need for greater contributions from agro-processing and food services to successfully transform food systems and create higher-value jobs.

Using an economywide modeling framework, Chapter 2 shows that different value chains within the agrifood system [1] should be prioritized for investment depending on policy goals. Results suggest that pulses and oilseeds , livestock, coffee and tea, and fruits and nuts should be the priority value chains for achieving the combined policy goals of reducing poverty, driving economic growth, creating employment, and improving diets.

Given the importance of livestock value chains in the current food system, and their potential to create economic growth, Chapter 3 provides a deep dive into the Kenyan livestock sector. It presents results from foresight analysis and stakeholder workshops to measure the supply and demand of livestock products and identifies policy pathways to sustainable transformation of the sector. The

1 Chapter 2 is an exception; it uses the term "agrifood system" because the analysis also includes nonfood agricultural production.

foresight analysis shows there is a risk that demand for livestock products will outpace supply in the coming decade but, if good economic conditions and governance prevail, then supply could outpace demand, potentially allowing Kenya to become a net exporter of livestock products. The chapter highlights the need for improved feed standards, more accessible marketing information systems, better animal health through improved veterinary services, and breed improvement.

The broad challenges and recommendations these chapters put forth are revisited in later chapters using specific case studies. For example, Chapters 15 and 17 focus specifically on priority value chains identified in Chapter 2, while nearly all chapters relate to strengthening value chains. Chapter 13 discusses efforts to improve animal health—a key recommendation from Chapter 3. Taken together, Part 1 sets the stage for the rest of the book by placing the food system in the broader context of the Kenyan economy and giving an overview of the livestock sector.

Chapter 2

KENYA'S AGRIFOOD SYSTEM: OVERVIEW AND DRIVERS OF TRANSFORMATION

Xinshen Diao, Karl Pauw, Jenny Smart, and James Thurlow

The 2010s were a decade of strong economic development in Kenya. Gross domestic product (GDP)—an indicator of the economy's size—expanded by an average of 5 percent per year (KNBS 2022). This exceeded population growth and helped raise household incomes, leading to a decline in poverty rates and, more importantly, in the number of poor people, for the first time in at least three decades (World Bank 2022). Agriculture played an important role in this. The sector grew alongside the rest of the economy, despite facing many challenges, including climate variability (Ochieng et al. 2020), weak rural infrastructure (Benin and Odjo 2018), shrinking farm sizes (Jayne et al. 2016), and inaccessibility of farm inputs combined with poor agronomic management (Worku et al. 2020). Agriculture, as part of the broader food system, also contributed to growth in downstream or off-farm sectors and helped cushion the economic damage resulting from COVID-19 in 2020 (Pauw, Smart, and Thurlow 2021).

This chapter provides a detailed description of the food (or agrifood) system. In short, the agrifood system consists of a complex network of actors, connected by their differing roles in supplying, using, and governing agrifood products. Rather than examining all the components of the agrifood system, this chapter has a narrower set of objectives. First, it measures the size and structure of Kenya's agrifood system and examines how, after a decade of rapid development, this system is transforming and contributing to national growth and structural change. This assessment is done from a supply-side perspective—that is, the chapter uses national accounts and employment statistics to track value addition, employment, and productivity changes across the different economic subsectors that form part of the agrifood system.

Second, the chapter evaluates the potential of different agricultural value chains to drive faster and more inclusive agricultural transformation in the future. This part of the analysis uses forward-looking economywide modeling that brings the supply and demand sides together. Thus, the modeling framework makes it possible not only to examine linkages across different on- and off-farm sectors on the supply side of the agrifood system but also to capture the interaction between food producers and consumers, shedding light on different households' access to and use of food. The chapter measures the inclusivity of the agricultural transformation process through the extent to which productivity growth in different agricultural value chains creates jobs in the more remunerative parts of the agrifood system, reduces poverty, and improves the quality of household diets.

The literature has described the agricultural transformation process in detail. In fact, agrifood systems are *expected* to evolve as countries develop and, eventually, they come to comprise far more than just primary agriculture (Timmer 1988; Diao, Hazell, and Thurlow 2010). Subsistence farming typically dominates during the earliest stages of development but, as agricultural productivity rises, farmers start to supply surplus production to markets, creating job opportunities for workers in the off-farm economy (Haggblade, Hazell, and Dorosh 2007). Rising rural incomes generate demand for more diverse products, leading to more processing, packaging, and transport activities. In these early stages, agriculture is an engine of rural, and even national, economic growth. Eventually, however, urban populations and nonagricultural incomes come to drive development, with urban consumers creating most of the demand for agricultural outputs via long value chains connecting the countryside to cities and towns (Dorosh and Thurlow 2013).

Although this description of the agricultural transformation process generally holds true, it is somewhat stylized and overlooks the unique structure and growth trajectory of a particular country's food system. Therefore, this chapter contributes to our understanding of the specific characteristics of Kenya's agrifood system and the potential for faster and more inclusive agricultural transformation. The next section introduces new indicators of agrifood system GDP and employment, which are used to describe Kenya's agrifood system and its component value chains from a supply-side perspective. Using these supply-side metrics, the following sections compare Kenya's agrifood system with those of other countries at different stages of development, and examine how Kenya's agrifood system has changed over the past decade and to what extent it has contributed to national development. A forward-looking economywide model is then used to identify which value chains have economic linkages that are more likely to drive inclusive agricultural transformation. The chapter concludes by summarizing findings and outlining an agenda for further research.

Kenya's agrifood system

Components and indicators

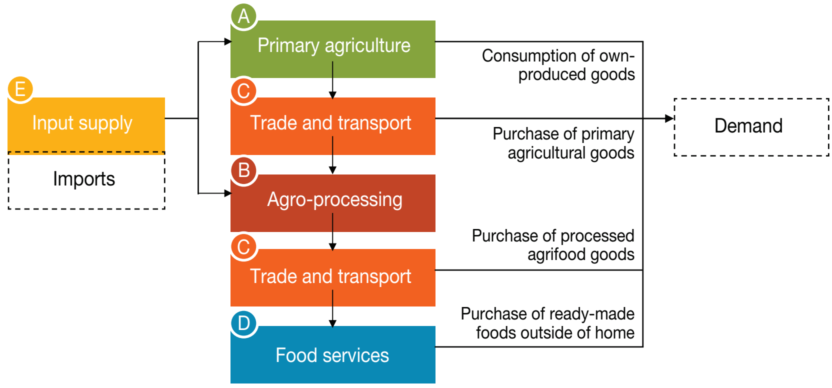
As stated earlier, the first objective of this chapter is to measure the size and structure of Kenya's agrifood system from a supply-side perspective using national accounts and employment statistics. Figure 2.1 provides a simple conceptual framework with five components (A to E). The framework follows the format of national accounts data, allowing us to estimate total value added and total employment in the agrifood system—indicators that we call AgGDP+ and AgEMP+, respectively.[1] An agrifood system is essentially the sum of all on- and off-farm GDP and employment generated across all agricultural value chains within a country.

Primary agriculture (A) is the first component of the agrifood system and includes the value added generated by all agricultural subsectors, including crops, livestock, forestry, and fishing.[2] *Agro-processing* (B) is part of the broader manufacturing sector and includes the value added from producing processed

1 Thurlow and colleagues (forthcoming) provide formal definitions of AgGDP+ and AgEMP+.

2 Note that GDP or value added is equal to the value of gross output minus the cost of intermediate inputs, such as the cost of seeds and fertilizers that farmers purchase and use.

FIGURE 2.1 Components of an agrifood system



Source: Thurlow et al. (forthcoming).

foods and other agriculture-related products, such as beverages, tobacco, yarn, and timber.[3]

Input supply (E) is the GDP generated during the production of intermediate inputs that farmers and processors use directly (for example, fertilizers and financial services). Inputs that farmers and processors themselves produce are excluded to avoid double counting, since the above components (A and B) capture these. AgGDP+ includes only a portion of GDP that local input producers generate. This portion is the share of agriculture and processing's input demand in total economywide demand for that input. For example, if farmers and processors use a third of all petroleum in the economy, then a third of the petroleum sector's GDP is considered part of the agrifood system. If all petroleum is imported, then this input does not contribute to AgGDP+, because the value added occurs outside the country.

Trade and transport services (C) includes all GDP generated by the transporting, wholesaling, and retailing of agrifood products between farms, firms, and final points of sale (that is, either domestic markets or the country's border for exported goods). National accounts data do not separate the trade sector's GDP into its food and nonfood components, but it is possible to estimate this using product-level data on transaction cost margins. Transaction costs are the main source of demand for trade services, and so it is possible to attribute a portion of trade sector GDP to the agrifood system based on the total share of trade margins on agrifood products relative to the total margins on all marketed products.

Finally, *food services* (D) is the value added generated by the food services sector, plus a portion of that generated by the hotels and accommodation sector. Producers of food services (that is, meals prepared outside the home) run standalone operations (for example, restaurants or stalls), whereas hotels often operate restaurants in addition to providing accommodations. The portion of GDP in the hotel and accommodation sector that is assigned to the agrifood system is based on the share of agrifood inputs in the sector's overall intermediate inputs.[4]

Total AgGDP+ is the sum of the five components and is estimated using a series of social accounting matrices (SAMs) that IFPRI has constructed for Kenya using the latest national accounts data (see KNBS 2022). Estimating AgEMP+ follows a similar procedure but with one additional data source. Employment is estimated by combining GDP from the SAM's 90 sectors

3 Yarn and timber are the immediate downstream subsectors for cotton farming and the forestry sector respectively.

4 Cross-country analysis using IFPRI's Agrifood System Database indicates that this is a conservative approach that slightly underestimates the part of hotels and accommodation GDP that is associated with the agrifood system.

with labor productivity estimates (that is, GDP per worker) for 14 aggregated sectors. The employment database triangulates information from a variety of sources, including the 2009 and 2019 population censuses (KNBS 2009, 2019), household budget and labor force surveys (KNBS 2017), and international databases containing sectoral employment timeseries data (ILO 2020; de Vries et al. 2021). Our definition of employment includes all workers aged 15 years or older, assigned to sectors based on their primary sector of employment. This standard global definition allows us to compare Kenya with other countries in IFPRI's Agrifood System Database.

Current structure

Table 2.1 shows the structure of Kenya's overall economy. Primary agriculture generated almost a quarter of total GDP in 2019 and over two-fifths of total employment. Kenya exports agrifood products such as coffee and tea but generally not in primary form. For example, coffee from the farm is supplied to the manufacturing sector, where it is processed, graded, and bagged before export. Such exports appear in the table as manufactured goods. Most of Kenya's imports also are manufactured, but these are mainly nonagricultural products such as fuels, machinery, and vehicles. In total, manufacturing generates only 9 percent of GDP and 6 percent of employment. Finally, services

TABLE 2.1 Structure of Kenya's economy, 2019

	Share of total (%)			
	GDP	Employment	Exports	Imports
All sectors	100	100	100	100
Primary agriculture	22.7	43.3	20.9	2.5
Industry	18.7	12.8	30.7	81.8
Mining	1.6	0.7	0.4	0.5
Manufacturing	8.6	5.8	30.2	79.2
Utilities	2.4	0.3	0.0	0.1
Construction	6.1	5.9	0.0	2.0
Services	58.6	43.9	48.5	15.7
Trade, transport, and food services	23.1	24.3	27.6	5.9
Finance, business, and real estate	17.7	3.7	10.9	7.7
Government, health, and education	12.6	8.7	0.0	0.0
Other services	5.3	7.2	10.0	2.1

Source: Authors using IFPRI's 2019 Kenya Social Accounting Matrix.

account for most of Kenya's GDP and are as important as agriculture for employment. Within services, trade and transport are the largest and among the most labor-intensive sectors.

Table 2.2 describes the size and components of Kenya's agrifood system. Total AgGDP+ was equal to $31 billion in 2019—well above primary agriculture, whose GDP was $21 billion. For every $1 of GDP generated on the farm there is an additional $0.49 of GDP generated off the farm within the broader agrifood system. Much of this off-farm GDP is from agro-processing, although, as with manufacturing more generally, the labor intensity of agro-processing is low compared with the rest of the economy. This explains why labor productivity (annual GDP per worker) is much higher in agro-processing ($9,928) than in primary agriculture ($2,580). Productivity is also relatively low in agrifood trade and transport and food services, where many jobs are informal or casual.

Using the supply use table, we can decompose the agrifood system across major product groups and track how much value added is generated in each of the five agrifood system components. Table 2.3 disaggregates AgGDP+ across eight product value chains.[5] Cereals and downstream grain milling account for 16 percent of total AgGDP+ (column 1). Livestock and horticulture are also large groups of value chains within the agrifood system, although, unlike

5 The specific products included in each value chain grouping are listed in Table A.2.1 in the appendix to this chapter.

TABLE 2.2 Kenya's agrifood system, 2019

	GDP		Employment		Average GDP per worker ($)
	Value ($ billions)	Share of total (%)	Workers (millions)	Share of total (%)	
Total economy	92.0	100	18.7	100	4,917
Agrifood system	31.1	33.8	10.2	54.7	3,040
Primary agriculture (A)	20.9	22.7	8.1	43.3	2,580
Off-farm agrifood system	10.2	11.1	2.1	11.4	4,791
Agro-processing (B)	4.7	5.1	0.5	2.5	9,928
Trade and transport (C)	3.6	3.9	1.1	6.1	3,125
Food services (D)	0.8	0.9	0.4	2.2	1,984
Input supply (E)	1.1	1.2	0.1	0.6	10,696
Non-agrifood system	60.9	66.2	8.5	45.3	7,184

Source: Authors using IFPRI's 2019 Kenya Social Accounting Matrix.

Note: A–E correspond to the five agrifood system components in Figure 2.1.

TABLE 2.3 Decomposing AgGDP+ across value chains, 2019

	Share of total GDP (%)		
	Agrifood system	Primary agriculture	Off-farm components
Total	100	100	100
Cereals	15.6	16.3	14.1
Pulses & oilseeds	7.8	7.9	7.6
Root crops	8.9	12.2	2.2
Horticulture	17.8	21.5	10.1
Livestock	22.0	17.3	31.7
Fish	2.3	2.7	1.6
Export crops	15.5	14.8	16.9
Forestry	7.6	7.3	8.1
Unattributable	2.5	0.0	7.6

Source: Authors using IFPRI's 2019 Kenya Social Accounting Matrix.

horticulture, livestock contributes more to off-farm AgGDP+ (column 3) than to primary agriculture GDP (column 2). Finally, some products have complicated value chains that are difficult to track. This "unattributable" group includes highly processed products with fewer or more convoluted linkages back to primary agriculture (for example, baby foods and alcoholic beverages). All the value added for these products is reported as off-farm. Nevertheless, most of Kenya's agrifood system can be attributed to distinct product groups.

Table 2.4 disaggregates each value chain group across the five components in the agrifood system. Most of the value added (70 percent) in the cereals

TABLE 2.4 Decomposing AgGDP+ within value chains, 2019

	Share of value chain GDP (%)					
	Agrifood system	Primary agriculture	Agro-processing	Trade and transport	Food services	Input supply
Total	100	67.3	15.0	11.5	2.6	3.6
Cereals	100	70.4	16.3	10.8	1.1	1.4
Pulses & oilseeds	100	68.0	11.2	10.8	7.6	2.3
Root crops	100	92.0	0.9	5.7	0.4	1.0
Horticulture	100	81.3	6.3	8.8	0.5	3.1
Livestock	100	22.0	23.0	16.2	2.9	5.2
Fish	100	77.9	5.3	11.6	2.0	3.1
Export crops	100	64.3	18.1	12.8	0.8	4.1
Forestry	100	64.9	21.9	12.0	0.0	1.2

Source: Authors using IFPRI's 2019 Kenya Social Accounting Matrix.

value chain is generated by primary agriculture (that is, growing cereals on the farm), with about one-fifth (16 percent) generated in agro-processing (for example, milling grains into flour). Trade and transport margins make up a further 10 percent of GDP in the cereals value chain. Overall, despite the growing importance of purchased and processed foods in Kenya (Tschirley et al. 2015), most value chains still generate most of their value added on the farm, with cereals representative of the overall agrifood system. Root crops is the least oriented toward off-farm components in the value chain, with almost all value added generated on the farm.

In summary, Kenya's agrifood system stretches well beyond the farm. For every $1 generated on the farm, $0.49 is generated off the farm. The structural information in this section is useful for understanding the agrifood system's linkages to the rest of the economy and anticipating its contribution to national structural change. For instance, the off-farm agrifood system is far less labor-intensive than farming, which means substantial off-farm growth would be required to absorb workers exiting agriculture. However, labor productivity is, on average, higher off the farm, meaning that workers who leave agriculture and find work elsewhere in the food system should increase economywide labor productivity. One exception is food services, which not only is highly labor-intensive but also exhibits labor productivity levels even lower than in agriculture. Finally, decomposing AgGDP+ across value chains helps us anticipate how different sources of agricultural growth may affect agricultural transformation differently, by favoring either on- or off-farm growth.

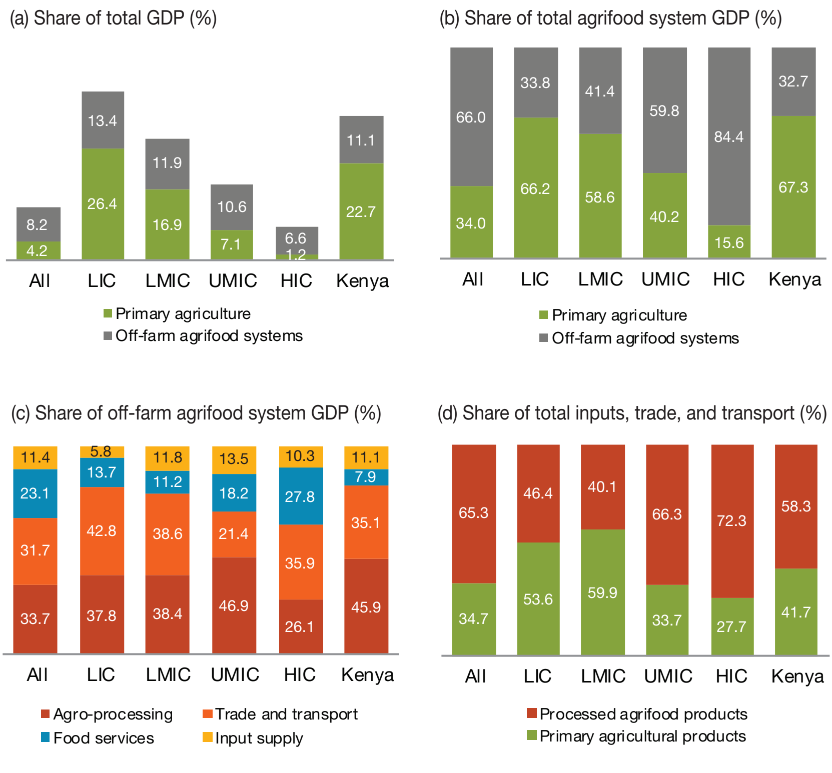
The next two sections will examine past growth trends and future growth scenarios. Before this, however, we compare Kenya's current agrifood system to those in other countries at different stages of development.

Comparison with other countries

IFPRI's Agrifood System Database contains estimates of AgGDP+ and AgEMP+ for 206 countries covering 96 percent of global GDP and 94 percent of the global population (see Thurlow et al. forthcoming). Figure 2.2 shows weighted estimates across the World Bank's country income groups and compares these with Kenya (see final column in each panel). The figure therefore shows the importance and composition of agrifood systems at different stages of development, with the latter proxied by gross national income (GNI) per capita.

Panel A shows the importance of primary agriculture for developing countries, and how agriculture's share of the economy is much smaller at later

FIGURE 2.2 Decomposing agrifood systems across country income groups, 2019



Source: IFPRI's Agrifood System Database in Thurlow et al. (forthcoming); IFPRI's 2019 Kenya Social Accounting Matrix.
Note: LIC are low-income countries; LMIC are lower-middle-income countries; UMIC are upper-middle-income countries; and HIC are high-income countries.

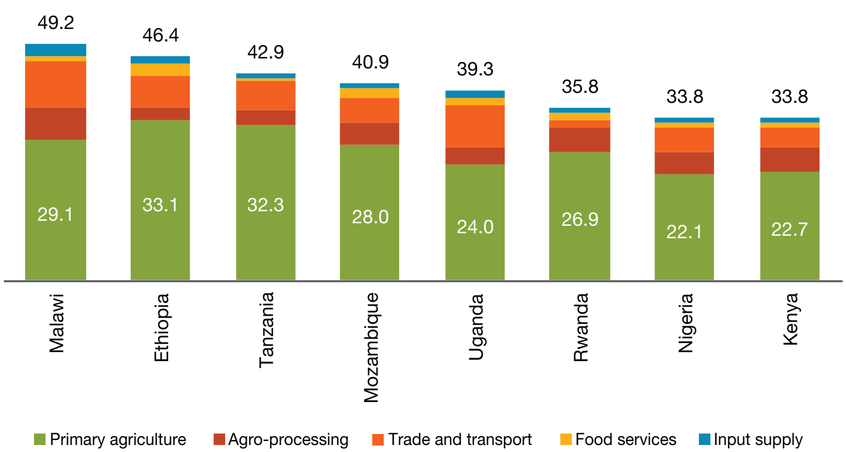
stages of development. On average, primary agriculture is 27 percent of total GDP for low-income countries (LICs) but only 1 percent for high-income countries (HICs). However, the agrifood system's contribution to the economy remains large, even in the most developed countries. In Hong Kong, for example, where agricultural GDP is virtually zero, the agrifood system still accounts for 8 percent of total GDP. The size of Kenya's agrifood system and its breakdown across farm and off-farm components is consistent with other countries that have recently reached lower-middle-income country (LMIC) status.

Panel B in the figure shows the contributions of farm and off-farm components to total AgGDP+ (that is, a different representation of the information in Panel A). At around $4,000 per capita, which is close to the threshold for attaining upper-middle-income country (UMIC) status, the value added generated off the farm exceeds what is generated on the farm. At $40,000 per capita, which is roughly the median income for HICs, about $4 of GDP is generated off the farm for each $1 on the farm. Kenya has a larger on-farm orientation than LICs on average, although this is well within the range of estimates across countries at a similar stage of development.

Panel C decomposes off-farm AgGDP+ into its four major components. HICs typically generate less value added from trading and transporting products and more from food services (for example restaurants). A larger share of Kenya's off-farm GDP comes from agro-processing, which reflects the processing requirements of the large livestock and export crop sectors (see Tables 2.3 and 2.4). Kenya has a relatively small food services sector, which is consistent with the structure of agrifood systems in other developing countries. Kenya's population is also less urbanized than those of other developing countries, which may explain the lesser importance of food services, which tend to be more heavily concentrated in urban centers.

Panel D decomposes the input supply and trade and transport components of the agrifood system. These components are separated into the value added generated on primary agricultural products and on processed agrifood products. This distinction is useful because during the early stages of agricultural transformation we expect there to be more value added associated with primary

FIGURE 2.3 Agrifood system share of total GDP in selected countries, 2019



Source: IFPRI's Agrifood System Database in Thurlow et al. (forthcoming); IFPRI's 2019 Kenya Social Accounting Matrix.
Note: Figures in black are the agrifood system's percentage share of total GDP.

products than with processed products. This is supported by Figure 2.2, which shows how more value added is generated on primary products in LICs but the opposite is true for HICs. Again, Kenya has a larger-than-expected agro-processing sector, given its stage of development, and this explains why inputs and trade and transport margins on processed products generate more GDP.

Finally, Figure 2.3 compares Kenya with other low-income African countries. Most countries in eastern and southern Africa have agrifood systems that account for a larger share of their national economies than is the case in Kenya. This mainly reflects these countries' larger primary agricultural sectors, although there is some variation in the composition of off-farm agrifood systems.

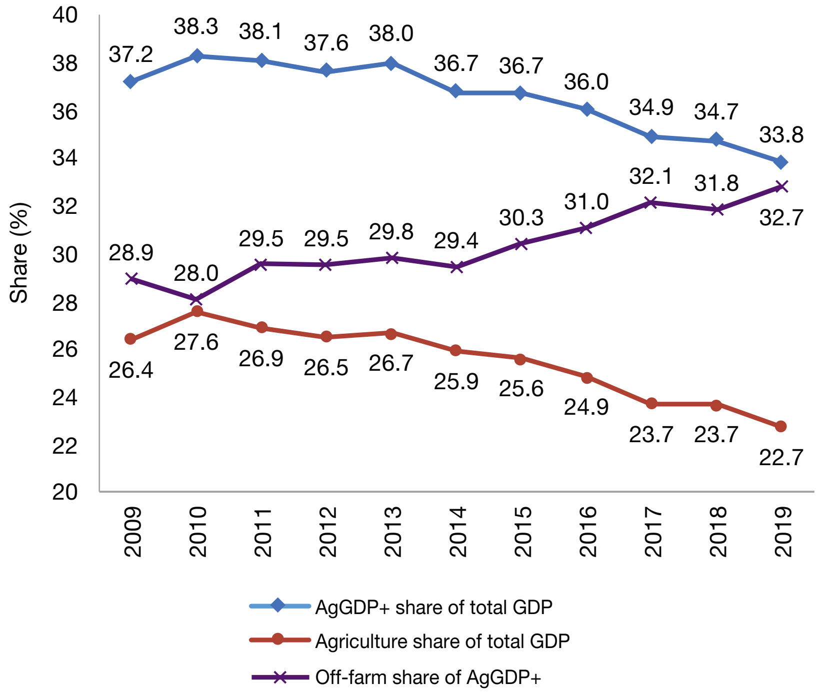
Overall, Kenya's agrifood system shares many of the characteristics of other countries in the region and countries at a similar stage of development. However, not all countries have grown as rapidly as Kenya has over the past decade. This means that a closer look at Kenya's agricultural and structural transformation is warranted.

Recent growth and transformation

This section considers whether recent growth within the agrifood system has been associated with agricultural and structural transformation in Kenya. Growth between 2009 and 2019 is decomposed using data on GDP and employment across the entire agrifood system (that is, AgGDP+ and AgEMP+) estimated from an annual timeseries of Kenyan SAMs. The SAMs are constructed using a standard national accounting system and so are directly comparable. SAMs measured in current prices are deflated (that is, converted to constant prices) using Kenya's most recent GDP series (KNBS 2022).

Figure 2.4 shows how the structure of the agrifood system has changed over the past decade. Primary agriculture's share of the economy declined from 27 percent in 2009 to 23 percent in 2019. The broader agrifood system's share of total GDP has also fallen but at a slower rate than that for agriculture. As a result, the contribution of the off-farm components of the agrifood system has risen slightly, from 29 to 33 percent. As the previous section illustrated using cross-country data, countries that move toward higher levels of development tend to have faster-growing off-farm components in their agrifood systems. The changing structure of Kenya's agrifood system is consistent with a country undergoing such an agricultural transformation, which may reflect Kenyan policymakers' long-standing emphasis on market-oriented agriculture and active engagement of the private sector in the agriculture sector.

FIGURE 2.4 Changing structure and contribution of AgGDP+ in Kenya, 2009–2019



Source: Authors using IFPRI's 2009–2019 Kenya Social Accounting Matrixes.

Table 2.5 confirms that the structural changes within the agrifood system observed in Figure 2.4 coincide with a period of economic growth. Kenya's overall economy grew at 4.9 percent per year from 2009 to 2019, with agriculture growing at 3.4 percent. This explains agriculture's declining contribution to the overall economy. In contrast, the off-farm components of the agrifood system grew faster than the economy, at 5.2 percent, increasing their importance over time. The fastest growth within the agrifood system was in trade and transport services, whereas the slowest growth was in food services. However, since food services accounts for only around 1 percent of GDP, its weak performance has a minimal impact on the overall performance of the agrifood system or economy. The table also decomposes growth of inputs, trade, and transport into primary agricultural products and processed agrifood products. Growth in inputs, trade, and transport was faster for primary products—8.8 percent per year—suggesting that parts of Kenya's agrifood system are still in the

TABLE 2.5 Agrifood system GDP and employment growth decomposition, 2009–2019

	Average annual growth rate (%)			Contribution to total change (%)		Share of total GDP (%)		Share of total employment (%)	
	GDP	Employment	GDP per worker	GDP	Employment	2009	2019	2009	2019
Total economy	4.9	2.2	2.7	100	100	100	100	100	100
Agrifood system	3.9	1.5	2.3	28.3	40.5	37.2	33.8	58.1	54.7
Primary agriculture (A)	3.4	0.9	2.4	16.7	19.6	26.4	22.7	49.0	43.3
Off-farm agrifood system	5.2	4.5	0.7	11.6	20.9	10.8	11.1	9.1	11.4
Agro-processing (B)	4.7	3.4	1.2	4.9	3.8	5.2	5.1	2.2	2.5
Trade and transport (C)	6.5	4.9	1.4	4.7	12.2	3.4	3.9	4.7	6.1
Food services (D)	2.4	4.8	–2.3	0.5	4.2	1.1	0.9	1.7	2.2
Input supply (E)	6.3	2.9	3.3	1.5	0.7	1.1	1.2	0.5	0.6
Inputs, trade, and transport (C+E)	6.4	4.8	1.6	6.2	13.0	4.4	5.1	5.2	6.7
Primary products	8.8	7.4	1.3	3.2	7.0	1.5	2.1	1.6	2.7
Processed products	5.0	3.4	1.6	3.0	5.9	3.0	3.0	3.6	4.0
Non-agrifood system	5.5	2.9	2.5	69.8	59.7	62.8	66.2	41.9	45.3

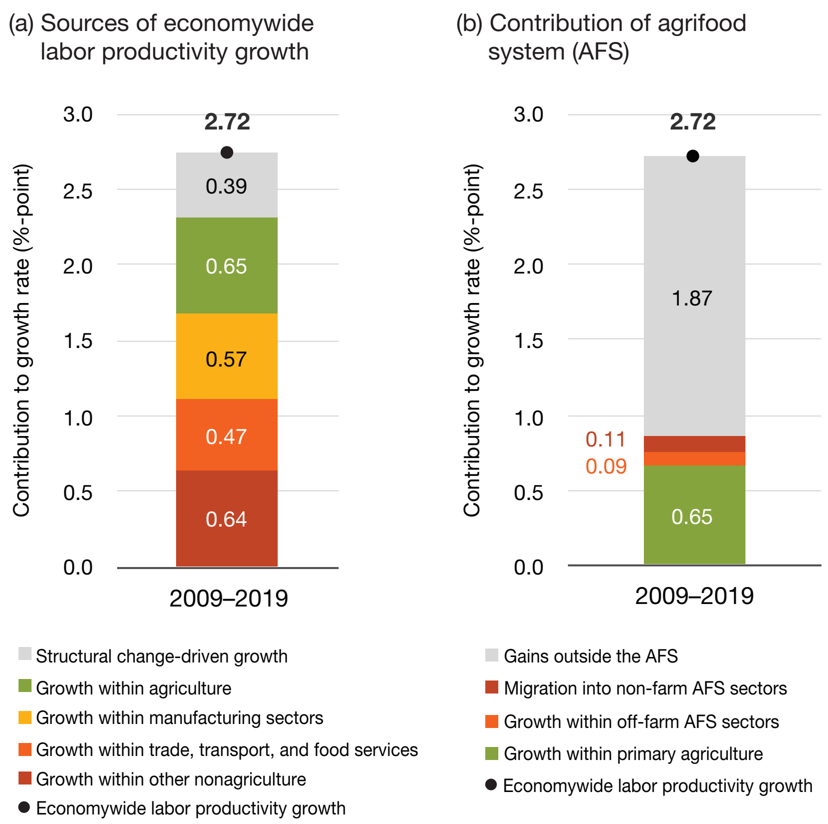
Source: Authors using IFPRI's 2009–2019 Kenya Social Accounting Matrixes and employment database.

earlier stages of agricultural transformation, when the focus is on extending the linkages between primary agriculture and the immediate downstream sectors.

Total employment in the economy grew at 2.2 percent per year during the 2009–2019 period. With GDP growing faster than employment, economy-wide labor productivity, measured by GDP per worker, rose over the period. Employment growth in agriculture was much slower than in the total economy, causing the sector's share of total employment to fall from 49 percent to 43 percent over the decade. Overall, labor productivity rose in most components of the agrifood system. The only exception is food services, where rapid employment growth exceeded sectoral GDP growth, causing average GDP per worker to fall over the decade.

A decline in the share of agricultural employment is expected as a country develops. An increase in economywide labor productivity, which is strongly associated with economic development, can arise through two channels. First, productivity can increase among workers within their sectors of employment. Second, economywide productivity increases when workers migrate from less to more productive sectors. As mentioned earlier, GDP per worker in agriculture is lower than in most other parts of the agrifood system and in the rest of the economy. As such, a shift in employment patterns away from agriculture and

FIGURE 2.5 Decomposition of average annual labor productivity growth rate, 2010–2019



Source: Authors using IFPRI's 2009–2019 Kenya Social Accounting Matrixes and employment database.

into other sectors should increase economywide labor productivity. These two channels are usually referred to as the "within-sector" and "between-sector" (or "structural change") drivers of labor productivity growth. The individual contributions of these structural drivers of growth can be estimated using the approach McMillan, Rodrik, and Verduzco-Gallo (2014) describe.

Figure 2.5 presents the overall findings from the growth decomposition analysis. As shown in Panel A, economywide labor productivity grew at an average annual rate of 2.7 percent from 2009 to 2019. Most of this growth was driven by within-sector labor productivity gains. Growth within agriculture was one of the largest contributors, with it being a large sector (that is, 26 percent of total GDP in 2009; see Table 2.5) experiencing relatively fast labor productivity growth (that is, 2.4 percent per year). Although manufacturing employment grew even faster, its small share of the economy limited its absolute contribution to economywide growth. Overall, the figure suggests that the within-sector drivers of productivity growth were quite evenly balanced across agriculture, manufacturing, trade, and other sectors. More importantly, changes in employment patterns were consistent with workers moving out of low-productivity sectors like agriculture and into higher-productivity sectors. This contributed to an increase in economywide labor productivity—a process called structural change-led growth.

Panel B estimates the contribution of the agrifood system to total labor productivity growth. The within-sector contribution from agriculture is the same in both panels. The migration of workers into the off-farm components of the agrifood system accounted for almost a quarter of the structural change-led growth that took place in Kenya over the decade (that is, 0.09 percentage points out of a total 0.39 percentage points). This is in addition to the annual increase in labor productivity among workers who were already employed in the off-farm sectors. The agrifood system thus accounted for 30 percent of total labor productivity growth, with the remaining 70 percent originating from within-sector productivity growth and migration into sectors outside of the agrifood system.

In summary, despite rapid economic growth, Kenya's economy is undergoing a slow, but positive, process of structural change. Most labor productivity growth has been driven by rising productivity within sectors rather than a steady reorientation of employment toward more productive activities. Within this national process of growth and structural change, agricultural transformation is proceeding steadily, with faster GDP and employment growth within the off-farm components of the agrifood system. However, employment growth has been fastest in the less productive components of the agrifood system (that is, trade, transport, and food services) instead of more productive components such as agro-processing. This pattern of agrifood system growth is consistent with the earlier stages of agricultural transformation. It has, however, limited the agrifood system's contribution to structural change-led growth at the national level. Identifying sources of agricultural growth that could accelerate the growth on and beyond the farm is therefore a priority in accelerating agrifood system and broad economic transformation.

Future drivers of inclusive agricultural transformation

This section uses IFPRI's Rural Investment and Policy Analysis (RIAPA) model to compare the potential contributions of growth driven by different agricultural value chains to inclusive agricultural transformation. The latter is proxied by growth in AgGDP+ and AgEMP+, as well as reductions in the poverty headcount rate and the gap between households' consumption of major food groups and the estimated cost of a healthy reference diet. RIAPA is briefly described below; Diao and Thurlow (2012) provide a more technical description.

The Rural Investment and Policy Analysis model

RIAPA comprises a series of interlinked datasets and models that are used to assess program impacts and inform policy and investment prioritization at the country level. At the core of RIAPA is an economywide computable general equilibrium (CGE) model that simulates the functioning of a market economy, including markets for products and factors (that is, land, labor, and capital). RIAPA measures how impacts are mediated through prices and resource reallocations, and ensures that resource and macroeconomic constraints are respected, such as when inputs or foreign exchange are limited.

RIAPA divides Kenya's economy into 90 sectors. Producers in each sector maximize profits and supply output to national markets, where it may be exported and/or combined with imports depending on relative prices, with exchange rate movements affecting foreign prices. Producers combine factors and intermediate inputs using sector-specific technologies. Maize farmers, for example, use a combination of land, labor, fertilizer, and purchased seeds. Rural and urban labor markets are divided by workers' education levels, and agricultural capital is separated into crop and livestock categories. Labor and capital are in fixed supply but less educated workers are considered underemployed. The government collects taxes on products, households, and enterprises, and uses these revenues to finance public services and social transfers. Remaining revenues are added to private savings and foreign capital inflows to finance investment. RIAPA is a dynamic model, with past levels of investment determining current capital availability.

RIAPA tracks changes in household incomes and expenditures, including changes in food and nonfood consumption patterns. The 15 household groups in RIAPA are separated into rural and urban consumption quintiles, with rural households further separated into farm and nonfarm groups. Table 2.6 describes aggregate household income and consumption patterns. Kenya's population of 47.6 million people consumed, on average, $1,718 of goods and services per person in 2019 (at market exchange rates unadjusted for purchasing power parity). Consumption levels are much lower in rural areas and among the poor. Poor households spend more of their earnings on food consumption; of this, they spend a smaller share on processed foods than on primary or

TABLE 2.6 Household incomes and consumption, 2019

	National	Poor	Nonpoor	Rural farm	Rural nonfarm	Urban
Consumption per capita (US$)	1,718	514	2,521	921	1,532	2,904
Food consumption share of total consumption (%)	38.9	59.9	36.1	49.7	39.0	34.2
Food consumption share by food group (%)	100	100	100	100	100	100
Cereals & roots	28.4	43.6	25.1	39.1	33.5	20.9
Vegetables	21.8	26.3	20.8	24.0	24.2	20.0
Fruits	11.1	8.5	11.7	12.0	10.9	10.6
Milk & dairy	11.0	10.5	11.1	11.4	11.9	10.5
Meat, fish, & eggs	24.0	6.6	27.8	9.3	15.3	34.6
Added fats	3.7	4.6	3.5	4.2	4.2	3.3
Processed food share (%)	51.7	35.3	55.4	38.3	46.3	61.6
Household income share by income source (%)	100	100	100	100	100	100
Crop land returns	12.6	36.4	9.8	47.8	0.0	1.3
Labor remuneration	32.0	30.4	32.2	18.8	26.2	38.3
Less educated workers	7.9	18.9	6.6	7.5	7.9	8.1
More educated workers	24.1	11.6	25.6	11.4	18.4	30.2
Capital profits	48.8	20.0	52.2	15.4	69.7	57.8
Other sources	6.6	13.2	5.8	18.0	4.0	2.6
Population (millions)	45.4	18.1	27.2	22.7	6.5	16.2

Source: Authors using IFPRI's 2019 Kenya Social Accounting Matrix and RIAPA model.

Note: Food consumption includes meals prepared outside the household. More educated workers are those who have completed at least primary schooling. Capital income is equivalent to gross operating surplus net of taxes and other corporate transfers. Other income sources include social and foreign transfers.

unprocessed foods. Cereals and roots dominate consumption patterns, although nonpoor and urban households consume more meat, fish, and eggs. Finally, poor households are, on average, more reliant on incomes from farming and less educated labor.

RIAPA tracks poverty and dietary impacts using survey-based microsimulation analysis. Individual survey households map to the model's household groups. Estimated consumption changes in the model are applied proportionally to survey households, and post-simulation consumption values are recalculated and compared with a poverty line to determine households' poverty status, and with the cost of a healthy reference diet to estimate dietary deprivation, a measure of diet quality.

Comparing growth driven by different value chains

RIAPA is used to simulate the effects of expanding farm production within existing agricultural value chains. Total factor productivity growth in each group of agricultural products is accelerated beyond baseline growth rates, such that, in each value chain scenario, total agricultural GDP is 1 percent higher by 2025 than is expected under a business-as-usual baseline scenario. Expanding agricultural production increases supply to downstream processing activities and generates demand for agricultural trade and transport services. Agricultural subsectors differ in size; as such, to achieve the same absolute increase in *total* agricultural value added, it is necessary for smaller value chains to expand more rapidly than larger ones.

The rows in Table 2.7 show the set of value chain scenarios implemented using the RIAPA model. These are based on the same set of value chains from before (see Tables 2.3 and 2.4), except that cereals are now split into maize and rice & wheat value chains; horticulture is split into vegetables and fruits & nuts; and livestock is split into cattle & dairy and poultry & eggs. A coffee & tea scenario represents the export crops value chain, and we retain the original aggregation for pulses & oilseeds, root crops, and fish value chains. A forestry scenario is excluded.

The columns in Table 2.7 report elasticities and multipliers estimated for each value chain scenario. The poverty–growth elasticity (semi-PGE) is the

TABLE 2.7 Estimated poverty, diet deprivation, economic growth, and employment elasticities

Value chain with accelerated productivity growth	Change in indicator given 1% agricultural growth driven by productivity gains (value chain rank in parentheses)				
	National poverty–growth elasticities (semi-PGE)		Diet deprivation–growth elasticities (DGE)	AgGDP+ growth multiplier	AgEMP+ growth multiplier
	Poverty headcount	Poverty gap	ReDD index		
Maize	–0.58 (3)	–0.20 (1)	–0.27 (8)	1.49 (3)	0.03 (6)
Rice & wheat	–0.29 (7)	–0.07 (7)	–0.16 (9)	1.21 (6)	0.04 (4)
Pulses & oilseeds	–0.59 (2)	–0.19 (2)	–1.24 (3)	1.67 (2)	0.05 (3)
Root crops	–0.13 (8)	–0.05 (8)	–0.03 (10)	1.15 (8)	–0.03 (9)
Vegetables	–0.04 (10)	–0.00 (10)	–0.91 (6)	1.33 (4)	–0.03 (10)
Fruits & nuts	–0.50 (5)	–0.18 (3)	–2.09 (1)	1.03 (10)	0.14 (2)
Coffee & tea	–0.42 (6)	–0.16 (5)	–0.29 (7)	1.16 (7)	0.29 (1)
Cattle & dairy	–0.09 (9)	–0.04 (9)	–2.08 (2)	2.11 (1)	–0.01 (8)
Poultry & eggs	–0.54 (4)	–0.11 (6)	–1.09 (4)	1.11 (9)	0.04 (5)
Fish	–0.64 (1)	–0.17 (4)	–0.98 (5)	1.32 (5)	0.02 (7)

Source: Results from IFPRI's Kenya RIAPA model.

percentage point change in poverty headcount or poverty gap ratio per unit increase in primary agricultural GDP growth generated by the targeted value chain. The results in the first column indicate that all value chains are pro-poor in that productivity growth in those value chains is associated with reductions in the national poverty headcount. Among the value chains, the fish value chain has the largest (negative) elasticity, implying that growth in this value chain is the most effective at reducing poverty. The vegetables value chain is the least effective. This reflects the fact that, currently in Kenya, relatively few households near the poverty line benefit from vegetable production or lower vegetable prices. It is also because expanding vegetable production displaces other value chains that are more beneficial for poor households. This displacement effect is an important mechanism within economywide models—that is, these models account for the scarcity of land and labor resources, which may mean the expansion of one value chain comes at the expense of others.

Poverty headcount rates focus simply on the share of people who live below the poverty line, whereas poverty gaps measure how far poor people are, on average, from that poverty line. Poverty gaps therefore better reflect the depth of poverty. Policies that are effective in supporting people to move from just below the poverty line out of poverty will affect the poverty headcount rate but may be less effective at improving the lives of the poorest among the poor and therefore reducing the depth of poverty. As such, we also do not expect the same value chains that are effective at reducing poverty headcount ratios to be effective with regard to poverty gap ratios. As the second column of the table shows, fish is more effective at reducing the poverty headcount rate than it is the poverty gap; the opposite is true for maize. Productivity growth in the maize value chain will therefore benefit poor households further below the poverty line, which is not true to the same extent for the fish value chain.

The third set of results in Table 2.7 reports estimated diet deprivation–growth elasticities (DGE). This elasticity is measured using the Reference Diet Deprivation (ReDD) index (Pauw et al. 2021). ReDD is derived from food consumption gaps across six major food groups relative to reference food intake levels, which are taken from the EAT–*Lancet* healthy reference diet (Willet et al. 2019). A decline in the ReDD index indicates narrowing food consumption shortfalls and is thus associated with an improvement in diet quality. Staples, such as cereals and root crops, are already dominant food groups, and so expanding production of these crops reduces dietary diversity and shifts consumption away from other important food groups in the reference diet. This explains the low diet quality ranking of these value chains (in fact, diets deteriorate in the case of root crops). The tea & coffee value chain also has weak impacts on diets, in part because these beverages are not required in a healthy diet but also because growth in the tea & coffee value chain has weak poverty effects. Diet quality is driven both by changes in relative prices (that is, cheaper tea and coffee will not improve diet quality) and by income changes. The biggest improvements in diets are seen for the fruits & nuts, cattle & dairy, and pulses & oilseeds value chains.

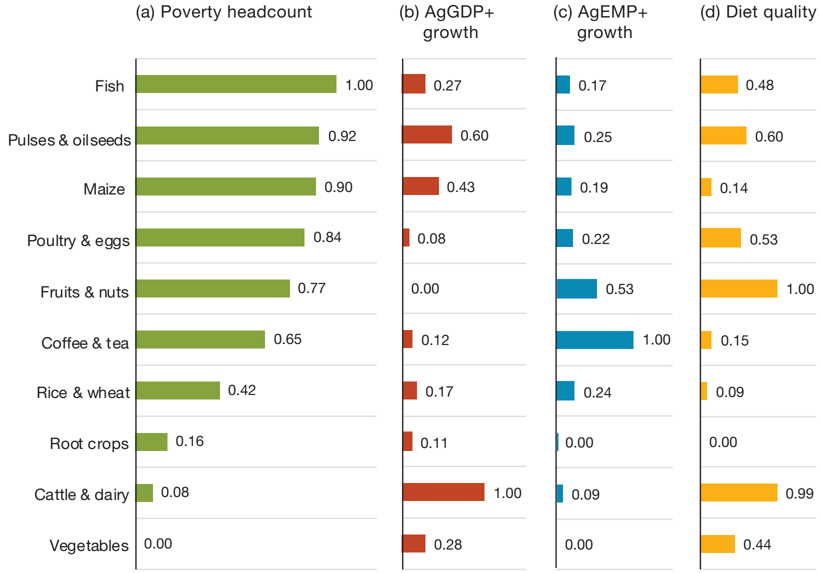
The final two sets of results in Table 2.7 report the growth and employment impacts of expanding production in different value chains. The AgGDP+ growth multiplier measures the monetary change in agrifood system GDP (in US dollars) per unit increase in agricultural GDP generated in the targeted value chain (also in US dollars). Similarly, the AgEMP+ growth multiplier measures the change in number of jobs created within the agrifood system per unit of increase in agricultural GDP generated in the targeted value chain (in US dollars). Value chains with larger off-farm components typically generate larger AgGDP+ growth multiplier effects across the agrifood system. For example, as we saw previously, livestock value chains generally have larger off-farm processing components compared with other value chains (see Table 2.4). It is therefore not surprising that the cattle & dairy value chain has the strongest AgGDP+ growth multiplier effect, especially when considering that much of the supply of raw milk and slaughtered animals goes to the downstream dairy and meat processing sectors that generate downstream value added and drive agrifood system growth beyond the farm. The pulses & oilseeds and maize value chains also have large AgGDP+ growth multipliers. In contrast, most of the value addition in the fruits & nuts value chain happens on the farm, hence this value chain is least effective in driving AgGDP+ growth.

Finally, while there is some correlation between AgGDP+ and AgEMP+ elasticities, it does not necessarily follow that the value chains that are most effective at generating value added are also the most effective at creating jobs. The vegetables and root crops value chains, for example, are not as labor-intensive as other value chains, and so have smaller AgEMP+ growth multipliers. In contrast, the more labor-intensive coffee & tea and fruits & nuts sectors have large employment effects across the agrifood system.

Prioritizing value chains

Figure 2.6 compares the relative effectiveness of growth in each value chain in achieving the various development outcomes. Since we choose to include only one poverty measure in the final assessment, we arbitrarily exclude the poverty gap measure. Also, since we are comparing outcomes with different units, such as poverty–growth elasticities and employment multipliers, it is necessary to

FIGURE 2.6 Normalized value chain scores for different outcomes



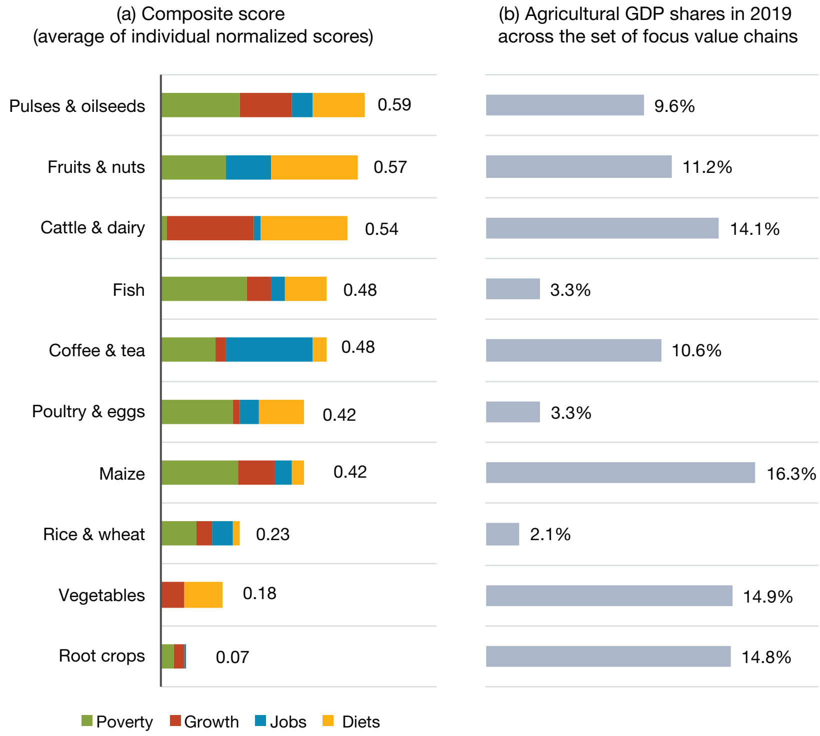
Source: Results from IFPRI's Kenya RIAPA model.

Note: Scores for each outcome category are normalized such that the value chain whose growth is most effective at improving that outcome has a score of one, while the least effective value chain has a score of zero.

normalize the individual outcome scores. The values of each indicator are scaled so that the most effective value chain is given a score of one and the least effective a score of zero. Normalization does not alter the relative effectiveness of value chains within each outcome category. For example, the fish and vegetables value chains were, respectively, the most and least effective value chains in reducing national poverty (see Table 2.7), and these rankings remain unchanged after normalization.

The value chains in the figure are ranked based on their poverty scores, with fish appearing at the top of Panel A. However, while the fish value chain is the most effective at reducing poverty, it is relatively ineffective at achieving the other outcomes. Cattle & dairy, on the other hand, is most effective at driving agrifood system growth. It is also highly effective at improving diet quality—but has weak poverty and employment impacts. This variation across outcomes shows how no single value chain is most effective at achieving every

FIGURE 2.7 Composite score and final ranking based on equally weighted outcomes



Source: Results from IFPRI's Kenya RIAPA model.
Note: Composite score is a simple average of the normalized scores for the four focus outcome indicators (see Figure 2.6).

development objective. Diversified sources of agricultural growth are therefore needed to drive inclusive agricultural transformation in Kenya.

Identifying which value chains are the most effective overall depends on the importance policymakers or society attach to each of the chosen outcome dimensions. Figure 2.7 shows composite scores estimated by assuming that each of the four outcomes is equally important. In other words, the composite score in the lefthand panel is a simple average of the four normalized scores in Figure 2.6—that is, each outcome dimension is weighted equally. The value chains are re-ranked based on the composite score, and the colors in the figure indicate the contribution of each outcome to the value chain's final score. Although the pulses & oilseeds value chain is not the highest-ranked value chain for any single development outcome, its persistently high rank means it scores highest on the composite score. Fruits & nuts, which are especially effective at improving diets and reducing poverty, and cattle & dairy are, respectively, ranked third and fourth.

The analysis suggests that, if outcomes are equally important and therefore equally weighted, then Kenya should orient its policy and investment target toward high-value products such as pulses & oilseeds, fruits & nuts, and cattle & dairy. Conversely, overinvesting in staple crops such as cereals and root crops will limit the pace of inclusiveness of agricultural transformation. Unfortunately, these crops make up a large share of the existing agriculture sector (see Panel B), which highlights the need for faster diversification.

Finally, we consider how the weighting of outcomes affects the value chain rankings. Table 2.8 ranks value chains using different weighting schemes. The first column assigns equal weights across outcomes (the same as in Figure 2.7), whereas the other columns give greater weight to each of the four outcome indicators in turn. Specifically, we arbitrarily give half the weight to a single outcome and split the rest across the other outcomes. The pulses & oilseeds value chain retains its top-three ranking irrespective of the weighting scheme adopted. The fruits & nuts value chain drops out of the top-three ranking only when the bias is in favor of the agrifood system growth outcome. The cattle & dairy value chain loses its top-three ranking when the poverty or diet quality outcomes are favored.

Although our value chain rankings are reasonably robust to different weighting schemes, our weighting schemes are limited in scope and

TABLE 2.8 Value chain rankings under different outcome weighting schemes

	Equal weights (no bias)	Outcome-biased rankings			
		Poverty bias	Growth bias	Employment bias	Diet quality bias
1	Pulses & oilseeds	Pulses & oilseeds	Cattle & dairy	Coffee & tea	Fruits & nuts
2	Fruits & nuts	Fish	Pulses & oilseeds	Fruits & nuts	Cattle & dairy
3	Cattle & dairy	Fruits & nuts	Maize	Pulses & oilseeds	Pulses & oilseeds
4	Fish	Maize	Fish	Cattle & dairy	Fish
5	Coffee & tea	Poultry & eggs	Fruits & nuts	Fish	Poultry & eggs
6	Poultry & eggs	Coffee & tea	Coffee & tea	Poultry & eggs	Coffee & tea
7	Maize	Cattle & dairy	Poultry & eggs	Maize	Maize
8	Rice & wheat	Rice & wheat	Vegetables	Rice & wheat	Vegetables
9	Vegetables	Vegetables	Rice & wheat	Vegetables	Rice & wheat
10	Root crops	Root crops	Root crops	Root crops	Root crops

Source: Results from IFPRI's Kenya RIAPA model.

Note: In the biased rankings, the focus outcome is given a 50% weight and the remaining outcomes share the remaining 50% equally.

hypothetical—that is, they may not represent the actual preferences of policymakers or society. Our results are also potentially sensitive to the definition of outcome indicators. For example, a different ranking may emerge if the poverty gap ratio is used instead of the poverty headcount ratio (see Table 2.7). Likewise, some might argue that a measure of undernourishment (that is, a lack of sufficient calories) would be more appropriate as a development outcome than our diet quality measure. And whereas we measure growth and employment effects within the agrifood system only—motivated by our interest in agrifood system transformation—others may be interested in the role of agricultural value chains in contributing to economywide growth and employment effects.

We further acknowledge that our value chain rankings offer a national perspective only. Kenya has several distinct agroecological zones, which differ in terms of the value chains that are most suited to local soil, climatic, and market conditions. The devolved political system means that county governments are mandated to design and implement their own development strategies, and this will likely include promotion of value chains depending on their suitability to local conditions and their contribution to local development goals. In an ideal setting, the analysis here would be conducted at the county or county cluster level, which would provide context-specific recommendations. This is an important area for further research in Kenya, albeit one that would require a significantly expanded data collection effort.

Lastly, the model outcomes reflect existing input–output relationships across sectors and current links between household and value chains via employment or consumption. The analysis does not account for the possibility that investments may provide access to new markets or alter input–output relationships, which may result in increased profitability or greater spillover effects between on-farm productivity growth and off-farm growth and employment. We also acknowledge the potential that policy incentives may, over time, allow certain households to engage more actively in value chains from which they are currently excluded. This could, for example, result in value chains such as vegetables or cattle & dairy having stronger poverty-reducing effects than the current data reflect. An analysis of the effects of upgrading value chains to their ideal states is beyond the scope of this study. Useful examples of such work in the context of Kenya include Davids and colleagues (2021), Delport and colleagues (2021), and Langat and colleagues (2021).

In summary, agricultural growth in Kenya is generally pro-poor, and it also contributes to broad economic development and job creation beyond the farm. However, the source or pattern of agricultural growth matters for the pace and inclusiveness of agricultural transformation, and this underscores the need to ensure a better-designed policy and investment portfolio of value chains to drive future agricultural growth.

Conclusion

Kenya's economy grew rapidly during the 2009–2019 decade, and this helped reduce the absolute number of poor people for the first time in decades. This chapter has used new economywide databases and indicators to measure the structure of Kenya's current and evolving agrifood system and its contribution to national development. It has found that the agrifood system, as measured from the supply side and using national accounts and employment statistics, stretches well beyond primary agriculture and creates jobs and income opportunities throughout the economy. These linkages will be expected to become even more important over time, as the development paths of more advanced economies demonstrate. Successful transformation in Kenya requires even larger contributions from agro-processing and food services, with more value added and jobs in the food system eventually generated off the farm. However, while Kenya's agrifood system is growing, and there is faster growth in its off-farm components, the pattern of growth is biased toward creating more value added for primary agricultural products than for processed products. This suggests that Kenya's agrifood system is, as a whole, still in an early stage of agricultural transformation, with most growth and job creation occurring close to the farm. Growth is also faster in the less productive activities of the agrifood system, which could slow the pace of agrifood system transformation.

To determine what is needed for Kenya's agrifood system to contribute more to broad development outcomes, we used RIAPA, an economywide model, to link alternative sources of agricultural growth to outcome indicators associated with inclusive agricultural transformation. The findings indicate that value chains differ considerably in their effectiveness in achieving different development goals. However, the value chains found to be the most effective in reducing poverty, generating growth and employment opportunities in the agrifood system, and improving diets are also the ones that already make up a relatively large share of Kenya's current agriculture sector. This includes value chains such as pulses & oilseeds, fruits & nuts, and cattle & dairy. That said, the value chains that are found to be least effective, including maize and root crops, often dominate agricultural landholding and account for a large share of public investments. Acceleration of structural changes within the agrifood system through the reorientation of the government's investment portfolio could enhance the potential contribution of the agrifood system to broad development outcomes.

The time series data developed for this chapter provide rich information on the changing structure of Kenya's agrifood system. The analysis here has focused on aggregate characteristics and broad trends. Further research is needed to fully exploit the database's information on detailed agricultural products and value chains, including their structure and performance in different agroecological zones. We did, for example, decompose the sources of agricultural growth across value chains, and assess their diverse contribution to national economic development. More in-depth analysis within the agriculture sector is needed to understand which sources of agricultural growth face which kinds of constraints, and which value chains are more promising for public and private investments, including at the subregional or county level. Such investments may also alter input–output relationships, allow value chain actors to access new markets, or enable new actors (such as poor households) to formally engage in value chains from which they were previously excluded.

Finally, our historical analysis of Kenya's agrifood system has focused on the supply side and decomposed changes in GDP and employment. A more comprehensive diagnosis would also require assessing changes in patterns of demand, including consumer demand (see Chapter 4 in this volume) and the role of domestic and international trade. Nevertheless, this chapter has laid the foundation for a more structured analysis of the agrifood system, including the characterization of historical patterns and drivers of change, and the identification of trade-offs and synergies between value chain investments designed to facilitate broad agricultural transformation.

Appendix 2.1 Decomposing agricultural GDP

TABLE A.2.1 Decomposing AgGDP+ across value chains, 2019

Product group	Individual products in the supply use table and their share of group's agricultural GDP (2019)
Cereals	Maize 85% | Sorghum & millet 5.3% | Rice 2.7% | Wheat & barley 6.6% | Other cereals 0.4%
Pulses & oilseeds	Pulses 90.1% | Groundnuts 7% | Other oilseeds 2.8%
Root crops	Cassava 10.2% | Irish potatoes 64.7% | Sweet potatoes 24.4% | Other roots 0.7%
Horticulture	Leafy green vegetables 27.9% | Other vegetables 22.4% | Nuts 2% | Bananas 14.6% | Plantains 0.5% | Other fruits 32.6%
Livestock	Cattle meat 27.7% | Raw milk 49.3% | Poultry meat 5.1% | Eggs 3.7% | Small ruminants 8.1% | Other livestock 6.1%
Fish	Aquaculture 9.8% | Capture fisheries 90.2%
Export crops	Sugarcane 16.8% | Tobacco 1.2% | Cotton & fibers 3% | Leaf tea 37.3% | Coffee 5.1% | Cut flowers 11.8% | Other crops & support services 24.8%
Forestry	One product line
Beverages & other foods	Cannot easily be assigned to a single agricultural activity's output

Source: Authors using IFPRI's 2019 Kenya Social Accounting Matrix

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