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Ghana's Agrifood System

Structure and Drivers of Transformation

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Introduction

Ghana experienced rapid economic growth with an annual GDP growth rate of 6.6 percent between 2009 and 2019 (GSS 2023). Restrictive COVID-19 policy measures in 2020 caused a slowdown in growth (Amewu et al. 2020), with the rate falling to just 0.5 percent in that year (World Bank 2023a). Economic growth rebounded to 5.4 percent in 2021, but this growth was fueled by excessive government borrowing to finance an ambitious public infrastructure campaign and ushered in a severe financial crisis in Ghana. By 2022, the fiscal deficit had reached almost 10 percent of GDP and the total debt-to-GDP ratio had skyrocketed to 90 percent, resulting in rampant inflation (32 percent year-on-year), a doubling of interest rates (from 14 to 28 percent), and a sharp currency depreciation (40 percent) (World Bank 2023b; Naadi 2023). Economic growth slowed to 3.2 percent in 2022 and is projected to decline further to 1.6 percent in 2023 (World Bank 2023a). Although President Akuffo-Addo blamed "malevolent forces" (Financial Times 2023)—including the global commodity market shock caused by Russia's invasion of Ukraine, which by some accounts had only a minimal effect on Ghana's economy (Arndt et al. 2023; Diao and Thurlow 2023)—the economic situation eventually forced the government to agree to an IMF bailout of US$3 billion in 2023. This will be in force for three years.

Ghana's agriculture sector grew at 3.3 percent annually during the 2009 to 2019 period, much more slowly than the overall economy. As a lower-middle-income country, Ghana's agriculture sector has become less important, accounting for only 18.5 percent of GDP and 29.2 percent of employment. The cocoa subsector, however, accounts for around two-fifths of export earnings and is considered strategically important. The broader agrifood system (AFS), which includes agroprocessing and food-related trade, transport, and other services, is much larger, accounting for 33.6 percent of GDP and 45.9 percent of employment. However, the AFS also did not perform well between 2009 and 2019, growing at only 3.4 percent annually. This suggests that transformation in Ghana's AFS was limited in terms of productivity growth and expansion of the off-farm components of the AFS. In this brief, we examine the historical and projected economic growth trajectory further to better understand the role of agriculture as well as the broader agrifood system in the performance and transformation of Ghana's economy.

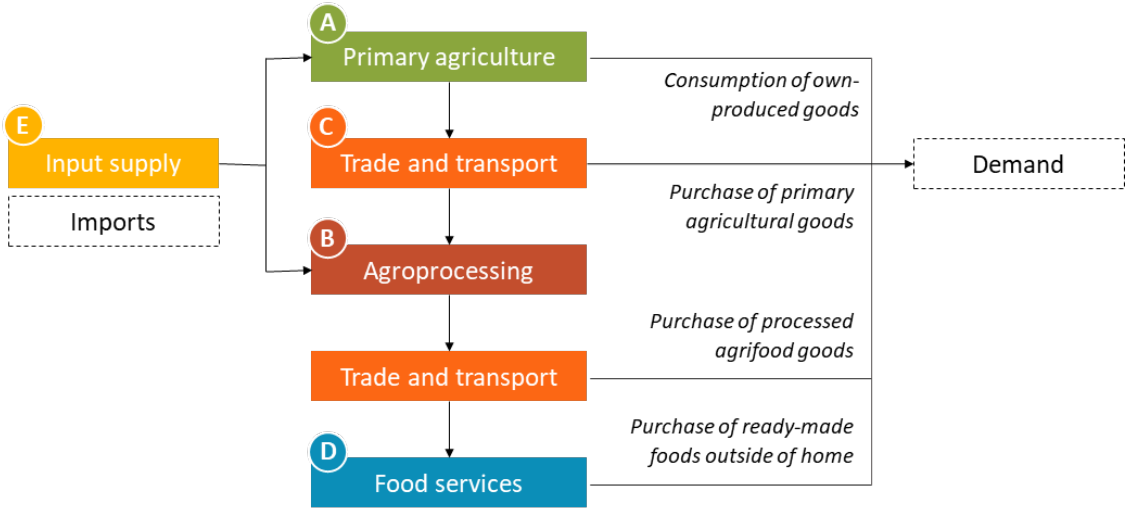
The AFS is a complex network of actors who are connected by their roles in supplying, consuming, and governing agrifood products and jobs. Just as an economy undergoes transformation as a country develops, agrifood systems are also expected to evolve (Diao, Hazell, and Thurlow 2010; Timmer 1988). Subsistence 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 nonfarm 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 nonfarm activities such as processing, packaging, transporting, and trading. 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 Ghana's AFS and evaluates the potential contribution of different value chains to the acceleration of agricultural transformation and inclusiveness. We start by offering a simple conceptual framework of the AFS and then compare Ghana's AFS with that of other countries at different stages of development. We go on to disaggregate Ghana's AFS across agricultural value chains, taking into consideration their different market structures and historical contribution 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 Ghana's AFS, we employ a narrower focus. First, we measure its size, structure, and historical contribution to economic growth and transformation through a data-driven exercise; second, we use the International Food Policy Research Institute (IFPRI) Rural Investment and Policy Analysis (RIAPA) model (IFPRI 2023a) to assess the effectiveness of AFS growth (led by productivity gains in different agricultural value chains) in promoting multiple development outcomes in Ghana. 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) includes 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 Ghana'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 the economy grows and transforms over time, there will be changes in the relative contributions of the various on-farm 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 be thus an increased contribution by 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 Ghana's Agrifood System

Table 1 presents the structure of Ghana's AFS in 2019 based on official national accounts data and sectoral employment statistics (GSS 2023; ILO 2020), as compiled in a 2019 Social Accounting Matrix (SAM) for Ghana (IFPRI 2023b). 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 for manufacturing and services (including the trade and transport services subsector) at the bottom of the table 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.

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

	GDP		Employment	
	Value (US$ billion)	Share (%)	Workers (million)	Share (%)
Total economy	**63.9**	**100.0**	**14.8**	**100.0**
Agrifood system	**21.5**	**33.6**	**6.8**	**45.9**
Primary agriculture (A)	**11.8**	**18.5**	**4.3**	**29.2**
Off-farm AFS	**9.6**	**15.1**	**2.5**	**16.7**
Processing (B)	2.6	4.1	0.7	4.8
Trade and transport (C)	4.2	6.6	1.0	6.5
Food services (D)	2.2	3.5	0.7	4.6
Input supply (E)	0.6	0.9	0.1	0.8
Rest of economy	**42.5**	**66.4**	**8.0**	**54.1**
Total manufacturing	8.5	13.3	2.2	15.0
Total services	30.8	48.2	7.5	50.9
Total trade and transport	18.9	29.5	4.1	27.8

Source: Authors' calculation based on the 2019 Social Accounting Matrix for Ghana (IFPRI 2023b).
Note: A to E correspond to the five agrifood system (AFS) components from Figure 1.

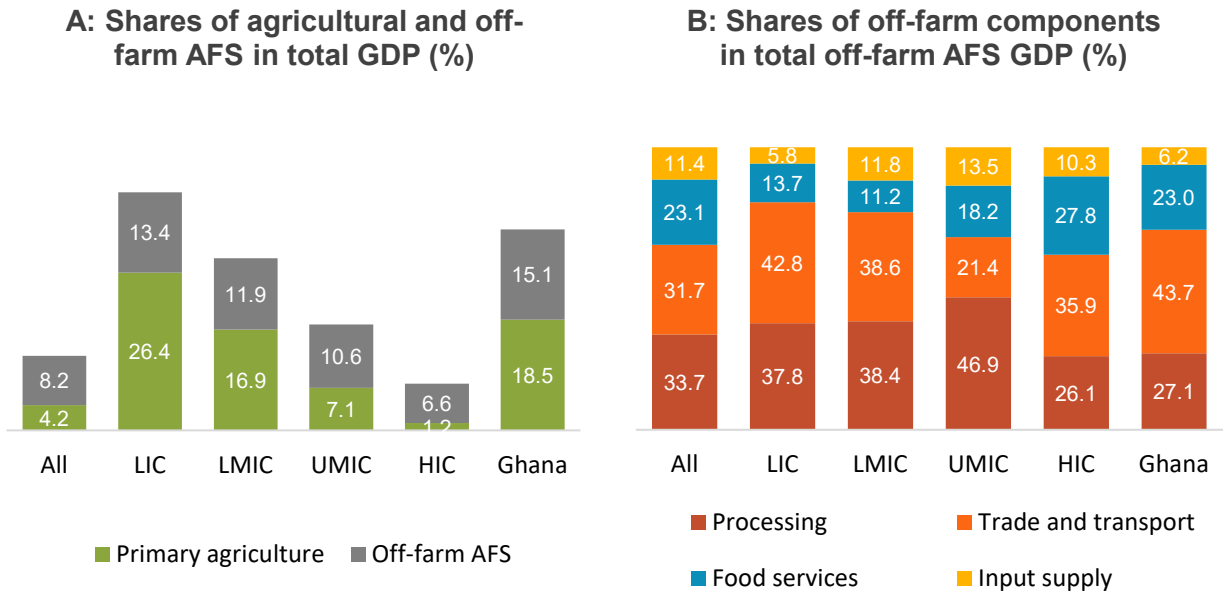
As shown in Table 1 and mentioned in the introduction, the AFS accounted for 33.6 percent of Ghana's national GDP and 45.9 percent of employment in 2019. Primary agriculture alone contributed less than one-fifth of GDP and close to 30 percent of employment, while the four off-farm components of the AFS contributed 15.1 percent to GDP and 16.7 percent to employment. Off-farm components of the AFS therefore accounted for roughly 45 percent of AgGDP+ and 37 percent of AgEMP+. Both the whole AFS and primary agriculture are no longer the largest components of the entire economy. The service sector has become the largest in terms of both GDP and total employment, but comparison of its GDP and employment shares shows that its labor productivity is not high. For the AFS, however, comparing on- and off-farm GDP and employment shares shows that labor productivity in off-farm components is significantly higher than on-farm productivity. The movement of farm workers into these off-farm components—a natural process of agricultural transformation—may thus be beneficial to household incomes and broad economic transformation.

Comparing Ghana's Agrifood System to Other Countries

The structure and economic contribution of a country's AFS varies at different development stages. 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). Ghana is

an LMIC, while both the on- and off-farm components of Ghana's AFS and its overall contribution to national GDP are larger than those of its LMIC peers (Panel A). Within the four off-farm components of the AFS, Ghana's agroprocessing is relatively smaller than in other LMICs, while the food service component is much larger (Panel B).

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

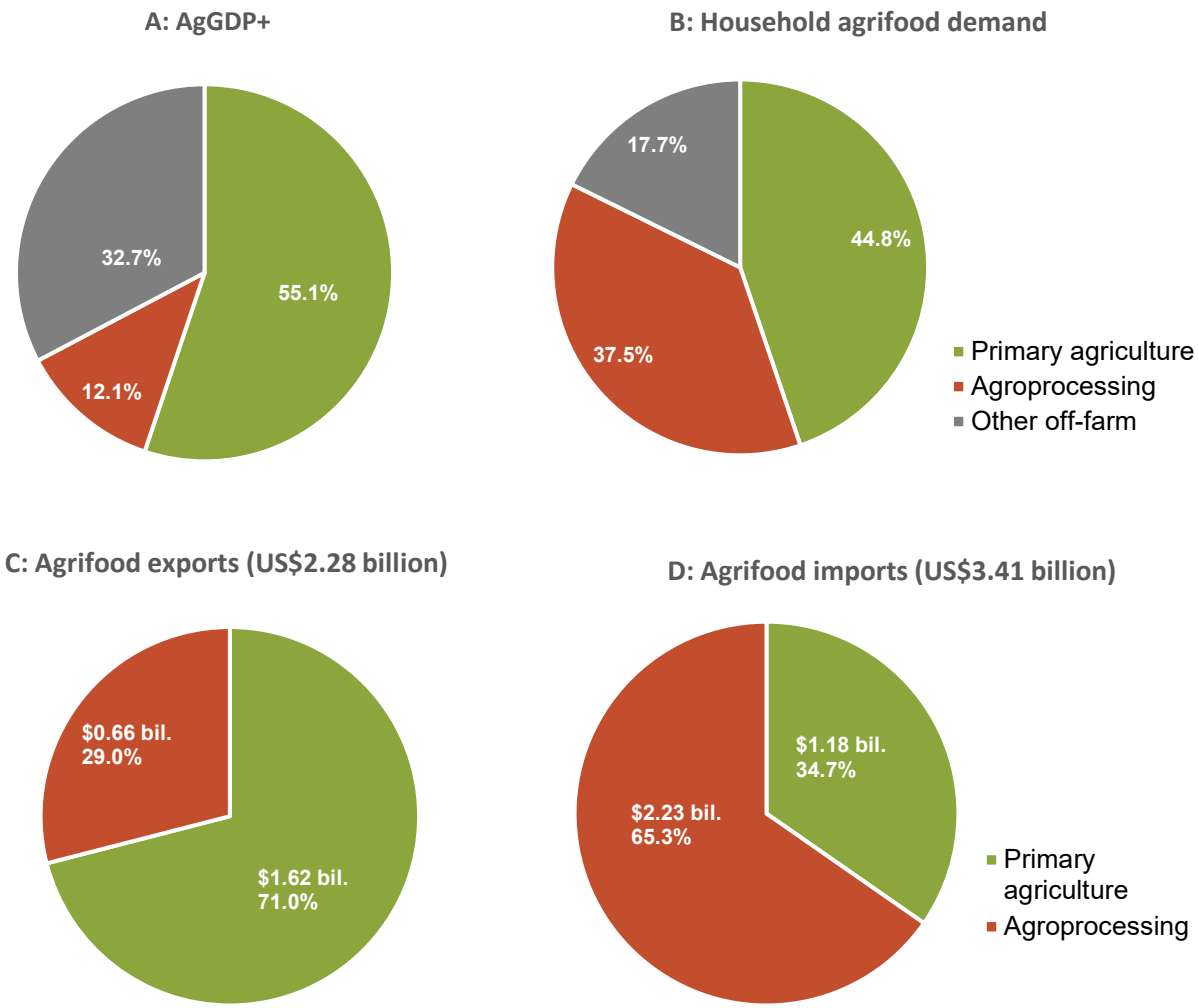


Source: IFPRI's Agrifood System Database (Thurlow et al. 2023) and the 2019 Social Accounting Matrix for Ghana (IFPRI 2023b).
Note: LIC = low-income country; LMIC = lower-middle-income country; UMIC = upper-middle-income country; and HIC = high-income country; AFS = agrifood system.

Unpacking the Demand Side of Ghana's Agrifood System

In Figure 3, the structure of Ghana'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 55.1 percent of AgGDP+ is from primary agriculture, primary agricultural commodities account for only 44.8 percent of household demand. In contrast, household demand for processed agrifood products accounts for 37.5 percent of total agrifood demand, even though the associated sector accounts for only 12.1 percent of AgGDP+. The bias toward processed agrifood products is mirrored in the high share of agrifood imports accounted for by processed products; that is, 71.0 percent of agrifood commodity exports are primary agricultural commodities (Panel C), but 65.3 percent of imports are processed goods (Panel D). Ghana has a deficit in its total agrifood trade balance driven by a substantial deficit in processed agrifood trade—the value of Ghana's processed agrifood imports is more than three times the value of its processed agrifood exports.

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



Source: Authors' calculation based on the 2019 Social Accounting Matrix for Ghana (IFPRI 2023b).

Disaggregating the Agrifood System across Value Chains

For a more detailed assessment of structural and historical growth patterns within the AFS, we group Ghana's agrifood system into 14 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 14 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 14 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 Ghana has a deficit in total agrifood trade, with an import–consumption ratio of 10.2 percent; this is

higher than the export–output ratio of 7.0 percent. Of the 14 value chains, only 2 are classified as exportable value chains because their export–output ratios exceed the national average for AFS value chains. While cocoa remains a large exportable sector, horticultural products (the other exportable sector) accounts for a larger share of total AgGDP+. Both cocoa and horticultural products require additional processing and more trade and transport services for exports, while the forestry products are mainly exported as primary products. Thus for the exportable sectors together, the off-farm AFS GDP share (24.6 percent) is similar to their primary agricultural GDP share (23.4 percent). Interestingly, some exportable value chains also have high import–consumption ratios. This may reflect urbanization and growing nonfarm income-generating opportunities in rural areas, which lead to an increase in demand for processed agrifood products, many of which are imported. In those value chains that have both high export–output and import–consumption ratios, it is often the case that exports are predominantly primary or less-processed agricultural products, while imports into that value chain are highly processed products.

Table 2. Ghana'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**	**7.0**	**10.2**
Exportable	**24.0**	**23.4**	**24.6**	**23.4**	**5.1**
Horticulture	6.9	7.8	5.7	7.5	8.8
Cocoa	6.3	8.9	3.0	63.4	6.2
Forestry	10.8	6.6	16.0	9.8	3.2
Importable	**34.6**	**21.9**	**50.3**	**3.2**	**16.9**
Rice	5.5	3.4	7.9	0.1	21.1
Oilseeds	5.3	4.0	6.8	8.4	11.2
Other crops	7.4	3.7	12.0	2.9	21.9
Poultry	1.8	2.4	1.1	0.0	28.4
Other livestock	6.2	3.3	9.6	0.4	10.1
Fish	8.5	5.0	12.8	5.1	13.9
Less traded	**38.2**	**54.7**	**17.9**	**0.1**	**0.3**
Maize	6.9	7.0	6.9	0.4	1.2
Pulses	0.6	0.8	0.4	0.2	2.7
Groundnuts	2.0	3.0	0.7		
Roots	26.1	40.3	8.7	0.0	0.1
Small ruminants	2.5	3.6	1.2		

Source: Authors' calculation based on the 2019 Social Accounting Matrix for Ghana (IFPRI 2023b).

Six of the 14 value chains are classified as importable value chains with their import–consumption ratios higher than the AFS average, while 5 of the 14 fall in the less-traded group of value chains. The importable and less-traded value chain groups are of similar size in terms of shares of AgGDP+, 34.6 and

38.2 percent respectively. However, many importable value chains require more processing, while many of the less-traded value chains have relatively small off-farm components. Importable value chains thus contribute a relatively large share to off-farm AFS GDP (50.3 percent) compared to their primary agricultural GDP contribution (21.9 percent), while less-traded value chains contribute a relatively large share to primary agricultural GDP (54.7 percent) compared to their off-farm AFS GDP (17.9 percent). Expansion of the importable value chains could thus effectively drive agricultural transformation by boosting overall value addition and off-farm employment in the value chain.

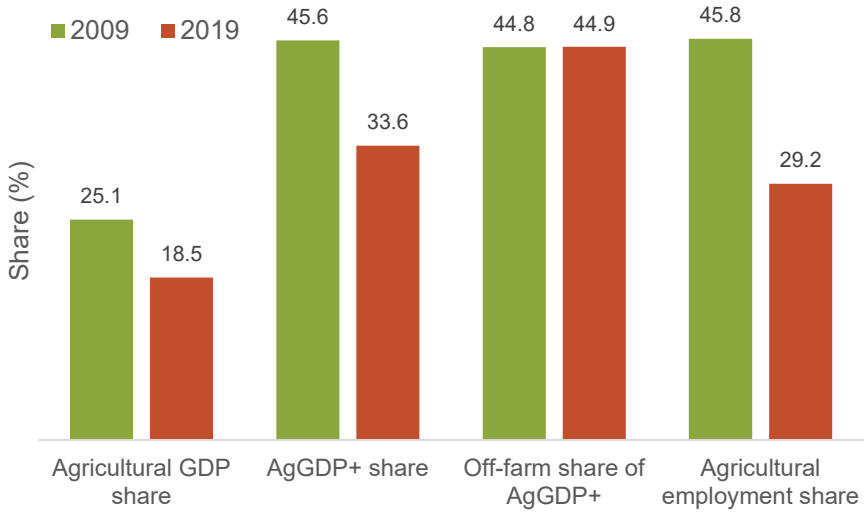
Structural Change and Drivers of Agrifood System GDP Growth

The previous sections have provided a snapshot of the current structure of Ghana's AFS, the disaggregation of the AFS across the 14 value chain groups, and the trade orientation of those value chains. We have demonstrated that Ghana has a deficit in total agrifood trade driven by processed agrifood imports far exceeding their exports. While importable value chains are large in terms of their contribution to off-farm AFS GDP, the less-traded value chains are dominant in terms of their contribution to primary agricultural GDP, because less-traded value chains are generally less oriented toward value addition in their off-farm components. Prioritizing growth in tradable value chains 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 Ghana's AFS in recent years. Labor productivity is typically lowest in primary agriculture, and higher in off-farm activities, such as agrifood processing and food services, and in sectors outside of the AFS. Economic growth and urbanization are associated with relatively faster 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 Ghana's national GDP, and agricultural employment as a share of total employment. It covers the period between 2009 and 2019. The figure also includes an estimate of the share of the off-farm components in AgGDP+. Agricultural GDP share and especially the agricultural employment share fell significantly over the period. The rapid decline in the agricultural employment share from 45.8 percent in 2009 to 29.2 percent in 2019 indicates a significant structural change within Ghana's broader economy. Primary agriculture has become a rather small part of the economy, both in terms of GDP and employment, while the share of the whole AFS in total GDP has also fallen. Because of a similar decline in both AgGDP+ and primary agricultural GDP shares of total GDP, off-farm components of AgGDP+ barely changed over time. This means that along with broad economic structural change, Ghana's AFS has also been continuously transforming, although the pace of change has slowed in this decade.

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



Source: Authors' estimates using the 2009 and 2019 Social Accounting Matrixes for Ghana (IFPRI 2023b).

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

	Average annual GDP growth rate (%)			
	Total AFS	Primary agriculture	Off-farm AFS	Agropro-cessing
Total AFS	**3.4**	**3.3**	**3.4**	**6.5**
Exportable	**2.0**	**2.3**	**1.7**	**8.9**
Horticulture*	3.7	3.3	4.4	14.7
Cocoa*	3.6	3.2	5.2	9.8
Forestry	0.4	0.3	0.4	7.6
Importable	**2.0**	**2.3**	**1.7**	**8.9**
Rice*	10.0	12.3	9.0	7.0
Oilseeds	0.9	−1.8	3.5	8.5
Other crops*	4.7	5.4	4.4	3.2
Poultry*	4.7	4.7	4.7	9.2
Other livestock*	6.0	2.7	7.9	8.6
Fish	−0.2	−1.4	0.4	12.2
Less traded	**4.3**	**4.4**	**3.8**	**1.9**
Maize*	4.5	4.6	4.3	1.8
Pulses*	6.0	6.3	5.3	9.8
Groundnuts*	7.4	7.7	5.8	
Roots*	3.7	3.9	2.6	9.8
Small ruminants*	9.2	8.7	11.3	

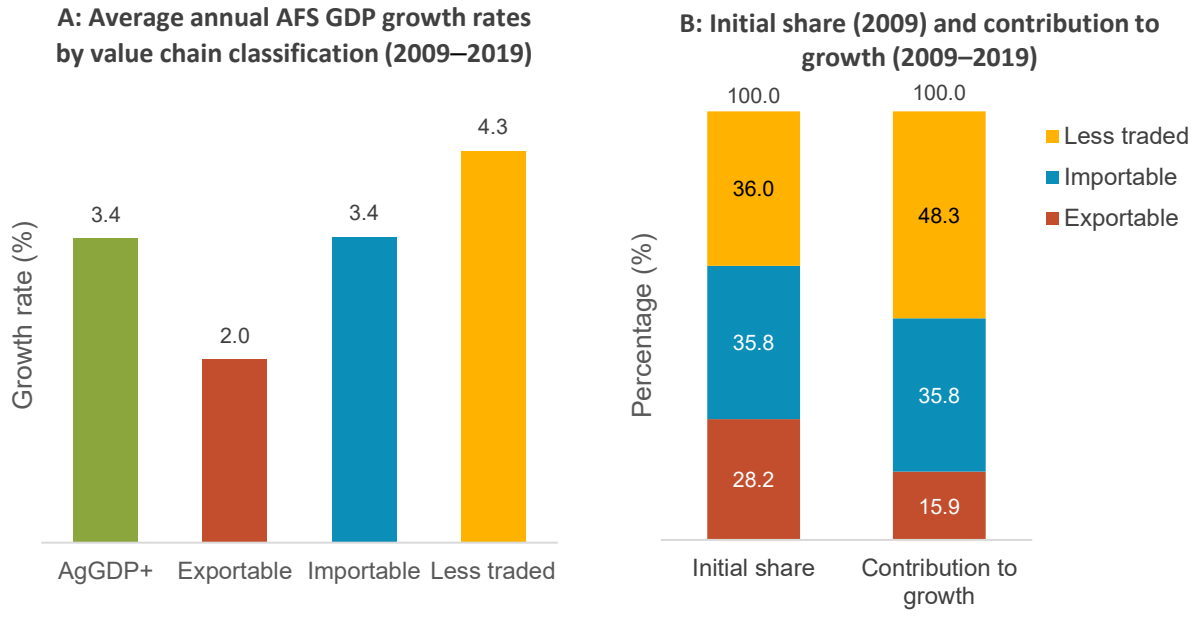
Source: Authors' analysis based on the 2009 and 2019 Social Accounting Matrixes for Ghana (IFPRI 2023b).
Note: Value chains that experienced above-average AgGDP+ growth over the 2009 to 2019 period (that is, higher than 3.4 percent) are marked with an asterisk (*).

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, Ghana's AFS grew modestly, with an average annual AgGDP+ growth rate of 3.4 percent. The off-farm component of the AFS grew slightly faster (3.4 percent) than primary agriculture (3.3 percent), with agrifood processing (a subcomponent of the off-farm component of the AFS) growing particularly fast, at 6.5 percent per year.

Among the 14 value chains, 11 achieved above-average growth during the 2009 to 2019 period, that is, more than 3.4 percent per year (these are marked with an asterisk in Table 3). Among these 11 value chains that achieved above-average growth, 5 of them—rice, pluses, groundnuts, small ruminants, and other livestock—grew at or more than 6 percent per year. These five value chains are driving forces of the broad AFS growth. In some of them, growth of the off-farm components was faster than growth of their primary agricultural component, while in others, primary agricultural GDP grew more rapidly. However, in all these value chains that achieved above-average growth—and also in a few slower-growing value chains—the processing components of value chains grew rapidly. This is consistent with the broader patterns of growth and structural change in Ghana's AFS; that is, growth in the on- and off-farm components of the AFS was similar, but more rapid in the processing component of AFS GDP.

Figure 5 summarizes the key growth trends from Table 3. On average, less-traded (4.3 percent) and importable (3.4 percent) value chains grew faster than or at a similar rate as the national AgGDP+ (3.4 percent) (Panel A). With similar initial shares of the AFS (36.0 percent for the less-traded and 35.8 percent for the importable groups), the less-traded and importable groups of value chains contributed the most to growth, 48.3 and 35.6 percent, respectively (Panel B).

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



Source: Authors' analysis using the 2009 and 2019 Social Accounting Matrixes for Ghana (IFPRI 2023b).

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 2023a). 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 Ghana's agricultural value chain groups to promote multiple development outcomes. The analysis was carried out for 10 value chain groups, which were selected from the original list of 14; other crops, other livestock, fish, and forestry were excluded. 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 the consumption preferences of households 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 due to 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 different development outcomes. The horticultural products value chain, for example, has strong poverty effects and is most effective at improving diet quality, but it is much less effective in reducing hunger or increasing jobs. The rice value chain, in contrast, has a growth multiplier of 2.69, which is the highest of all the value chains. This means that for every US$1.00 increase in GDP in the rice value chain driven by rising productivity, an additional US$2.69 is generated in total GDP; that is, US$1.69 is generated either in the off-farm components of the rice value chain or

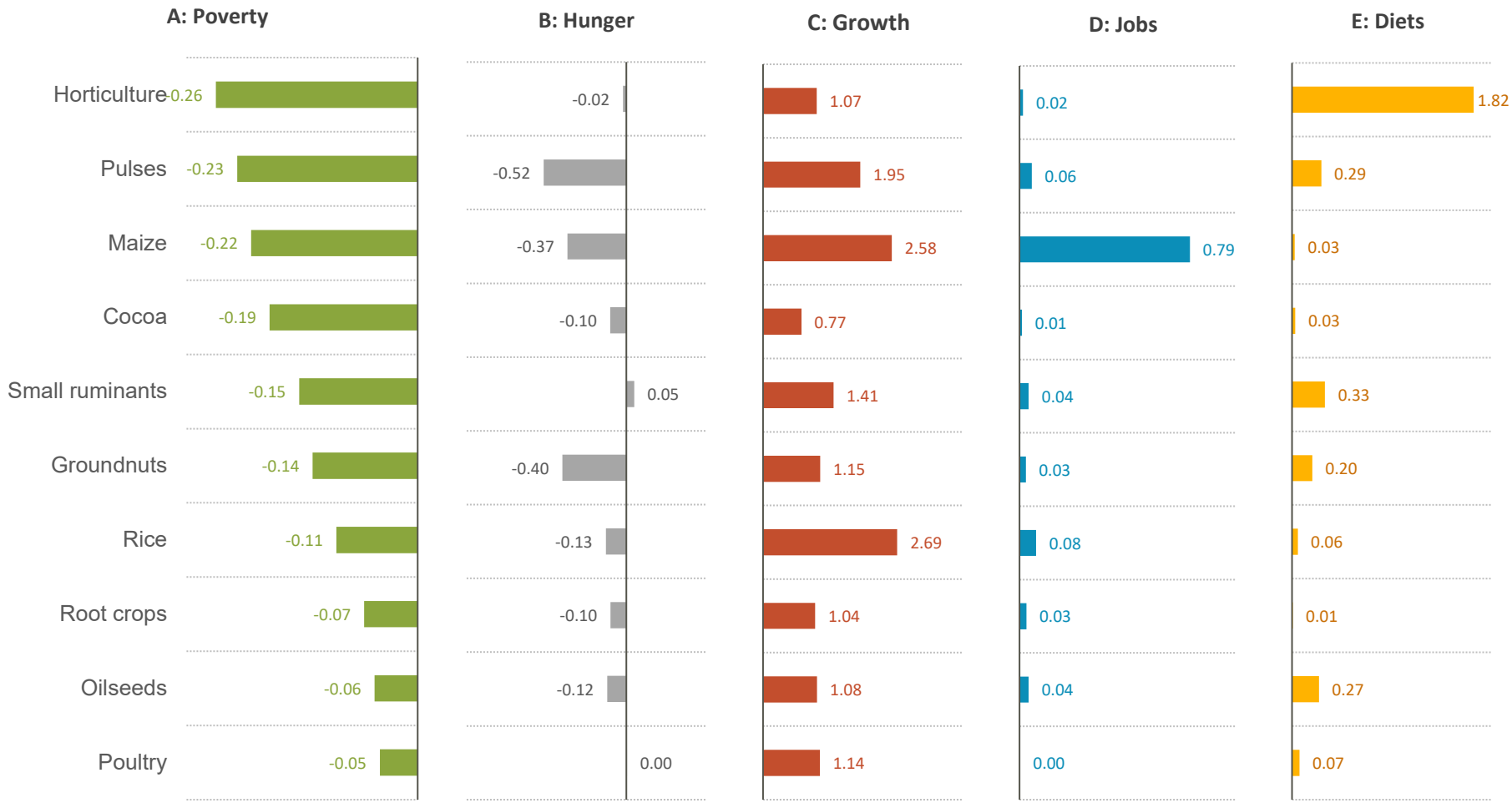
in other value chains or sectors of the economy. The rice value chain, however, ranks much lower in the other four outcomes.

These results highlight the possible trade-offs that may emerge when prioritizing individual value chains—there is no single value chain that 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 score 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 one (pulses, cocoa). The remaining value chains receive a score between 1 and 0 that is proportionate to their original scores 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 particular outcome score can be adjusted accordingly.

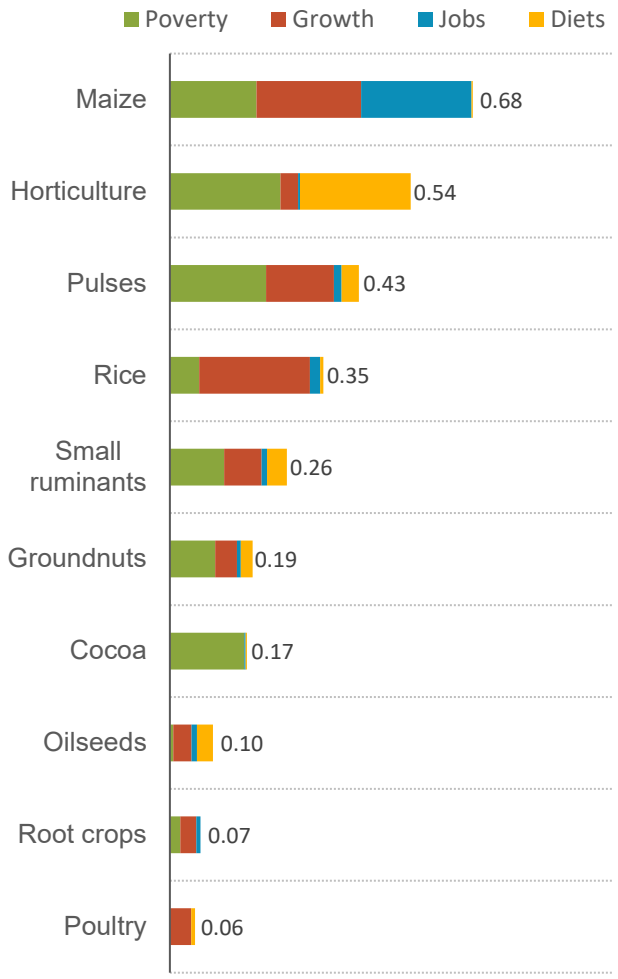
Figure 7 presents the composite scores using equal weights across the four development outcome indicators (that is, excluding hunger). Each component in the bars shows the relative contribution of a particular outcome indicator in the final score. The maize, horticultural products, and pulses value chains are ranked highest. For maize and horticulture, the two highest-ranked value chains, not all the four outcome components make important contributions to the composite score. Maize-led growth would not contribute to diet quality improvement, while horticulture-led growth would not contribute to job creation, and its contribution to GDP growth is also minimal, though productivity growth in maize or horticulture could have important impacts on the other development outcome areas. While a ranking of value chain impacts on multiple development outcomes on the basis of composite scores allows us to identify and prioritize among them, trade-offs clearly exist as to which outcomes are most significantly affected by productivity-led growth in each value chain.

Figure 6. Impact of value chain growth on development outcomes



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

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, Ghana's economy grew rapidly at 6.6 percent per year. The agrifood system (AFS), however, grew much more slowly at 3.4 percent. The agriculture sector is no longer a large sector in terms of either GDP or employment, while the broader agrifood system (AFS) is much larger. Rapid economywide growth has been accompanied by a significant structural change in the broader economy and Ghana's AFS has been transforming. Both the agricultural GDP and agricultural employment shares declined significantly over the 2009 to 2019 period; however, the off-farm share of the AFS barely changed, indicating that the structural change within Ghana's AFS slowed down in the decade prior to the pandemic.

Almost all the growth in Ghana's AFS between 2009 and 2019 was contributed by less-traded value chains (48.3 percent) and importable value chains (35.8 percent). The large contribution from the group of less-traded value chains is explained by both its large initial size and above-average growth rate.

Growth in the group of importable value chains was similar to the AFS average and its significant contribution to overall AFS growth can be explained by its relatively large size in the entire AFS.

The RIAPA model-based comparison of future sources of growth shows that there is no single value chain group that is the most effective in achieving all desired development outcomes, that is, declining poverty, declining hunger, economic growth, job growth, and improved diets. The maize, horticultural products, and pulses value chains rank highly in their composite outcome scores. However, the highest-ranked value chains—maize and horticulture—could not contribute to all the development outcomes. Maize-led growth has no impact on diet quality improvement, while horticulture-led growth would not contribute to job creation, and its contribution to GDP growth is minimal, though productivity growth for maize and horticulture could have important impacts on the other development outcome areas. Promoting multiple value chains together, thus, offers an effective and broad-based way to achieve these development outcomes.

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References

Amewu, S., S. Asante, K. Pauw, and J. Thurlow. 2020. "The Economic Costs of COVID-19 in Sub-Saharan Africa: Insights from a Simulation Exercise for Ghana." *European Journal of Development Research* 32: 1353–1378.

Arndt, C., X. Diao, P. Dorosh, K. Pauw, and J. Thurlow. 2023. "The Ukraine War's Impacts on Global Poverty and Food Insecurity." *Global Food Security* 36:100680.

Diao, X., P. Hazell, and J. Thurlow. 2010. "The Role of Agriculture in African Development." *World Development* 38 (10): 1375–1383.

Diao, X., and J. Thurlow. 2023. *Impacts of Global Shocks on Poverty, Hunger, and Diets.* Agrilinks Webinar, February 9, 2023. https://agrilinks.org/events/impacts-global-shocks-poverty-hunger-and-diets

Dorosh, P., and J. Thurlow. 2013. "Agriculture and Small Towns in Africa." *Agricultural Economics* 44: 435–445.

Fanzo, J., L. Haddad, R. McLaren, Q. Marshall, C. Davis, A. Herforth, A. Jones, T. Beal, D. Tschirley, A. Bellows, L. Miachon, Y. Gu, M. Bloem, and A. Kapuria. 2020. "The Food Systems Dashboard Is a New Tool to Inform Better Food Policy." *Nature Food* 1 (5): 243–246. https://doi.org/10.1038/s43016-020-0077-y

Financial Times. 2023. How Ghana's Economy became Cautionary Tale for Africa. 13 May 2023. https://www.ft.com/content/bd67731c-cea0-4045-96d4-5fff001f1fd2. Accessed June 13, 2023.

GSS (Ghana Statistical Services). 2023. Rebased 2013–2022 Annual Gross Domestic Product. April 2023 Edition. Accra.

Haggblade, S., P. Hazell, and P. Dorosh. 2007. "Sectoral Growth Linkages Between Agriculture and the Rural Nonfarm Economy." In *Transforming the Rural Nonfarm Economy: Opportunities and Threats in the Developing World*, eds. S. Haggblade, P. Hazell, and T. Reardon. Washington, DC: Johns Hopkins University Press.

IFPRI (International Food Policy Research Institute). 2023a. *RIAPA Data and Modeling System*. Washington, DC. https://www.ifpri.org/project/riapa-model

IFPRI. 2023b. 2019 Social Accounting Matrix for Uganda. (Unpublished dataset). Washington, DC.

ILO (International Labour Organization). 2020. *Modeled Estimates of the Labor Market*. Geneva.

Naadi, T. 2023. "Ghana IMF loan: Will $3bn Solve the Economic Crisis?" BBC News, May 18. https://www.bbc.com/news/world-africa-65622715

Thurlow, J., B. Holtemeyer, X. Diao, K. Pauw, and J. Randriamamonjy. 2023. Measuring Agrifood Systems: New Indicators and Global Estimates. Mimeo. Washington, DC:IFPRI.

Timmer, C. P. 1988. "The Agricultural Transformation." In *Handbook of Development Economics*, Vol. 1, eds. H. Chenery and T. N. Srinivasan, 276–328. Amsterdam: Elsevier Science Publishers.

World Bank. 2023a. *Global Economic Prospects, January 2023*. Washington, DC: World Bank. http://hdl.handle.net/10986/38030

World Bank. 2023b. The World Bank in Ghana: Overview. Accessed June 13, 2023. https://www.worldbank.org/en/country/ghana/overview

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 (6.9%)	Maize 100%
Rice (5.5%)	Rice 100%
Groundnuts (2.0%)	Pulses 100%
Other oilseeds (5.3%)	Groundnuts 100%
Pulses (0.6%)	Other oilseeds 100%
Roots (26.1%)	Cassava 44.2% | Sweet potatoes 0.5% | Other roots 35.2% | Plantains 20.1%
Horticulture (6.9%)	Leafy green vegetables 14.9% | Other vegetables 14.8% | Nuts 20.1% | Bananas 9.1% | Other fruits 41.1%
Cocoa (6.3%)	Cocoa 100%
Other crops (7.4%)	Sorghum & millet 45% | Sugarcane 0.4% | Tobacco 0.6% | Cotton & fibers 0.9% | Cut flowers 0.4% | Rubber 0.4% | Other crops 52.3%
Small ruminants (2.5%)	Small ruminants 100%
Poultry & eggs (1.8%)	Poultry meat 45.2% | Eggs 54.8%
Other livestock (6.2%)	Cattle meat 4.4% | Raw milk 6.7% | Other livestock 88.9%
Fish (8.5%)	Aquaculture 32% | Capture fisheries 68%
Forestry (10.8%)	Forestry 100%

Source: Authors' calculation based on the 2019 Social Accounting Matrix for Ghana (IFPRI 2023b).

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