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Transformation of Kenya's Agrifood System

Structure and Drivers

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Introduction

Kenya experienced significant economic development in the 2009 to 2019 period. Gross domestic product (GDP)—an indicator of the economy's size—expanded by an annual average of 5 percent (KNBS 2022). This exceeded population growth and helped raise household incomes, leading to a decline in poverty rates; more importantly, for the first time in at least three decades, the country experienced a decline in the absolute number of poor people (World Bank 2022). While the global COVID-19 pandemic caused negative economic growth in 2020, the economy recovered quickly in 2021. Kenya was also largely spared the adverse effects of the global commodity market disruptions arising from the Russia-Ukraine war that started in 2022 and from the global recession in 2023 (Arndt et al. 2023; Diao and Thurlow 2023). Kenya's GDP growth is projected to reach 5.0 percent in 2023 and 5.3 percent in 2024 (World Bank 2023), suggesting that the economy is resuming its pre-pandemic growth trajectory. Agriculture remains an important sector, accounting for about one-quarter of GDP and nearly half of Kenya's employment. It has thus played an important role in economic development. The sector has grown alongside the rest of the economy despite many challenges including climate variability (Ochieng et al. 2020), weak rural infrastructure (Benin and Odjo 2018), declines in farm size (Jayne et al. 2016), and limited access to farm inputs combined with poor agronomic management (Worku et al. 2020). In this brief, we look beyond primary agriculture to understand how Kenya's broader agrifood system (AFS) is contributing to growth and transformation in the country.

The AFS is a complex network of actors who are connected by their roles in supplying, consuming, and governing agrifood products and jobs. Just as an economy undergoes transformations as a country develops, agrifood systems are expected to evolve (Diao, Hazell, and Thurlow 2010; Timmer 1988). Subsistence farming typically dominates agriculture during the earliest stages of development; as agricultural productivity rises, however, farmers start to supply surplus production to markets, thus creating job opportunities for workers in the off-farm economy, both within and outside the agrifood sectors (Haggblade, Hazell, and Dorosh 2007). Rising rural incomes generate demand for more diverse products; this leads to more processing, packaging, transporting, trading, and other nonfarm activities. In

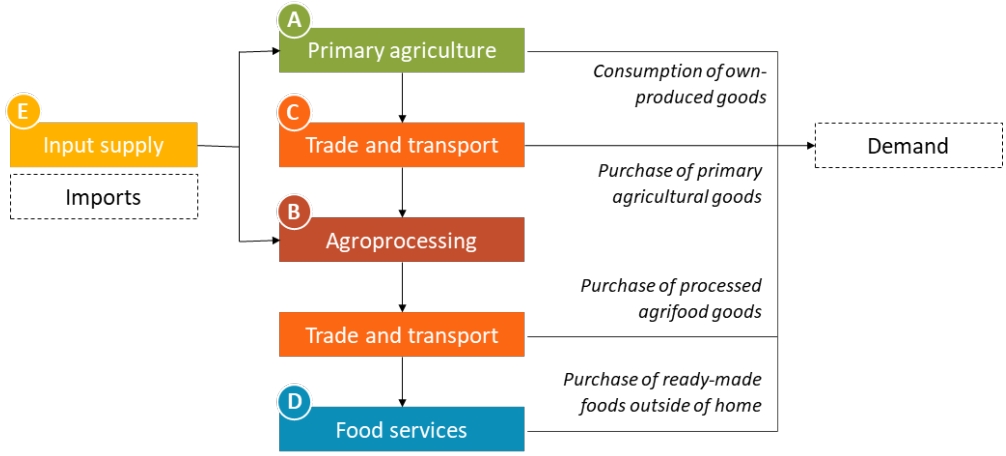
the early stages of transformation, the agriculture sector serves as an engine of rural—and even national—economic growth. Eventually, urbanization, the nonfarm economy, and nonagricultural incomes play more dominant roles in propelling agrifood system development, with urban and rural nonfarm consumers creating most of the demand for agricultural outputs via value chains that connect rural areas to towns and cities (Dorosh and Thurlow 2013). The exact nature of this transformation process varies across countries because of the diverse structure of their economies and the unique growth trajectories of their various agrifood and nonfood subsectors.

This brief describes the current and changing structure of Kenya's AFS and evaluates the potential contribution of different value chains to the acceleration of agricultural transformation and inclusiveness (for more detailed analysis, see Diao et al. 2023). We start by offering a simple conceptual framework of the AFS and then compare Kenya's AFS with that of other countries at different stages of development. We go on to disaggregate Kenya's AFS across agricultural value chains, taking into consideration their different market structures and historical contributions to economic growth and transformation. Finally, we use a forward-looking economywide model to assess the diverse contributions that specific value chains can make to each of a set of broad development outcomes. We conclude by summarizing our main findings.

A Simple Conceptual Framework of the Agrifood System

A country's AFS is a complex network of actors who are connected by their roles in supplying, using, and governing agrifood products (see Fanzo et al. 2020 for a detailed conceptual description of the AFS). In this brief, rather than examining all components of Kenya's AFS, we employ a narrower focus. We first measure its size, structure, and historical contribution to economic growth and transformation through what is primarily a data-driven exercise; second, we use the International Food Policy Research Institute (IFPRI) Rural Investment and Policy Analysis (RIAPA) model (IFPRI 2023) to assess the effectiveness of AFS growth (led by productivity gains in different agricultural value chains) in promoting multiple development outcomes in Kenya. Our measurement of the AFS is done from a supply-side perspective; that is, we use national accounts and employment statistics to either track or simulate growth and employment changes over time. By disaggregating the AFS into several value chain groups, this analysis offers a unique and useful perspective on the drivers of AFS growth and transformation.

Figure 1. A simple conceptual framework of the agrifood system



Source: Thurlow et al. (2023).

Figure 1 provides a simple conceptual framework of the AFS, made up of five components, A to E (see Thurlow et al. 2023). *Primary agriculture* (A) comprises the supply and demand of all agricultural products including crops, livestock, fisheries, and forestry products. *Agroprocessing* (B) is part of the manufacturing sector and includes those subsectors that process agriculture-related food or nonfood products. *Trade and transport services* (C) include those services associated with the transporting, wholesaling, and retailing of agrifood products between farms, firms, and final points of sale. *Food services* (D) includes services such as meals prepared at restaurants, food stalls, or hotels. Finally, *input supply* (E) is the portion of domestically produced intermediate inputs that is used directly in agricultural and agroprocessing production, such as fertilizers and financial services.

Using this conceptual framework, it is possible to measure the size and structure of Kenya's AFS from a supply-side perspective. Following the definitions of Thurlow et al. (2023), AFS GDP (or AgGDP+) is the sum of the GDP contributions of the five components (A to E), while AFS employment (or AgEMP+) is the total number of jobs across those components. As an economy grows and transforms over time, there will be changes in the relative contributions of the various on- and off-farm components of the AFS to total AgGDP+ or AgEMP+. A transforming economy, for example, will typically be characterized by more rapid growth in the off-farm components of the AFS; there will thus be an increase in the contributions of off-farm components to AgGDP+ and AgEMP+ and a relative decline in the contribution of primary agriculture. By disaggregating AgGDP+ and AgEMP+ by specific agricultural value chains, we can further assess the contribution of each of those value chains to AFS growth and transformation.

Current Structure of Kenya's Agrifood System

Table 1 presents the structure of Kenya's AFS in 2019 based on official national accounts data and sectoral employment statistics (KNBS 2022; ILO 2020), as compiled in a 2019 Social Accounting Matrix (SAM) for Kenya (IFPRI 2021). National estimates are broken down into estimates for the AFS (that is, AgGDP+ and AgEMP+) and the rest of the economy. The AFS is further broken down into its on-farm (primary agriculture) and off-farm components. The estimates at the bottom of the table for manufacturing and services (including the trade and transport services subsector) include activities in both the AFS and non-AFS sectors; they thus provide a perspective on the relative size of the off-farm AFS components within the overall manufacturing and services sectors.

As shown in Table 1, in 2019 the AFS accounted for about one-third of Kenya's national GDP and more than 50 percent of its employment. Primary agriculture alone contributed 23 percent of GDP and 43 percent of employment, while the four off-farm components of the AFS contributed 11 percent to GDP and about 11 percent to employment. The off-farm components of the AFS therefore accounted for roughly one-third of AgGDP+ and 20 percent of AgEMP+. The comparison of on- and off-farm GDP and employment shares shows that labor productivity in the off-farm components of the AFS is higher than on-farm. The movement of farm workers into these off-farm components—a natural process of agricultural transformation—may thus be beneficial to household incomes.

Table 1. Current structure of Kenya's agrifood system and economy (2019)

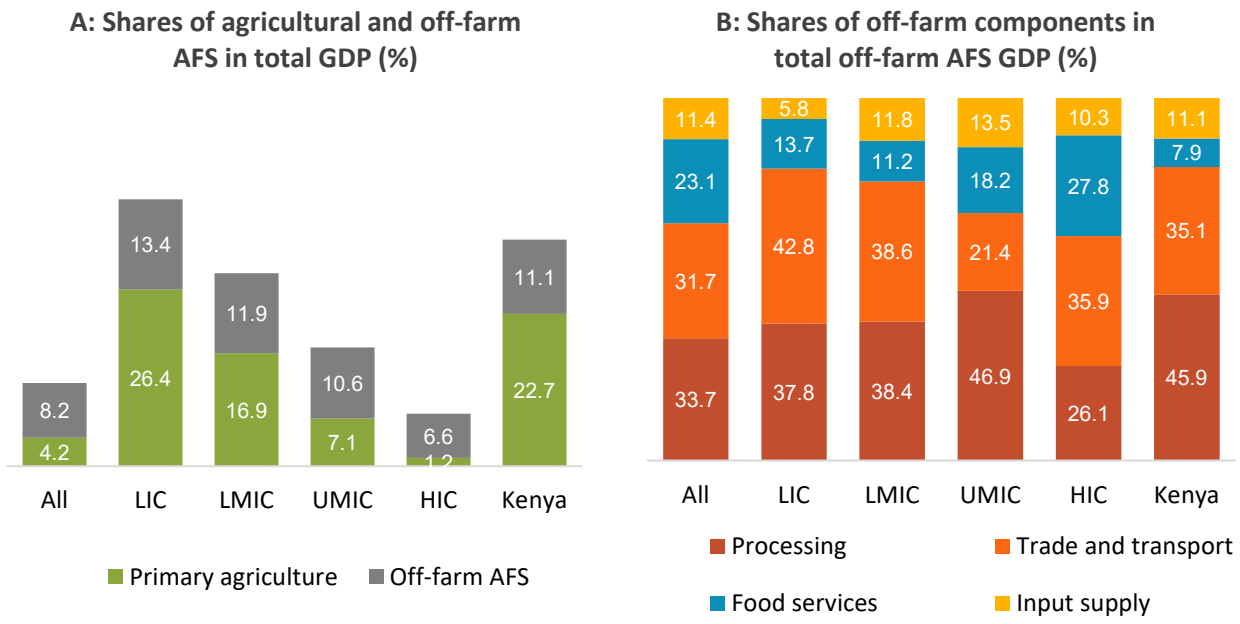
	GDP		Employment	
	Value (US$ billion)	Share (%)	Workers (million)	Share (%)
Total economy	**92.0**	**100.0**	**18.7**	**100.0**
Agrifood system (AFS)	**31.1**	**33.8**	**10.2**	**54.7**
Primary agriculture (A)	**20.9**	**22.7**	**8.1**	**43.3**
Off-farm AFS	**10.2**	**11.1**	**2.1**	**11.4**
Processing (B)	4.7	5.1	0.5	2.5
Trade and transport (C)	3.6	3.9	1.1	6.1
Food services (D)	0.8	0.9	0.4	2.2
Input supply (E)	1.1	1.2	0.1	0.6
Rest of economy	**60.9**	**66.2**	**8.5**	**45.3**
Total manufacturing	7.9	8.6	1.1	5.8
Total services	53.9	58.6	8.2	43.9
Total trade and transport	21.2	23.1	4.5	24.3

Source: Authors' calculation based on the 2019 Social Accounting Matrix for Kenya (IFPRI 2021).
Note: A to E correspond to the five agrifood system components from Figure 1.

Comparing Kenya's Agrifood System to Other Countries

The structure and economic contribution of a country's AFS varies at different stages of its development. Evidence of this is provided in Figure 2, which compares the 2019 AFS structures of low-income (LIC), lower-middle-income (LMIC), upper-middle-income (UMIC), and high-income countries (HIC). As an LMIC, the off-farm component of Kenya's AFS and its contribution to national GDP are comparable to its peer LMICs, while the country's on-farm AFS component falls between those of LICs and LMICs (Panel A). In terms of the four off-farm components of the AFS, Kenya's agroprocessing is much larger than what is seen in other LMICs; this reflects the processing requirements of Kenya's large livestock and tradable crop sectors (see discussion below). Consistent with the structure of AFSs in other African countries, Kenya has a relatively small food services sector. Kenya's population is also less urbanized than that of many other developing countries; this may explain the lesser importance of food services, which tend to be more concentrated in urban centers (Panel B).

Figure 2. Comparing Kenya's agrifood system to other countries (2019)

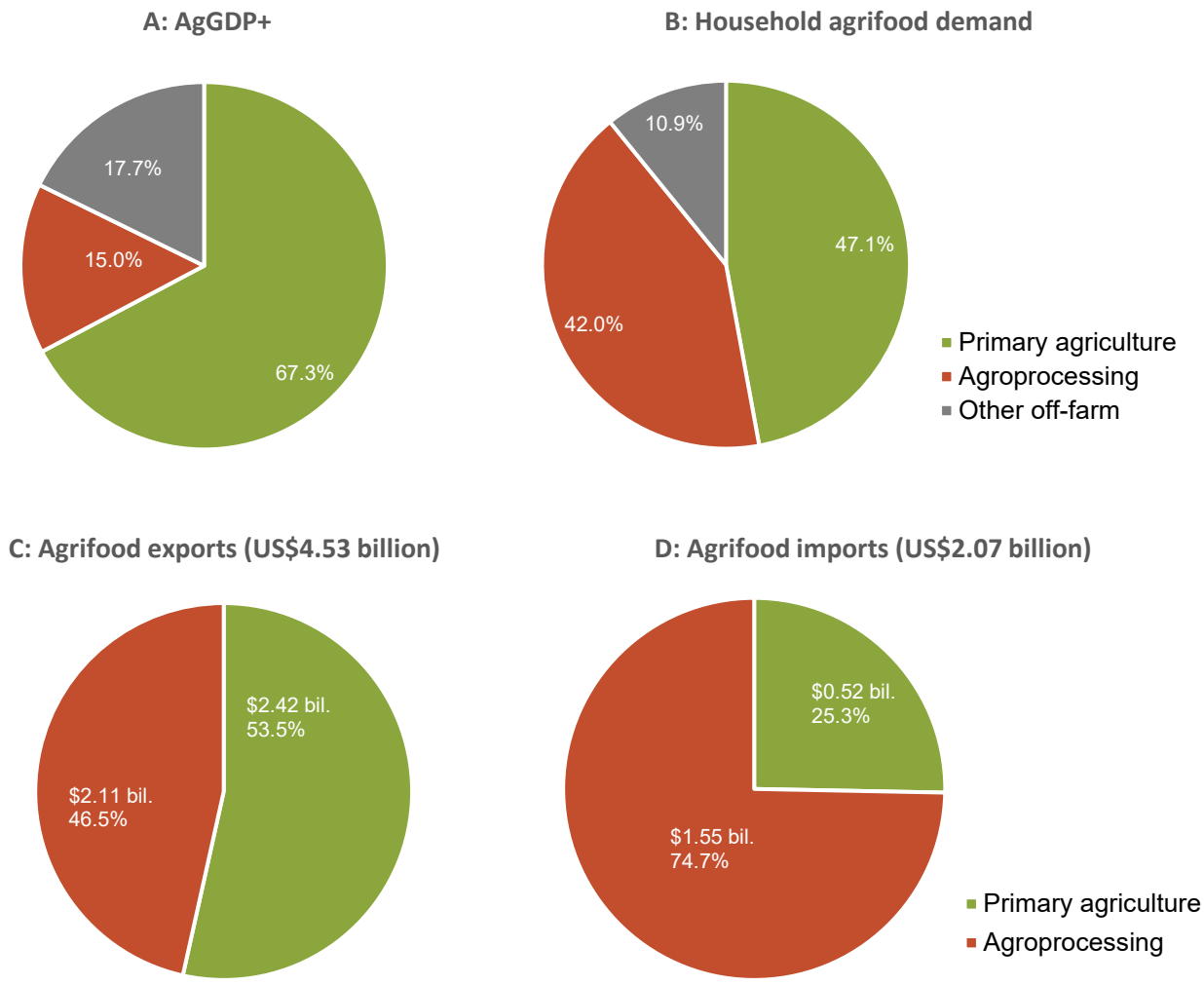


Source: IFPRI's Agrifood System Database (Thurlow et al. 2023) and the 2019 Social Accounting Matrix for Kenya (IFPRI 2021).
Note: LIC = low-income country; LMIC = lower-middle-income country; UMIC = upper-middle-income country; HIC = high-income country.

Unpacking the Demand Side of Kenya's Agrifood System

In Figure 3, the structure of Kenya's AFS from the supply side, as measured by AgGDP+ (Panel A), is compared to the structure of the AFS from the demand side, as measured by household consumption of agrifood products (Panel B). While two-thirds of AgGDP+ is from primary agriculture, primary agricultural commodities account for only 47.1 percent of household demand. In contrast, household demand for processed agrifood products accounts for 42.0 percent of total agrifood demand, even though the associated sector accounts for only 15.0 percent of AgGDP+. The bias toward processed agrifood products is mirrored in the high share of agrifood imports that is accounted for by processed products; that is, 53.5 percent of agrifood commodity exports are primary agricultural commodities (Panel C), but 74.7 percent of imports are processed goods (Panel D). Kenya nevertheless maintains a substantial surplus on its agrifood commodity trade balance for both primary agricultural and processed agrifood commodities: the value of Kenya's agrifood commodity exports is more than twice the value of its agrifood imports.

Figure 3. Composition of agrifood system GDP, household demand, and trade (2019)



Source: Authors' calculation based on the 2019 Social Accounting Matrix for Kenya (IFPRI 2021).

Disaggregating the Agrifood System across Value Chains

For a more detailed assessment of structural and historical growth patterns within the AFS, we group Kenya's agrifood system into 15 value chain groups (see Table A1 in the Appendix for details on how individual value chains, or subsectors, are mapped to value chain groups.) The 15 value chain groups are further categorized into three subgroups on the basis of their trade orientation. Exportable and importable value chains are defined, respectively, as those value chains with export–output and import–consumption ratios above the national average. Trade in both primary and processed agrifood products is considered in the calculation of these trade ratios. The remaining value chains are classified as less-traded value chains.

Table 2 shows the 15 value chain groups, categorized into exportable, importable, and less-traded value chains. The table also reports the contribution of each value chain group to AgGDP+, primary agricultural GDP, and GDP in off-farm components of the AFS. Consistent with Figure 3, Table 2 shows that Kenya has a comparative advantage in exports, with an export–output ratio of 8.9 percent; this is

much higher than the import–consumption ratio of 4.3 percent. Of the 15 value chains, 2 are classified as exportable because their export–output ratios exceed the national average for AFS value chains. It should be noted that both of these exportable value chains groups together various agricultural products; "export crops", for example, included tea, coffee, and cut flowers, which are the country's most important agricultural export products. The two exportable value chains have relatively small off-farm AFS GDP shares compared with their shares in primary agricultural GDP, as traditional agricultural exports are mainly in primary products. Together the two exportable value chains account for only 11.3 percent of total off-farm AFS GDP, while they account for 19.1 percent of primary agricultural GDP.

Table 2. Kenya's agrifood system composition by trade orientation of value chains (2019)

	Share of GDP (%)			Exports/output (%)	Imports/demand (%)
	AFS (AgGDP+)	Primary agriculture	Off-farm AFS		
Total	**100.0**	**100.0**	**100.0**	**8.9**	**4.3**
Exportable	**16.5**	**19.1**	**11.3**	**45.2**	**2.7**
Fruits and nuts	7.8	9.2	4.9	11.6	3.2
Export crops	8.7	9.9	6.3	65.0	2.0
Importable	**15.8**	**11.5**	**24.5**	**3.3**	**12.9**
Rice and wheat	3.2	1.7	6.4	0.5	15.4
Oilseeds	3.3	2.1	5.7	5.8	21.9
Other crops	6.8	5.0	10.6	4.8	9.4
Poultry and eggs	2.4	2.7	1.9	0.3	5.7
Less traded	**65.2**	**69.4**	**56.7**	**1.1**	**1.6**
Maize	10.5	13.4	4.6	0.2	2.3
Sorghum and other cereals	1.9	1.2	3.2	2.2	1.6
Root crops	8.9	12.2	2.2	0.0	0.3
Pulses	4.5	5.7	1.9	0.9	3.7
Vegetables	9.9	12.3	5.2	2.7	0.4
Cattle and dairy	17.4	11.6	29.4	0.2	1.1
Other livestock	2.1	2.9	0.4	5.8	0.6
Fish	2.3	2.7	1.6	5.3	3.9
Forestry	7.6	7.3	8.1	0.9	3.6

Source: Authors' calculation based on the 2019 Social Accounting Matrix for Kenya (IFPRI 2021).

Despite the Kenyan economy's relative openness, 9 of the 15 value chains fall in the less-traded group of value chains; together, they account for 65.2 percent of AgGDP+. Many of these less-traded value chains have relatively small off-farm components, and they thus contribute a relatively small share to off-farm AFS GDP (56.7 percent) compared to their primary agricultural GDP contribution (69.4 percent). The cattle and dairy value chain is a clear exception in that it is associated with significant value

addition off-farm (such as meat processing and dairy products). Expansion of this sector could thus effectively drive agricultural transformation by boosting value addition and off-farm employment in the value chain.

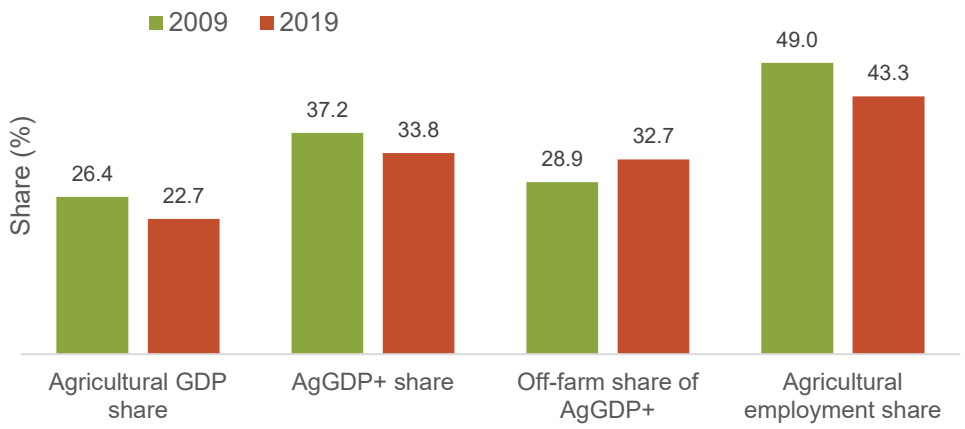
Structural Change and Drivers of Agrifood System GDP Growth

The previous sections have provided a snapshot of the current structure of Kenya's AFS, the disaggregation of the AFS across the 15 value chain groups, and the trade orientation of those value chains. We have demonstrated that Kenya has a comparative advantage in agrifood exports, while less-traded value chains are dominant in terms of their contribution to AgGDP+ and primary agriculture. With cattle and dairy as an exception, these value chains are also generally less oriented toward value addition in the off-farm components of the AFS; that is to say, their contribution to off-farm AFS components is small relative to their contribution to primary agriculture, especially when compared to tradable value chains. Prioritizing growth in tradable value chains and the cattle and dairy value chain could therefore be an effective strategy for expanding off-farm value addition and jobs, which would contribute positively to AFS transformation.

In this section, we assess the performance and structural transformation of Kenya's AFS in recent years. Labor productivity is typically lowest in primary agriculture and higher in off-farm activities such as agrifood processing or in sectors outside the AFS. Economic growth and urbanization are associated with relatively rapid growth in these nonagricultural sectors, which can help create higher-paying jobs for both rural and urban households. As such, even smallholder farm households with family members who obtain off-farm employment may benefit from structural transformation.

Figure 4 compares the shares of agricultural GDP and AgGDP+ in Kenya's national GDP and shows agricultural employment as a share of total employment. It also includes an estimate of the share of the off-farm components in AgGDP+. The figure covers the period between 2009 and 2019. Over these years, agricultural GDP and AgGDP+ shares in national GDP fell, as did the agricultural employment share in total employment, while the off-farm component's share of AgGDP+ increased. This indicates that Kenya's AFS has been experiencing a transformation. However, primary agriculture still dominates AgGDP+,with its contribution twice the size of the off-farm contribution.

Figure 4. Agricultural GDP, agrifood system GDP, and employment shares (2009–2019)



Source: Authors' estimates using IFPRI's 2009 and 2019 Social Accounting Matrixes for Kenya (IFPRI 2021).

Table 3 evaluates the growth performance across AFS value chains over the 2009 to 2019 period. As before, value chains are grouped according to their trade status, that is, exportable, importable, and less traded. Overall, Kenya's AFS grew modestly, with an average annual AgGDP+ growth rate of 3.9 percent. In comparison, in that same 10-year period, the national GDP annual growth rate was 5.5 percent. The off-farm component of the AFS grew faster (5.2 percent) than primary agriculture (3.4 percent), while agrifood processing (a subcomponent of the off-farm component of the AFS), grew at an annual rate of 4.7 percent.

Table 3. Agrifood system GDP growth rates by value chain (2009–2019)

	Average annual GDP growth rate (%)			
	Total AFS	Primary agriculture	Off-farm AFS	Agro-processing
Total AFS (agrifood system)	**3.9**	**3.4**	**5.2**	**4.7**
Exportable	**1.6**	**0.8**	**4.9**	**4.3**
Fruits and nuts	-0.8	-1.7	4.4	4.4
Export crops*	4.3	4.1	5.2	4.3
Importable	**4.3**	**3.6**	**5.0**	**4.8**
Rice and wheat*	4.0	3.8	4.1	3.6
Oilseeds*	4.2	1.9	6.5	10.1
Other crops	3.0	1.8	4.5	4.4
Poultry and eggs*	10.2	11.1	7.9	4.4
Less traded	**4.5**	**4.1**	**5.5**	**4.7**
Maize*	6.5	6.6	5.7	5.1
Sorghum and other cereals*	5.9	5.9	5.8	5.5
Root crops	3.3	3.0	8.2	5.6
Pulses*	8.0	8.0	7.9	4.6
Vegetables*	5.5	4.9	9.0	4.3
Cattle and dairy	3.1	1.6	4.5	4.6
Other livestock	2.5	2.4	3.7	4.0
Fish	3.3	2.4	7.0	4.4
Forestry*	4.8	4.3	6.0	4.7

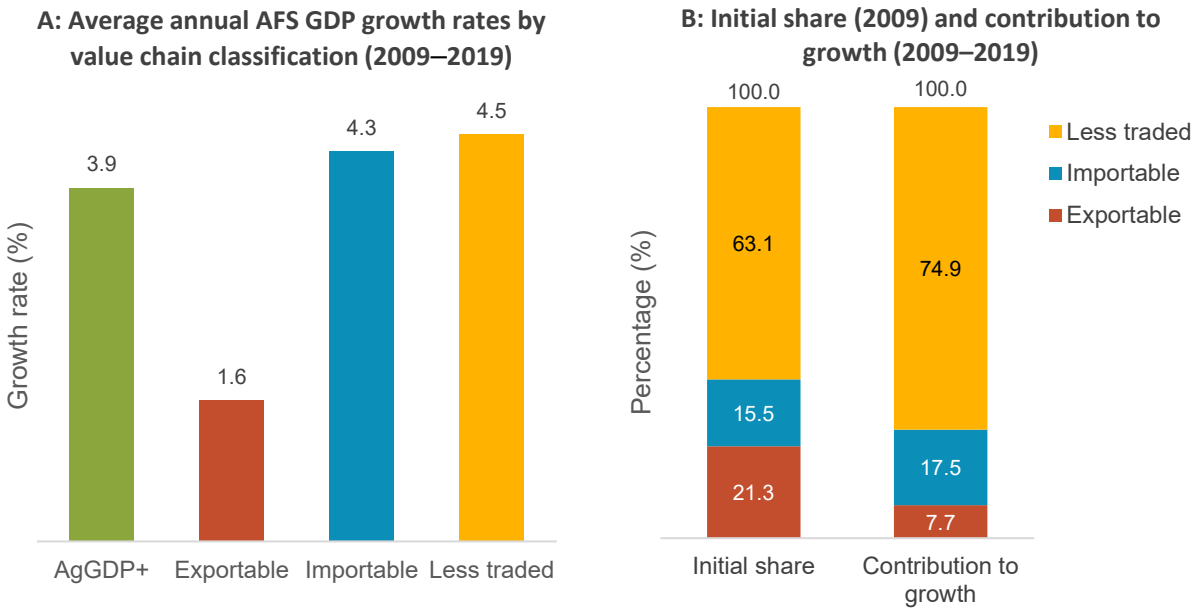
Source: Authors' analysis using the 2009 and 2019 Social Accounting Matrixes for Kenya (IFPRI 2021).
Note: Value chains that experienced above-average AgGDP+ growth over the 2009 to 2019 period (that is, higher than 3.9 percent) are marked with an asterisk (*).

Among the 15 value chains, 9 achieved above-average growth (more than 3.9 percent per year) during the 2009 to 2019 period (they are marked with an asterisk in Table 3). Of the two exportable value chains, the export crops value chain grew faster than the AFS average, while the growth rate was negative for the fruits and nuts value chain; this led to poor growth performance for the total exportable value chain group. Of the 9 less-traded value chains, 5 achieved above-average growth: maize, sorghum and other cereals, pulses, vegetables, and forestry. Of the 4 importable value chains, 3 also grew faster than the AFS average: rice and wheat, oilseeds, and poultry and eggs. In several of these rapidly

growing value chains, growth in the off-farm components of the AFS was higher than growth in the primary agricultural component. In most of the value chains that achieved above-average growth, however, the processing components of value chains did not grow rapidly. This is consistent with the broader patterns of growth and structural change in Kenya's AFS, which show that growth in the off-farm component of the AFS was faster than on-farm growth, but that agroprocessing GDP grew relatively modestly.

Figure 5 summarizes the key growth trends from Table 3. On average, less-traded (4.5 percent) and importable (4.3 percent) value chains grew faster than the national average growth in AgGDP+ (3.9 percent) (Panel A). Since importable value chains make up only a relatively small share of the AFS (15.5 percent), however, the large less-traded group of value chains contributed the most to overall AFS growth, at 74.9 percent (Panel B).

Figure 5. Drivers of Kenya's AFS GDP growth (2009–2019)



Source: Authors' analysis using the 2009 and 2019 Social Accounting Matrixes for Kenya (IFPRI 2021).

Assessing Growth Outcomes Using IFPRI's RIAPA Model

IFPRI's Rural Investment and Policy Analysis (RIAPA) model is a tool for conducting forward-looking, economywide, country-level analysis (IFPRI 2023). RIAPA has been used in a wide variety of contexts to simulate the impacts of policies, investments, and economic shocks. Here we employ RIAPA to assess the effectiveness of productivity-led growth in Kenya's agricultural value chain groups in terms of their ability to promote multiple development outcomes. The analysis was carried out for 10 value chain groups, which were selected from the original list of 15; other crops, other livestock, and forestry were excluded, while pulses and oilseeds were combined. We considered five development outcomes:

- A poverty–growth elasticity that measures the percentage point change in the poverty headcount rate per unit of agricultural GDP growth generated within the targeted value chain;

- A growth multiplier that measures the change in GDP per unit of increase in agricultural GDP in the targeted value chain;
- An employment multiplier that measures the change in the number of jobs created per unit of increase in agricultural GDP in the targeted value chain;
- A diet-quality indicator that measures the percentage change in a diet quality index per unit of agricultural GDP growth generated within the targeted value chain; and
- A hunger–growth elasticity that measures the percentage point change in the rate of undernourishment per unit of agricultural GDP growth generated within the targeted value chain.

The simulations entail increasing on-farm productivity separately in each targeted value chain and comparing development outcomes across the value chains. While this exogenous productivity shock is imposed only in the primary agriculture component of each value chain, there are spillover effects into that value chain's off-farm components as well as into other agricultural value chains or sectors outside the AFS. These spillovers are captured by the economywide model and provide an indication of the transformation effect that agricultural productivity growth in the value chain has within the AFS and in the broader economy. There are also structural differences across value chains; for example, value chains have unique links to other sectors as suppliers or users of intermediate inputs, or they have unique links to rural or urban households in different income groups because of the types of workers they employ or because of households' consumption preferences for the agrifood products produced by those value chains.

As such, each value chain growth scenario is expected to have a unique impact on development outcomes; moreover, not all value chains will be equally effective at improving outcomes. In some cases, there may even be trade-offs because of competition for resources across value chains. With the aid of the RIAPA model these complex effects can be unpacked, thus providing information to governments or development partners that can be used to prioritize across different value chains; this is subject, of course, to the development outcomes they value most highly.

Figure 6 shows the scores each value chain achieves across the five development outcome indicators. We arbitrarily rank the value chains by their poverty score. Value chains clearly differ significantly in terms of their effectiveness in improving the various development outcomes. The fish value chain, for example, has the strongest poverty effects and is relatively effective at improving diet quality, but it is much less effective in increasing jobs. In contrast, the cattle and dairy value chain is most effective at improving diet quality and has the highest growth impact, with a growth multiplier of 1.81. This means that for every US$1.00 increase in GDP in the cattle and dairy value chain that is driven by rising productivity, an additional US$1.81 is generated in total GDP; that is, US$0.81 is generated either in the off-farm components of the livestock value chain or in other value chains or sectors of the economy. In terms of the poverty outcome, however, the cattle and dairy value chain ranks much lower.

Figure 6. Impact of value chain growth on development outcomes

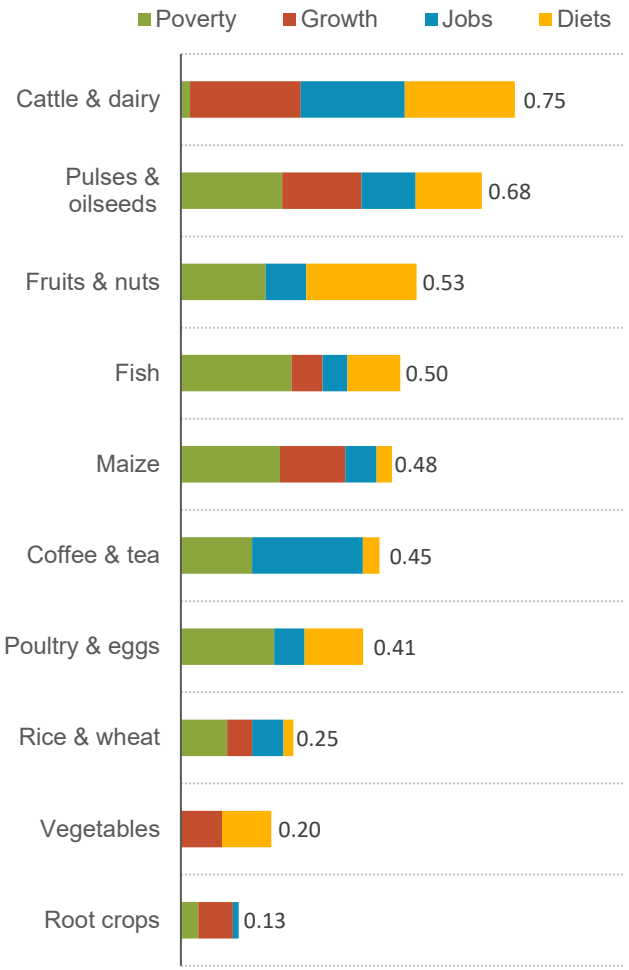
Source: RIAPA model results.
Note: Panel A shows the percentage point changes in the poverty rate that are associated with a 1 percent increase in agricultural GDP; Panel B shows the percentage point changes in the hunger rate that are associated with a 1 percent increase in agricultural GDP; Panel C is the change in total GDP (in US$ millions) associated with a US$1.0 million increase in agricultural GDP from the targeted value chain; Panel D is the change in total economywide employment (in thousands of persons) associated with a US$1.0 million increase in agricultural GDP from the targeted value chain; and Panel E is the percentage improvement in diet quality associated with a 1 percent increase in agricultural GDP. The figure is ordered by the poverty rate outcome.

These results highlight the possible trade-offs that may emerge when prioritizing individual value chains, as no single value chain is the most effective at achieving every development objective. Promoting a few value chains jointly will not only diversify agricultural growth; it can also help to simultaneously achieve multiple development objectives.

A composite score across different outcome indicators is created in order to narrow down the number of value chains that might be prioritized. Because of a high correlation between poverty and hunger impacts across value chains, the hunger score is omitted from the composite score. Also, since the different outcome indicators have different underlying units, the individual outcomes are normalized so that they are comparable while still retaining their ranking within the outcome category. Normalization entails assigning a score of 1 to the value chain that is most effective within an outcome category and a score of 0 to the least-effective value chain. All value chains with adverse effects on an outcome are also assigned a score of 0. This includes value chains with a growth multiplier of less than 1 (such as fruits and nuts and coffee and tea) or those with negative diet-quality effects (such as root crops). The remaining value chains receive a score between 0 and 1 that is proportionate to their original score relative to the highest-ranked value chain. The individual normalized scores for the outcomes are then combined into a composite score for each value chain. The default approach assumes that each of the four outcome indicators is equally important, so an equal weight is assigned to each score; however, if policymakers consider a particular development outcome to be more or less important than the other outcomes, the weights assigned to each outcome score can be adjusted accordingly.

Figure 7 presents the composite scores using equal weights across the four development outcome indicators (that is, excluding hunger). Each component in the bars shows the relative contribution of a particular outcome indicator to the final score. The cattle and dairy, pulses and oilseeds, and fruits and nuts value chains are ranked highest. For cattle and dairy and pulses and oilseeds—the highest and second-highest ranked value chains—each of the four outcome components makes some contribution to the composite score. By contrast, in the fruits and nuts value chain—which is ranked third—there is no contribution from the growth component; this means that horticulture-led growth would not contribute positively to GDP growth beyond its own growth. While a ranking of their impacts on multiple development outcomes on the basis of composite scores allows us to identify and prioritize value chains, trade-offs clearly exist as to which outcomes are most significantly affected by productivity-led growth in each value chain.

Figure 7. Composite score of development outcomes: Equal weights



Source: RIAPA model results.
Note: The composite score is a simple average (equally weighted) of the scores for each of the four outcome categories; the figure is ordered according to the highest composite score.

Summary

In the decade prior to the COVID-19 pandemic, Kenya's economy grew rapidly at 5.5 percent per year. Although the agrifood system (AFS) did not grow as fast, it still achieved a respectable annual growth rate of 3.9 percent. Since more than half of the labor force in Kenya is engaged in the AFS, this growth was important for household income growth and poverty reduction; it resulted in a decline in the absolute number of poor people for the first time in at least three decades (World Bank 2022). This growth led to a structural change within Kenya's AFS between 2009 and 2019, with the off-farm component of the AFS growing more quickly than the on-farm component (5.2 and 3.4 percent, respectively) and the off-farm share of the AFS increasing from 28.9 percent to 32.7 percent. Both agricultural GDP and agricultural employment shares declined over this period, though agriculture remains a relatively large sector in Kenya.

Almost all the growth in Kenya's AFS that occurred between 2009 and 2019 can be attributed to growth in less-traded value chains (74.9 percent) and importable value chains (17.5 percent), both of which

achieved above-average growth rates; this indicates the important role of domestic markets in AFS growth.

The RIAPA model-based comparison of future sources of growth shows that there is no single value chain group that is most effective in achieving all the desired development outcomes, that is, declining poverty, declining hunger, economic growth, job growth, and improved diets. The cattle and dairy, pulses and oilseeds, and fruits and nuts value chains rank highly in their composite outcome scores for poverty, GDP, jobs, and diets. Promoting these value chains together offers an effective and broad-based way to achieve these development outcomes.

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Appendix

Table A1. Value chain groups and their corresponding agricultural subsectors

Value chain groups and their share of AgGDP+	Individual value chains (or agricultural subsectors) in the group and their share of the group's agricultural GDP
Maize (10.5%)	Maize 100%
Rice and wheat (3.2%)	Rice 33.1% | Wheat and barley 66.9%
Sorghum and other cereals (1.9%)	Sorghum and millet 94.0% | Other cereals 6.0%
Oilseeds (3.3%)	Groundnuts 51.0% | Other oilseeds 49.0%
Pulses (4.5%)	Pulses 100%
Roots (8.9%)	Cassava 10.1% | Irish potatoes 64.0% | Sweet potatoes 24.6% | Other roots 0.7% | Plantains 0.7%
Vegetables (9.9%)	Leafy green vegetables 55.0% | Other vegetables 45.0%
Fruits and nuts (7.8%)	Nuts 6.0% | Bananas 39.9% | Other fruits 11.6%
Export crops (8.7%)	Tea 71.4% | Coffee 17.0% | Cut flowers 38.2
Other crops (6.8%)	Sugarcane 36.8% | Cotton and fibers 6.3% | Tobacco 2.7% | Other crops 54.2%
Cattle and dairy (17.4%)	Cattle meat 38.1% | Raw milk 61.9%
Poultry and eggs (2.4%)	Poultry meat 77.5% | Eggs 22.5%
Other livestock (2.1%)	Small ruminants 46.7% | Other livestock 53.3%
Fish (2.3%)	Aquaculture 12.9% | Captured fish 87.1%
Forestry (7.6%)	Forestry 100%

Source: Authors' calculation based on the 2019 Social Accounting Matrix for Kenya (IFPRI 2021).

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