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Farming, Food Processing, or Distribution?

**Agrifood Investment Priorities for Poverty Reduction and Dietary
Improvements in Sub-Saharan Africa**

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Abstract

Improving access to affordable healthy diets while reducing poverty is a central challenge of agrifood systems transformation in low- and middle-income countries. Productivity-enhancing investments can help achieve these goals, but policymakers face difficult choices about where within agrifood systems to target investments or which value chains to prioritize while balancing multiple development objectives. We address these questions by linking household microsimulation modules to economywide models for five sub-Saharan African countries—Ethiopia, Ghana, Malawi, Nigeria, and Tanzania—to quantify how productivity growth across agrifood system components and value chains affects poverty, the affordability of healthy diets, and diet quality. We find that productivity growth in farming continues to generate the largest overall gains. A 10 percent increase in farm productivity raises GDP by 4.2 percent on average, reduces poverty by 3.3 percentage points, and lowers the cost of a healthy diet by 6.5 percent. However, when impacts are normalized by GDP growth, productivity gains in food processing and distribution are equally or more effective at reducing poverty. Across value chains, staple crop productivity delivers the largest absolute reductions in poverty, while horticulture generates the strongest improvements across development outcomes per unit of GDP growth. These findings suggest that agrifood system investment priorities should evolve as economies undergo structural change, with policymakers aligning investments to societal priorities while managing trade-offs across poverty reduction, healthy-diet affordability, and diet quality.

Keywords: Productivity growth, diet quality, sub-Saharan Africa, CGE model

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1 Introduction

Agricultural transformation is considered a prerequisite for structural change, economic development, and poverty reduction in low-income countries (Christiaensen and Martin, 2018; Dorosh and Thurlow, 2018; Johnston and Mellor, 1961). Accordingly, policies aimed at raising on-farm productivity and output have dominated agrifood system strategies for decades, with notable success—most prominently during Asia’s Green Revolution of the 1960s and 1970s (Pingali, 2012). The structural transformation literature distinguishes between complementary “push” and “pull” mechanisms underlying this process. Agricultural productivity growth can push labor and other resources toward non-agricultural activities, while productivity growth outside agriculture can pull resources toward higher-return nonfarm activities. While both these mechanisms can contribute to structural transformation, their relative importance varies across countries and stages of development (Alvarez-Cuadrado and Poschke, 2011). This has implications for agrifood policy design and its evolution over time.

Replicating Asia’s success in transforming agriculture has proven challenging in other parts of the world, particularly sub-Saharan Africa (Diao et al., 2025). Many developing countries today continue to face low agricultural productivity, persistent poverty, and malnutrition, alongside limited integration between on-farm and off-farm segments of agrifood value chains and insufficient creation of decent non-agricultural employment (Barrett and Gomez, 2025). Despite slow progress in agricultural transformation, these countries are nevertheless experiencing rapid rural–urban migration and pronounced shifts in food consumption patterns, including rising demand for processed foods purchased through retail and food service outlets (Barrett et al., 2022). Agrifood systems are therefore transforming even though the process of agricultural modernization remains, in many instances, incomplete.

Recognizing that economic activity increasingly extends beyond primary agriculture and into downstream segments of the agrifood system, we follow Thurlow et al. (2025) in conceptualizing the agrifood system as comprising various interconnected on-farm and off-farm components. We group these into three broad segments for the purposes of this paper: primary agriculture (hereafter “farming”); agroprocessing and agricultural input supply (“processing”); and trade, transport, and other food services, including restaurants (“distribution”). While traditional on-farm policies remain essential for addressing agricultural productivity constraints, the growing importance of processing and distribution raises the question of whether “agricultural” development strategies should increasingly balance productivity-enhancing investments in farming with those in off-farm agrifood activities while recognizing the broader push and pull mechanisms associated with broader structural transformation.

Investment priorities also depend on the development objectives being pursued. Policymakers in the agrifood space are increasingly expected to consider a broad set of objectives beyond agricultural growth and rural poverty reduction, including food security, nutrition, equity, and environmental sustainability (Byerlee et al., 2009; Ingram and Thornton, 2022). These development outcomes are realized through overlapping income, price, and behavioral channels triggered by productivity growth either in the on-farm or off-farm components of agrifood systems. Consequently, investments that perform best against one objective need not perform best against

another. This motivates our central research question: How does the location of productivity growth within the agrifood system affect different development outcomes, and what trade-offs arise when investment priorities are evaluated against multiple objectives? We focus specifically on three interrelated outcomes that frequently feature prominently in agrifood policy debates: household poverty, the cost and affordability of healthy diets, and diet quality.

Our analysis contributes to the literature on how productivity growth in different parts of the agrifood system shapes multiple dimensions of development. First, it extends conventional sectoral growth analysis by comparing productivity growth across farming, processing, and distribution within the agrifood system, rather than relying on a broad agriculture/non-agriculture distinction. Second, it examines heterogeneity across major agrifood value chains, including staples, horticulture, animal-source foods, pulses, and cash and export crops, and across five sub-Saharan African countries with distinct agrifood system structures and levels of development. Third, it evaluates these alternative locations of productivity growth simultaneously against poverty, healthy-diet affordability, and diet quality, revealing synergies and trade-offs that are obscured when investment priorities are assessed against a single outcome. These comparisons can help inform policymakers where productivity-enhancing agrifood investments might be prioritized as they pursue multiple development objectives.

Geographically, we focus on five low- and lower-middle-income countries, namely Malawi, Ethiopia, Tanzania, Ghana, and Nigeria. Methodologically, we employ Rural Investment and Policy Analysis (RIAPA) country models. These economywide models provide detailed representations of national agrifood systems and are linked to survey-based microsimulation modules to assess household-level welfare outcomes (IFPRI, 2026). Our paper is structured as follows: Section 2 provides the conceptual and empirical background for the research design and highlights the heterogeneity across the case study countries. Section 3 presents the economywide models, metrics, and simulation scenarios. Section 4 discusses the results, and, finally, Section 5 concludes.

2 Conceptual and Empirical Background

2.1 Agrifood System Investments and Transformation

The structural transformation literature distinguishes between “push” and “pull” pathways out of agriculture. Agricultural productivity growth raises farm incomes, lowers food prices, and releases (or “pushes”) labor and other resources for redeployment outside of agriculture (Johnston and Mellor, 1961); likewise, non-agricultural productivity growth, including within the off-farm processing or distribution components of the agrifood system can attract (or “pull”) resources toward higher-return activities (Reardon and Timmer, 2012) or even stimulate technology adoption in the farm sector (Barrett et al., 2022). Both mechanisms contribute to structural transformation, with their relative importance shown to vary across stages of development (Alvarez-Cuadrado and Poschke, 2011). Therefore, the contribution of push and pull effects to transformation is a context-specific empirical question rather than a settled matter of theory.

A substantial empirical literature examining the role of public investments in facilitating agricultural and structural transformation in sub-Saharan African developing countries emerged

alongside the launch of the Comprehensive Africa Agriculture Development Program (CAADP) two decades ago. By demonstrating how agricultural investments can accelerate economic growth and poverty reduction, while showing that returns could vary considerably across expenditure functions, agricultural subsectors, and geographical locations (Fan and Zhang, 2008; Mogues et al., 2012; Matchaya, 2020), this literature helped establish the case for carefully targeted and adequately funded public agricultural investment programs in the region. As rising incomes, urbanization, and changing diets strengthened links between farm production and increasingly market-dependent consumers, more recent literature has advocated a broader agrifood systems approach to public investments, highlighting the importance of complementary investments across both agriculture and the off-farm processing and distribution sectors of the agrifood system (Barrett et al., 2022). This evolution is also reflected in CAADP itself. The 2025 Kampala Declaration broadened the agenda beyond agricultural production to emphasize agro-industrialization and trade alongside food and nutrition security, jobs and equitable livelihoods, and sustainability (African Union, 2025).

The growing complexity of the agrifood policy landscape means policymakers are required to anticipate synergies and trade-offs across multiple policy levers and impact pathways rather than optimizing against a single outcome (Brouwer et al., 2020; Mausch et al., 2020). Economywide models offer a particularly useful framework for examining how productivity growth and policy interventions in different parts of the economy affect multiple, potentially competing development objectives. Several Computable General Equilibrium (CGE) applications, many focused on sub-Saharan Africa, have examined how productivity growth in different agricultural and non-agricultural sectors affects economic growth, structural transformation, and household welfare (Diao et al., 2010, 2012; Dorosh and Thurlow, 2018). A complementary strand of literature explicitly links public investments or policy instruments to agricultural productivity changes and their resulting economywide effects, allowing alternative spending priorities to be evaluated against multiple development objectives (Aragie et al., 2024; Cateia et al., 2024; Sánchez et al., 2026). Building on both these strands of the literature, our analysis broadens the focus from agriculture to the wider agrifood system and specifically examines how the location of productivity growth across agrifood system components, both on and off the farm, as well as across agrifood value chains, affects poverty, healthy-diet affordability, and diet quality across five sub-Saharan African countries.

2.2 Case Study Countries

Our five case study countries cover a range of income levels and exhibit substantial variation in the structure of their economies and agrifood systems, thus providing diverse settings for examining the effects of productivity growth in the agrifood system. Table 1 summarizes their key economic characteristics, with countries ordered from lowest to highest GDP per capita. GDP results are reported in current 2019 US dollars, which aligns with the common base year of the economywide models used (see Section 3). Malawi, Ethiopia, and Tanzania are classified by the World Bank as low-income countries (LICs), with GDP per capita ranging from \$577 to \$949. Ghana and Nigeria are lower-middle-income countries (LMICs), with per capita GDP of \$2,109 and \$2,028, respectively.

Rural populations account for 65.5 to 82.8 percent of total population in the three LICs, and livelihoods remain heavily dependent on farming. By contrast, a minority of Ghanaians (43.3 percent) and Nigerians (48.8 percent) reside in rural areas, and their economies are more diversified. Consistent with these structural differences, agrifood system GDP, i.e., the combined value-added of farming, processing, and distribution, is generally a larger share of national GDP in LICs. Within agrifood systems, the farming component dominates at lower income levels, while processing and distribution become increasingly important as countries develop and supply chains extend beyond the farm (Barrett et al., 2022; Thurlow et al., 2025). Malawi is an exception due to its relatively large tobacco processing sector. These structural differences shape how agrifood productivity growth translates into changes in national GDP.

Staple crops dominate agricultural production across all five countries, accounting for between 35.0 and 60.4 percent of farming GDP. Beyond this commonality, however, agricultural structures differ markedly. Malawi (24.2 percent) and Nigeria (25.1 percent) have relatively large horticulture sectors; Ethiopia (30.3 percent) and Tanzania (32.6 percent) have substantial livestock sectors producing animal-source foods; and Ghana has a relatively large export crop sector (12.5 percent), dominated by cocoa.

Table 1. Key Characteristics of Case Study Countries (2019)

	Malawi	Ethiopia	Tanzania	Ghana	Nigeria
Country income classification ^a	LIC	LIC	LIC	LMIC	LMIC
GNI (PPP, current international \$), billion ^a	26.9	257.9	168.3	179.9	1,560.2
GNI per capita (PPP, current \$) ^a	1,420	2,230	2,930	5,760	7,450
National GDP (current \$ billion) ^b	10.4	98.0	55.7	64.1	407.6
Population (million) ^b	18.0	112.1	58.7	30.4	201.0
Rural population share (%) ^b	82.8	78.8	65.5	43.3	48.8
GDP per capita (current \$) ^b	577	875	949	2,109	2,028
GDP shares by sector (%) ^b	100.0	100.0	100.0	100.0	100.0
Agrifood system	43.1	46.7	38.6	33.3	35.7
Farming	24.4	35.2	28.9	18.5	22.1
Processing	11.1	3.6	3.6	5.0	5.8
Distribution	7.5	7.9	6.1	9.7	7.7
Non-agrifood system	56.9	53.3	61.4	66.7	64.3
Farming GDP shares by value chain (%) ^b	100.0	100.0	100.0	100.0	100.0
Staples	44.4	45.9	35.0	60.4	57.4
Horticulture	24.2	5.2	14.9	6.4	25.1
Animal-source foods	9.0	30.3	32.6	10.8	5.0
Pulses	19.7	12.9	16.2	9.1	9.2
Cash and exports	2.6	5.7	1.3	12.5	1.2
Development outcome indicators					
Poverty rate below \$3/day (%) ^c	75.4	38.6	51.3	39.6	41.8
Cost of a healthy diet (PPP \$, 2021) ^d	3.43	3.88	2.79	3.50	3.76
Unaffordability of a healthy diet (%) ^e	88.3	57.9	74.5	63.5	77.5
Mean diet adequacy (0-100) ^f	28.4	28.2	36.6	25.8	43.8

Source: Estimates based on RIAPA model baselines. External benchmarking and calibration for development outcome indicators are drawn from World Development Indicators of the World Bank (2026), and diet cost and affordability estimates of the Food and Agricultural Organization (FAO, 2026).

Notes: ^a World Bank estimates. Country income classification and Gross National Income (GNI) for 2019, consistent with the RIAPA baseline; LIC = low-income country; LMIC = lower-middle income country. ^b RIAPA baseline database (2019). Model-based estimates for selected countries. GDP is measured at market prices. Nigeria's GDP predates the 2025 rebasing. Shares of GDP and farming GDP are at factor cost. ^c RIAPA model estimates, aligned with World Bank poverty rates reflecting the proportion of the population below the international poverty line of \$3.00 per day. ^d RIAPA model estimates, aligned with FAO (2026) cost of a Healthy Diet Basket (HDB). ^e RIAPA model estimates, aligned with FAO (2026) prevalence of diet unaffordability indicator, defined as the share of the population unable to afford the HDB in 2021. ^f RIAPA model estimates of mean diet adequacy, defined as the average ratio of observed to recommended consumption across HDB food groups among diet-deprived households, with food-group adequacy capped at 100 percent.

The bottom panel of Table 1 reports development outcomes examined in this study: poverty, the cost and affordability of healthy diets, and diet quality. Poverty rates, assessed at the World Bank (2026) \$3.00-a-day international poverty line, are highest in the LICs, with 51.3 percent of Tanzanians and 75.4 percent of Malawians living in poverty, and lower in Ghana (39.6 percent) and Nigeria (41.8 percent). Ethiopia is an exception among LICs, exhibiting a relatively low poverty rate (38.6 percent), reflecting its comparatively low income-inequality.

Diet indicators use the Food and Agriculture Organization (FAO) Healthy Diet Basket (HDB) as reference diet, a global dietary standard for healthy eating specifying recommended intakes across staples, vegetables, fruits, animal-source foods, legumes and nuts, and fats and oils (Herforth et al., 2025). Measured against baseline diet costs, which range from \$2.78 in Tanzania to \$3.88 in Ethiopia (2021 PPP dollars) per adult equivalent per day, the FAO (2026) estimates that 88.3 percent of people in Malawi, the poorest country in our sample, cannot afford the HDB. The prevalence of diet unaffordability remains high even in wealthier countries, including Nigeria (77.5 percent).

Greater healthy-diet affordability is generally correlated with improved diet quality. However, even the wealthiest households often fall short of the HDB recommendations, since consumption outcomes also reflect other factors, such as consumer preferences, convenience, and cultural norms. The mean diet adequacy score measures observed consumption relative to recommended intake across HDB food groups among households with at least one consumption shortfall. Food-group adequacy ratios are capped at 100 percent so that excess consumption in one food group cannot compensate for inadequate consumption in another and are then averaged across food groups and diet-deprived households. Higher values therefore indicate that consumption is, on average, closer to recommended quantities. Nigeria records the highest score (43.8 percent), while Ghana records the lowest in our sample (25.8 percent), mainly due to low adequacy scores for fruits and legumes.

In summary, while poverty generally declines as real incomes rise, healthy-diet affordability and diet quality can follow distinct trajectories shaped by agrifood system structures, value chain dynamics, consumer preferences, and relative food prices. Although the agrifood system remains central to poverty and dietary outcomes at all stages of development, structural shifts may alter the relative importance of farming versus processing or distribution. Moreover, lower poverty and greater healthy-diet affordability do not necessarily translate into better quality diets. These general observations motivate deeper examination in this study around how agrifood policies and their associated impacts on productivity growth across different agrifood system components or value chains ultimately translate into development outcomes in countries at different stages of development or exhibiting diverse economic structures and consumer preferences.

3 Methods

3.1 Economywide Models and Data

We use country-level Rural Investment and Policy Analysis (RIAPA) models that combine economywide and microsimulation modeling techniques (IFPRI, 2026) to assess the impacts of agrifood system productivity gains on multiple development outcomes. Using equations that characterize microeconomic behavior within a set of macroeconomic constraints, RIAPA models capture macroeconomic and sectoral effects, accounting for market feedback and economywide linkages as well as household-level distributional and welfare impacts. At the core of each RIAPA model is a CGE model calibrated to a Social Accounting Matrix (SAM) representing the structure of the relevant national economy. The SAMs used in our analysis are highly disaggregated to reflect country-specific economic and agrifood system structures (IFPRI, 2025). Thus, although

RIAPA models adopt common functional forms and behavioral assumptions, their underlying economic structures and calibrated behavioral responses vary across countries.

Production behavior is modeled using a nested system in which substitution between capital, labor, and land is governed by a Constant Elasticity of Substitution (CES) function while under a Leontief specification intermediate inputs are used in fixed proportions to outputs. Production technologies are calibrated separately for each activity using sector-specific intermediate input requirements, value-added shares, and factor intensities as represented in the SAM. The SAMs, in turn, derive these data from supply-and-use tables and labor force or household surveys. Each country SAM incorporates up to 24 agricultural subsectors, 15 agroprocessing subsectors, and 3 food trade, transport, and services sectors, alongside up to 50 manufacturing and service sectors outside the agrifood system. Factor substitution elasticities also differ across broad sectors; for instance, we assume a lower degree of substitutability among factors in agricultural sectors (elasticity of 0.5) than in manufacturing and services (elasticity of 2.0). Agricultural activities are additionally calibrated to country-specific crop production and land-use estimates. Producers compete with imports and supply both domestic and export markets, with CES and Constant Elasticity of Transformation (CET) functions determining how much is imported and exported in response to relative domestic and world prices. Commodity-specific international trade elasticities for the CES and CET functions are drawn from Dimaranan (2006).

Household consumption behavior is modeled using a Linear Expenditure System (LES) of demand which is uniquely specified for each of 15 representative household groups in the SAM, namely urban, rural farm, and rural nonfarm households, each disaggregated by expenditure quintile. The demand systems distinguish marketed consumption (valued at retail prices) and home consumption (valued at producer prices) and are calibrated using commodity-specific income elasticities informed by Ecker and Comstock (2021) and reflect household consumption patterns from nationally representative household survey data used in the construction of each country's SAM (Ethiopia 2015–2016; Ghana 2016–2017; Malawi 2019–2020; Nigeria 2018–2019; and Tanzania 2018). These elasticities and observed consumption patterns are used to derive household- and commodity-specific subsistence quantities and marginal budget shares in the LES, allowing demand for necessities, including staple foods, to respond differently to income growth than demand for higher-value foods and nonfood goods. Household-group-specific consumption patterns further allow demand responses to vary across household types according to their initial expenditure patterns and income levels.

Each SAM further distinguishes eight labor categories, disaggregated into rural and urban labor and four education groups. Labor supply is represented by upward-sloping supply curves, allowing employment to respond to changes in real wages as workers enter or exit the labor market. Conditional on these labor-supply responses, wages adjust endogenously to clear labor markets; this market-clearing assumption does not preclude underemployment or low-productivity employment often seen in developing countries. Land and capital markets also clear endogenously, although their supplies evolve differently. Land supply is set exogenously based on historical land expansion rates, while, under the recursive-dynamic specification, investment in one period is endogenously allocated across sectors to generate new capital stocks for the subsequent period.

All country SAMs adopt a common 2019 base year. This choice is deliberate: even though more recent SAMs are available for some of the countries in our sample (see IFPRI, 2025), a common base year improves comparability across the five case studies. Moreover, the years immediately following 2019 were characterized by substantial economic disruptions associated with the COVID-19 pandemic, which temporarily altered production patterns, trade flows, and household incomes. Using pre-pandemic SAMs therefore avoids calibrating the models to these exceptional short-term conditions.

3.2 *Microsimulation Models and Development Outcome Indicators*

Household welfare impacts are evaluated using microsimulation models built from the various nationally representative household surveys used in the construction of each country’s SAM. These surveys provide detailed information on food and nonfood consumption patterns of individual households. Consistent with the treatment of household consumption in the RIAPA models, the surveys capture both market purchases and consumption from own production. Survey households are uniquely mapped to representative household groups in the SAM, and modeled changes in real consumption are applied to baseline consumption to generate new consumption distributions for each simulation scenario. Comparing these distributions with the baseline allows us to estimate changes in development outcome indicators, including poverty, the prevalence of diet unaffordability, and diet quality, proxied by the mean food group adequacy ratio.

Consistent with the definitions used for our baseline estimates (see Table 1 and Section 2.2), poverty is measured using the \$3.00-a-day international poverty line and survey-based total consumption expenditure per adult equivalent as the welfare aggregate. The prevalence of diet unaffordability is estimated similarly by comparing a notional food budget—calculated as total consumption expenditure per adult equivalent net of the nonfood component of the international poverty line (\$1.11 of the \$3.00 threshold)—with FAO estimates of the cost of a healthy diet, which range from \$2.79 to \$3.76 across the five countries in the baseline. Simulated changes in diet costs reflect consumption-weighted changes in producer prices for own-consumed foods and retail prices for purchased foods.

The mean food group adequacy measure used as a proxy for diet quality is the average ratio of observed to recommended consumption across HDB food groups among diet-deprived households. It accounts for consumption of both purchased and own-produced food. This measure is closely related to a component of the composite Reference Diet Deprivation (ReDD) index (Pauw et al., 2023), another measure of diet quality, and one of the standard reporting parameters in the RIAPA model. Specifically, the ReDD index is the product of three indicators: the incidence of diet deprivation (H), measured as the share of the population whose diets fail to meet the HDB standard; the breadth of diet deprivation (A), measured as the average share of food groups in which diet-deprived households fall short of the HDB; and the severity of diet deprivation (G), measured as the average consumption shortfall across all HDB food groups among diet-deprived households. Thus, $\text{ReDD} = H \times A \times G$. Mathematically, the mean food group adequacy ratio is the complement of the severity measure, equal to $(1 - G) \times 100$. By directly measuring the magnitude of consumption shortfalls, the mean food group adequacy ratio is an intuitive measure

of diet quality and therefore the focus in the main analysis. As a robustness check, we also report results for the ReDD index in Table A4 in the Appendix.

3.3 *Simulation Design and Results Interpretation*

We conduct two sets of simulations to examine how productivity growth across agrifood system components and value chains affect poverty, healthy-diet affordability, and diet quality. The first set compares productivity growth across the three broad components of the agrifood system, namely farming, processing, and distribution, thus providing high-level guidance on where productivity-enhancing investments may generate the greatest development impacts. The second set examines productivity growth within specific agrifood value chains, defined by the commodities they supply. These simulations inform more specific guidance on value chain priorities by highlighting how structural differences across value chains shape development outcomes.

Baseline scenarios represent neutral reference trajectories for each country from 2019 to 2025 rather than country-specific forecasts. To facilitate comparison across countries, the baselines are calibrated to generate approximately 3 percent annual GDP growth, without imposing substantial differences in productivity growth across subsectors. Common macroeconomic assumptions are also applied. Government consumption and foreign savings grow at 3 percent annually, while capital depreciates at 5 percent annually. Under the balanced savings-investment closure, investment adjusts to available savings while the shares of investment and government spending in domestic absorption remain fixed. Investment in each period adds to the productive capital stock available in the subsequent period. These common assumptions and deliberately neutral growth assumptions provide a common reference against which to evaluate the marginal effects of productivity growth occurring in different parts of the agrifood system.

Simulation scenarios increase total factor productivity (TFP) growth rates in targeted agrifood system components or value chains by approximately 1.6 percentage points above baseline during a 2020–2025 simulation period, such that TFP levels are 10 percent higher than baseline by 2025 $[(1 + 0.016)^6 - 1 \approx 0.10]$. Since the models capture production behavior at national level, the implicit assumption is that all subregions experience the same uniform productivity increase.

The simulations are intentionally productivity-based rather than investment-cost scenarios. We remain agnostic about the specific policy instruments, financing sources, and public or private costs required to achieve the modeled productivity gains. Complementary approaches explicitly link public agricultural investments to productivity gains (e.g., Arague et al., 2024; Cateia et al., 2024; Sánchez et al., 2026), allowing the costs and effects of broader investment strategies to be compared. Our approach instead allows us to isolate how the location of productivity growth within the agrifood system affects the outcomes of interest and is therefore suited to the research questions we seek to address in this study.

Results are evaluated by comparing simulated outcomes against baseline outcomes in 2025, the final simulation year. Table 1 provides baseline indicators for 2019, which evolve over time under the baseline growth path. Results for our selected outcome indicators are reported using two complementary approaches. In the first approach we present absolute changes in poverty and healthy-diet affordability (in percentage point terms) and changes in the diet quality indicator

(point changes) from their baseline levels. Under this approach, productivity growth in larger sectors is expected to have larger impacts on outcome indicators simply because of their size.

In the second approach we normalize the results by calculating growth elasticities for outcome indicators. These are calculated as the percentage or point-change in each outcome relative to baseline divided by the corresponding percentage change in national GDP. This neutralizes sector size effects and instead emphasizes how structural characteristics such as input–output relationships, employment patterns, and household consumption linkages drive change. Although smaller sectors would have to experience faster productivity growth to generate the same GDP expansion as larger sectors, the elasticity-based approach, which is common in the poverty–growth literature (see Christiaensen and Todo, 2014; Dorosh and Thurlow, 2018), provides clearer insights into the “growth-linkage effects” of productivity growth across agrifood system components and value chains.

4 Results and Discussion

4.1 Agrifood System Productivity, Growth, and the Cost of Healthy Diets

We begin by examining the effects of productivity growth on national GDP (Table 2). GDP growth provides an indication of average household income growth and, depending on how income gains are distributed among households, underpins key welfare outcomes such as changes in poverty or healthy-diet affordability. As expected, direct GDP impacts depend on the relative size of the agrifood system component or value chain experiencing productivity growth.

Table 2. Impact of Agrifood System Productivity Growth on GDP

	Change in GDP (% deviation from base)					
	Malawi	Ethiopia	Tanzania	Ghana	Nigeria	Average
TFP growth (10%) by component						
Farming	4.2	6.5	4.1	2.9	3.4	4.2
Processing	1.2	0.5	0.4	0.6	0.8	0.7
Distribution	0.7	1.3	1.0	1.0	1.5	1.1
TFP growth (10%) by value chain						
Staples	2.0	2.2	0.8	1.7	2.0	1.7
Horticulture	0.9	0.2	0.3	0.2	0.7	0.4
Animal-source foods	0.4	2.5	1.6	0.3	0.2	1.0
Pulses	0.2	1.0	0.4	0.2	0.4	0.4
Cash and exports	0.6	0.4	0.1	0.4	0.1	0.3

Source: RIAPA model results

Note: The final column shows a simple (unweighted) average across the five countries.

Across the three broad components of the agrifood system, productivity growth in farming generates the largest GDP response, increasing national GDP by an average of 4.2 percent across the five countries. Impacts are slightly larger within LICs, where farming accounts for a greater share of the economy. Productivity growth in distribution and processing generates more modest GDP gains of 1.1 percent and 0.7 percent, respectively, consistent with their smaller size. A similar

pattern emerges across agrifood value chains. A 10 percent increase in TFP in staples, the largest value chain in all countries, yields the greatest GDP impact, raising national GDP by an average of 1.7 percent. This is followed by productivity growth in animal-source foods (1.0 percent). By contrast, productivity growth in the relatively small cash and export crop sector contributes the least to national GDP growth (0.3 percent).

Productivity growth in different parts of the agrifood system also has differential effects on relative food prices and hence diet costs. These impacts are explored in Table 3. In standard CGE models, prices are expressed relative to a fixed numeraire, which in our case is the consumption-weighted average cost of a representative basket of food and nonfood consumer items. As such, reported changes in prices or costs should be interpreted as real price changes. Our results show that productivity growth in farming reduces the real cost of a healthy diet by 6.5 percent, on average. Productivity growth in the processing and distribution components has mixed effects across countries but raises healthy diet costs by 0.4 percent, on average, relative to the numeraire. This somewhat unexpected result can be explained by the fact that off-farm productivity growth consistently lowers prices of grain milling products or cooking oils that dominate processed and traded foods. This encourages reallocation of productive resources toward the upstream farming segments of these value chains (i.e., cereals or oilseeds) at the expense of other value chains such as horticulture or pulses. The resulting price increases in these underrepresented food groups lead to higher healthy diet costs in most countries.

Table 3. Impact of Agrifood System Productivity Growth on Diet Costs

	Change in diet costs (% deviation from base)					Average
	Malawi	Ethiopia	Tanzania	Ghana	Nigeria	
TFP growth by component						
Farming	-6.8	-1.8	-7.5	-9.4	-6.8	-6.5
Processing	0.1	0.4	0.4	0.8	0.5	0.4
Distribution	0.2	-0.6	0.6	1.5	0.3	0.4
TFP growth by value chain						
Staples	-0.2	0.0	-0.3	0.7	1.5	0.4
Horticulture	-5.9	-0.5	-3.0	-7.8	-4.9	-4.4
Animal-source foods	-0.1	2.1	-1.6	0.2	0.2	0.2
Pulses	-0.5	-0.6	-0.4	-1.0	-0.9	-0.7
Cash and exports	0.3	-0.2	0.0	0.6	0.0	0.1

Source: RIAPA model results

Note: The final column shows a simple (unweighted) average across the five countries.

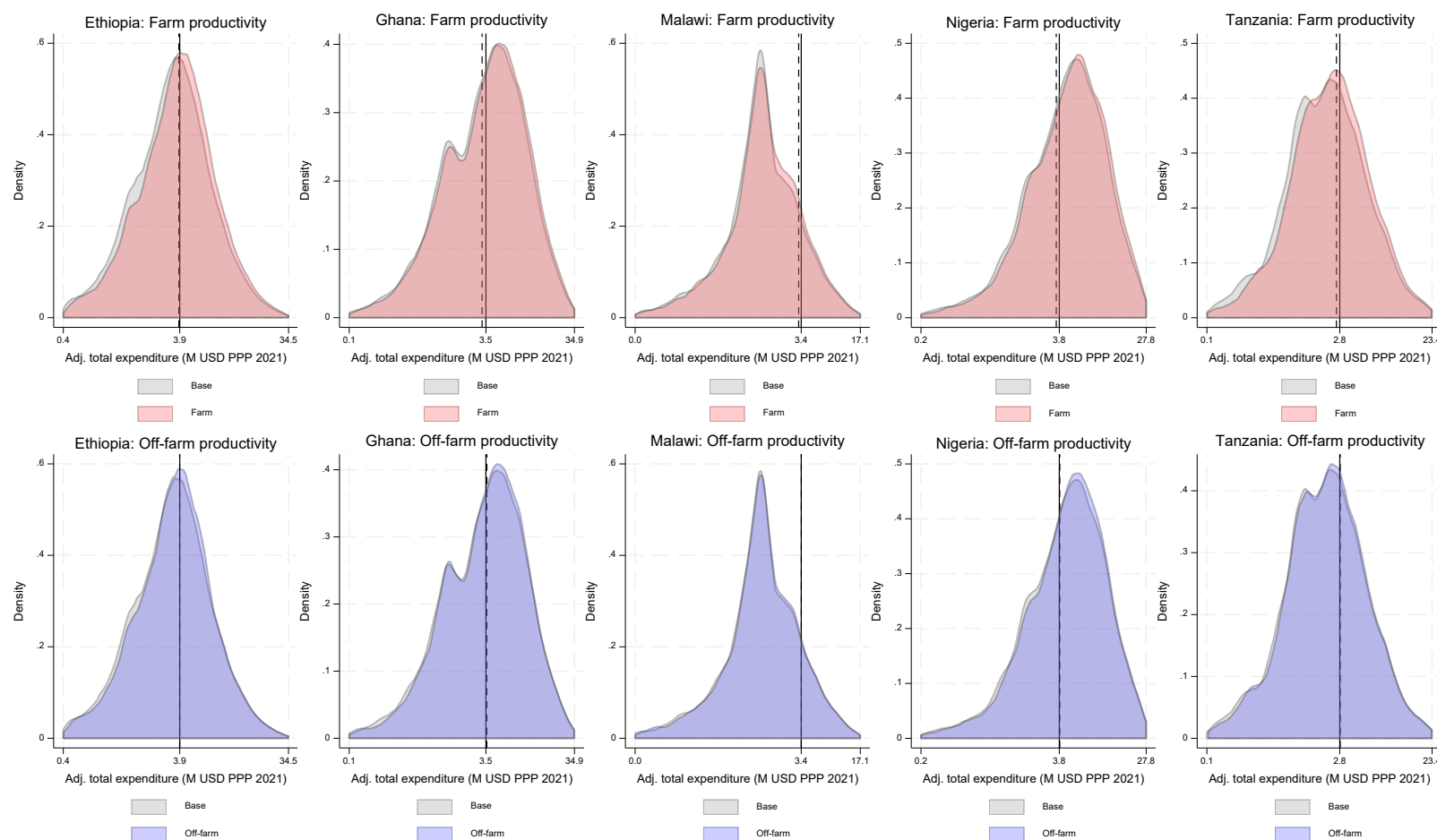
Similar trade-offs arise when productivity growth is targeted at specific value chains. As shown in bottom panel of Table 3, productivity growth in staples increases overall healthy diet costs (by 0.4 percent on average), whereas productivity growth in horticulture yields the largest reduction in healthy diet costs (−4.4 percent). Pulses also reduce diet costs, producing a smaller but consistently negative effect across countries (−0.7 percent on average). Other food groups show mixed effects.

An important consideration is that the HDB represents an aspirational diet, and hence its cost does not represent the cost of actual food baskets. Actual diets in low-income settings tend to be

dominated by relatively low-cost, calorie-dense staples, with limited consumption of vegetables, fruits, or animal-source foods. Consequently, while changes in the cost of a healthy diet directly affect its affordability, their implications for consumer welfare depend on consumption choices. Households are less exposed to price increases in foods they consume in small quantities. We find, for instance, that productivity growth in staples lowers the actual food price index by 1.1 percent even though it increases the healthy diet cost by 0.4 percent. This reflects the greater weight of staples in actual consumption baskets, where falling staple prices more than offset rising prices of other foods.

The affordability of a healthy diet is not only impacted by relative food price changes, but also by changes in households' disposable incomes. Figure 1 illustrates the mechanism underlying our microsimulation models. Modeled changes in consumption of representative household groups are linked to individual households in each underlying survey to estimate the distributional implications of productivity gains. Modeled price changes are similarly used to estimate changes in diet costs (see Table 3). The shaded density distributions represent the food expenditure distributions, while the vertical lines represent diet costs under the baseline scenario and under two counterfactual scenarios. Productivity growth in the farming component (top figures) raises household incomes and shifts food expenditure distributions to the right, while changes in relative food prices reduce real diet costs. Productivity growth in the off-farm components (bottom figures) likewise shifts the food expenditure distribution to the right, but its effects on diet costs are, as previously discussed, mixed. The area below each distribution curve and to the left of the diet cost line represents the share of the population unable to afford the healthy diet before and after the intervention. The method can therefore be used to estimate changes in the prevalence of diet unaffordability. Similar approaches are used to measure changes in poverty or diet quality.

Figure 1: Productivity Growth and Changes in Food Expenditures and Diet Costs: An Illustration



Source: RIAPA model results

Notes: (a) The figure shows the effects of a simulated 10% increase in agrifood system productivity (both on-farm and off-farm sectors) across all countries. (b) Solid vertical lines represent baseline diet costs, while dashed vertical lines indicate the associated costs under farm or off-farm scenarios.

4.2 *Productivity Gains in Farming, Processing, and Distribution*

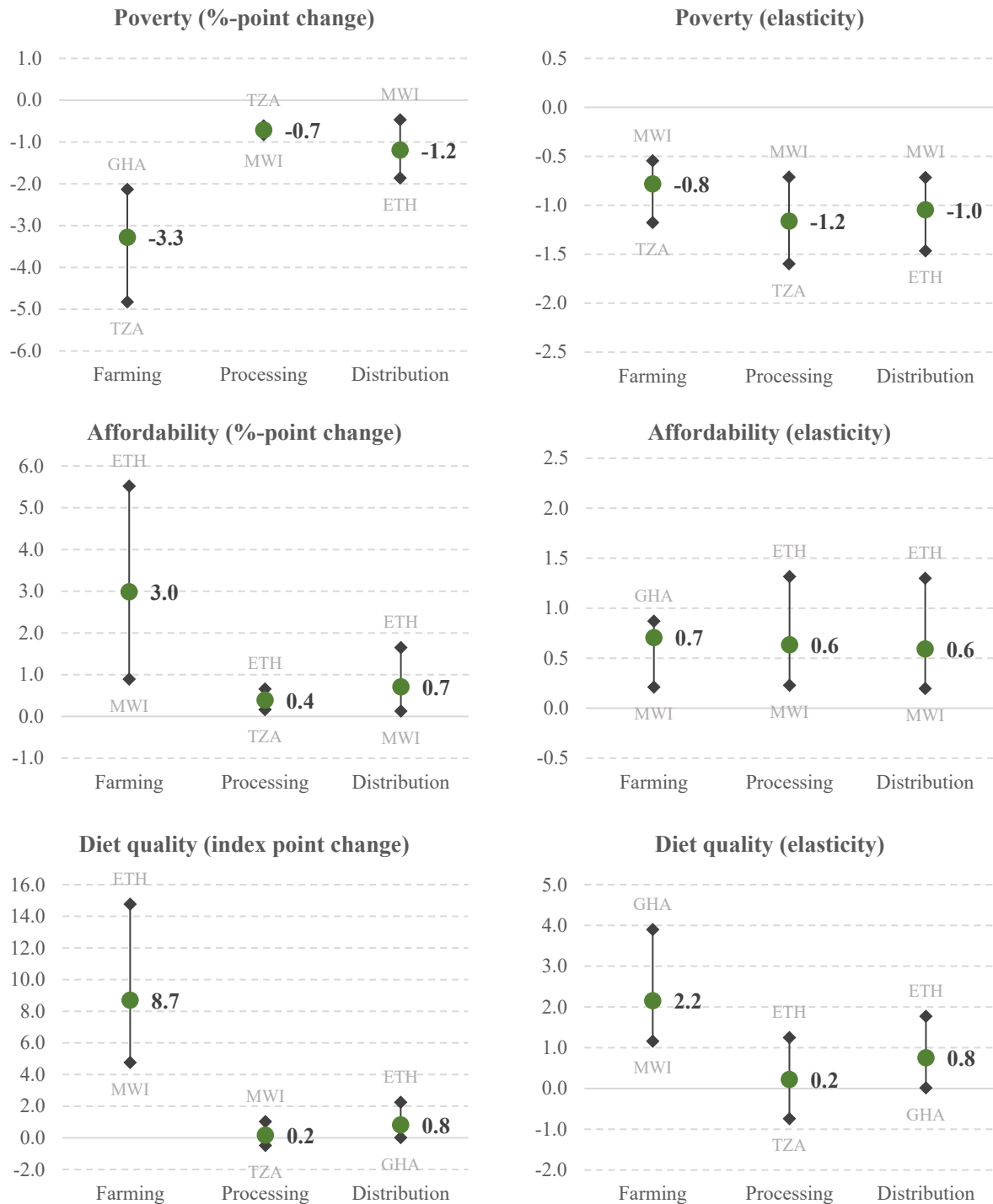
We now turn to our key simulation results. Figure 2 summarizes the effects of productivity growth in the farming, processing, and distribution components of the agrifood system on poverty, healthy-diet affordability, and diet quality. Vertical lines indicate the range of country-level outcomes, with labels identifying the countries exhibiting the largest and smallest impacts, as well as the average effect across the five countries. Detailed country results are reported in Tables A1–A4 in the Appendix. For each outcome, we present two sets of results: modeled changes associated with a 10 percent increase in TFP in each component (left-hand panels), and growth elasticities that express changes in outcome indicators per unit of GDP growth generated in each scenario (right-hand panels).

In absolute terms, productivity growth in farming dominates across all three outcome indicators: on average, TFP growth in farming reduces poverty by 3.3 percentage points, improves healthy-diet affordability by 3.0 percentage points, and raises diet quality by 8.7 index points. These large effects reflect both the substantial size of the farming sector relative to the off-farm agrifood system components as well as its strong influence on national income growth, especially among the many poor households that remain directly linked to agriculture, a consistent finding in empirical analyses of the role of agriculture in poverty reduction (Dorosh and Thurlow, 2018; Sánchez et al. 2026). This dominance is most pronounced in Malawi, Ethiopia, and Tanzania, the three LICs, where farming accounts for the largest share of agrifood system GDP and rural livelihoods remain heavily agriculture-dependent (see Table 1).

When outcomes are normalized by GDP growth, however, the dominance of farming is less pronounced. Per unit of national GDP growth, productivity gains in processing (–1.2) and distribution (–1.0) are slightly more effective at reducing poverty than farming (–0.8). A similar pattern is observed across all countries. This reveals the strengthening consumption and employment linkages between poor households and off-farm agrifood activities that accompany structural transformation, even while these sectors remain relatively small in scale. On average, farming is marginally more effective at improving healthy-diet affordability, although in Ethiopia and Nigeria processing and distribution perform slightly better. These results suggest that a country’s level of economic development alone is not a reliable guide for determining where within the agrifood system productivity-enhancing investments should be prioritized to address poverty and healthy-diet affordability.

By contrast, productivity growth in farming consistently yields the largest diet quality growth elasticities across countries (2.2), followed by distribution (0.8) and processing (0.2). This pattern reflects the relatively large quantities of fresh fruits, vegetables, and animal-source foods in the HDB, which are consumed with little or no processing. While the literature highlights the positive dietary impacts of off-farm employment income for farming households (Babatunde & Qaim, 2010), our examination of productivity growth across agrifood components also captures important price and marketing channels. Specifically, productivity growth in farming directly lowers the cost of producing these foods, while productivity growth in distribution lowers the cost of delivering food to increasingly market-dependent consumers.

Figure 2. Agrifood System Components: Productivity Growth and Welfare Outcomes



Source: RIAPA model results

Notes: MWI = Malawi; ETH = Ethiopia; TZA = Tanzania; GHA = Ghana; NGA = Nigeria. The affordability indicator measures the percentage-point change in the share of the population that can *afford* a healthy diet.

Related evidence emphasizes the complementary roles of domestic production and supply chains in expanding access to nutrient-dense foods, particularly as urbanization increases consumers' reliance on markets (Reardon et al., 2024). Processing, which tends to be dominated by grain milling and oilseed processing in developing countries, by comparison, plays a more limited role in improving diet quality, making the combination of farming and distribution the more critical components for advancing dietary outcomes.

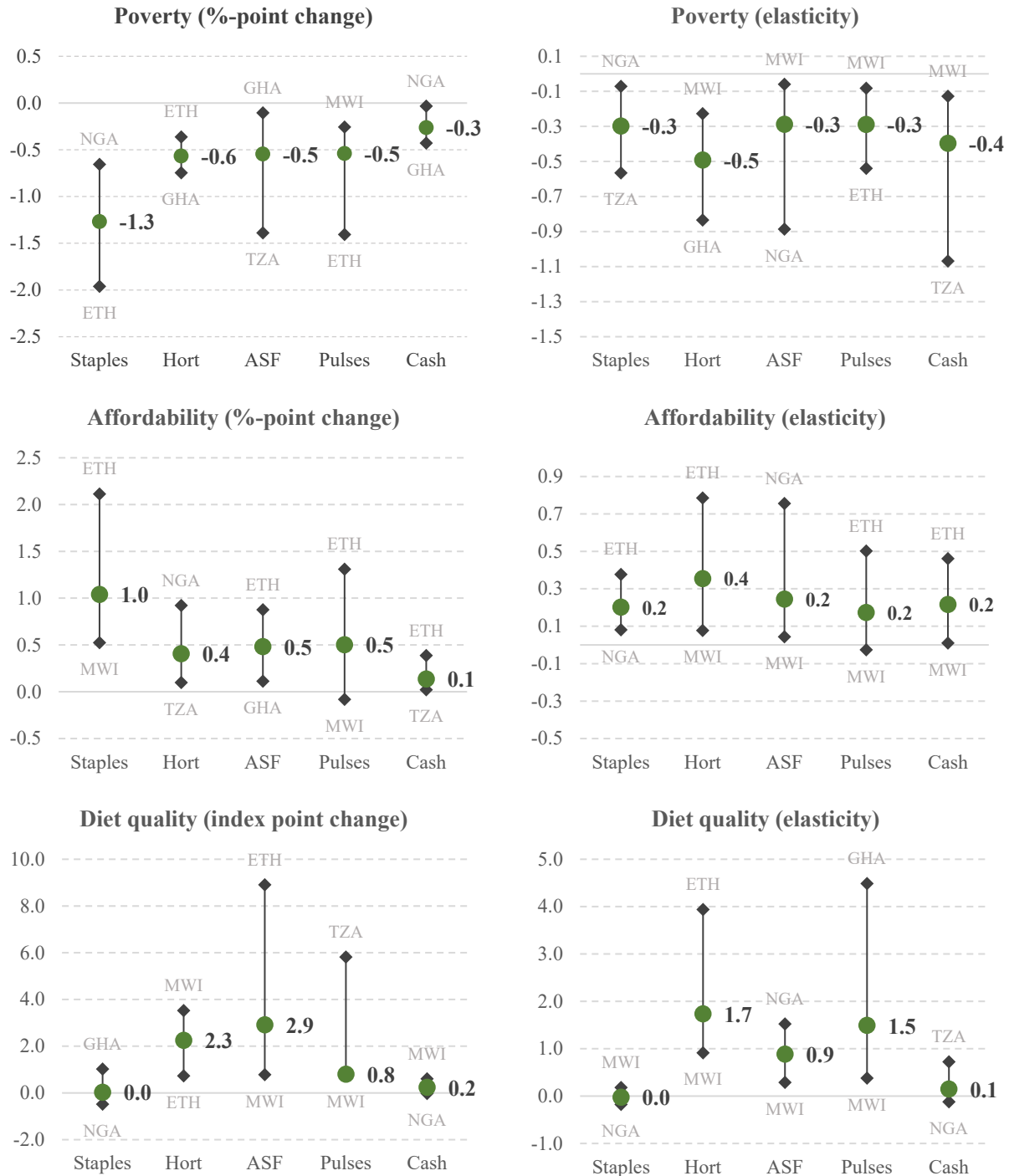
4.3 Productivity Growth in Agrifood Value Chains

We next consider productivity growth in specific agrifood value chains. Agricultural development strategies frequently prioritize value chains considered strategically important. Understanding how differences in the size and structure of these value chains shape the development impacts of productivity growth can help inform these priorities. Figure 3 summarizes the impacts of productivity growth on poverty, healthy-diet affordability, and diet quality across agrifood value chains. As before, detailed results are reported in Tables A1–A4 in the Appendix.

In absolute terms, productivity growth in the staples sector generates the largest reductions in poverty (–1.3 percentage points) and the largest improvements in healthy-diet affordability (1.0 percentage point). Staples consistently rank highest across countries for these two outcomes, with the cereal subsector driving most of the effect, consistent with its large share of farming GDP across all five countries (35.0 to 60.4 percent, Table 1). Productivity growth in animal-source foods is also effective at reducing poverty (–0.5 percentage points) and improving healthy-diet affordability (0.5 percentage points), although this result is largely driven by the positive results for Tanzania. In countries such as Malawi where poor households consume limited quantities of animal-source food, or Ghana, where the livestock sector is relatively small compared to crops sectors, productivity growth in animal-source foods has more limited effects on poverty and healthy-diet affordability.

Diet quality outcomes present a different pattern. Productivity growth in animal-source food (2.9 index points) and horticulture (2.3 index points) yields the largest improvements in diet quality. Although productivity growth in these value chains is relatively less effective at reducing overall healthy diet costs, the combined effects of income gains, relative price changes, and large initial consumption gaps explain their strong effects on diets. Cash crops and staples are at the opposite end of the spectrum: productivity growth in the small cash crop sector has limited effects on incomes or food prices, while productivity growth (and associated price declines) in staples often increases staple consumption at the expense of more nutrient-dense foods, resulting in only modest improvements in diet quality.

Figure 3. Agrifood Value Chains: Productivity Growth and Welfare Outcomes



Source: RIAPA model results

Notes: MWI = Malawi; ETH = Ethiopia; TZA = Tanzania; GHA = Ghana; NGA = Nigeria. The affordability indicator measures the percentage-point change in the share of the population that can *afford* a healthy diet.

Growth elasticity results offer a complementary perspective. When impacts are normalized by GDP growth, horticulture emerges as the highest-ranked value chain across all three outcome dimensions, with an average poverty growth elasticity of -0.5 , a healthy-diet affordability growth elasticity of 0.4 , and a diet quality growth elasticity of 1.7 . In fact, horticulture ranks highest in at least three of the five countries for each outcome and performs especially well in Nigeria, where horticulture accounts for 25.1 percent of farming GDP (see Table 1). Cash crops rank second overall in poverty reduction, largely driven by the result for Tanzania, while staples also have strong poverty-reducing effects. Animal-source foods rank second in improving healthy-diet affordability (0.3), and pulses rank second in enhancing diet quality (0.5).

Taken together, the results highlight an important distinction between the scale and relative effectiveness of productivity growth across value chains. Staples generate broad poverty-reduction and healthy-diet affordability gains, reflecting their large weight in agricultural systems and consumption baskets, consistent with studies highlighting the pro-poor potential of cereals value chains (Diao et al., 2010; Aragie et al., 2024). Horticulture, by contrast, performs particularly strongly once impacts are normalized by GDP growth, ranking highest across poverty reduction, healthy-diet affordability, and diet quality.

4.4 Unpacking Productivity Growth in Off-Farm Sectors

Although on-farm productivity growth generates the largest absolute improvements in poverty and dietary outcomes, productivity gains in off-farm subsectors can also generate substantial welfare effects and play a critical role, particularly in poverty reduction. Tables A1–A4 in the Appendix report detailed results on the contributions of individual subsectors within the processing and distribution components.

Focusing on growth elasticities, we find considerable heterogeneity across off-farm subsectors. Within the processing component, productivity growth in the grain milling subsector is the most effective at reducing poverty per unit of GDP growth, reflecting its strong backward linkages to cereal crop production and its importance for poor consumers. In contrast, productivity growth in oilseed processing is most effective at improving healthy-diet affordability and diet quality, consistent with its influence on the prices of fats and oils that feature prominently in both food budgets and in the HDB itself.

Within the distribution component, productivity growth in food transport yields the largest poverty-reduction effects per unit of GDP growth, reflecting its economywide role in lowering marketing costs and improving market access. Productivity growth in food trade, by contrast, is most effective at improving healthy-diet affordability and diet quality, as it directly affects retail prices and access to a more diverse range of foods.

5 Conclusions

Public investment in agrifood systems remains central to growth, poverty reduction, and dietary outcomes in sub-Saharan Africa, a region that is home to over four-fifths of the world's three billion people unable to afford a healthy diet (FAO, 2026). Using economywide models, this study examines how productivity growth across different agrifood system components—farming, processing, and distribution—and value chains shapes household income growth and relative food

prices, with implications for poverty, healthy-diet affordability, and diet quality. The analysis draws on simulations for five African countries—Malawi, Ethiopia, Tanzania, Ghana, and Nigeria—spanning different stages of economic development and agrifood system transformation.

Consistent with longstanding evidence on agricultural transformation, we find that productivity growth in primary agriculture remains highly effective at reducing poverty and improving healthy-diet affordability in absolute terms, particularly through staple crop value chains. This reflects the continued dominance of farming within agrifood systems in many sub-Saharan African countries, including those already transitioning to middle-income country status, and the large share of poor households directly linked to agriculture.

When outcomes are expressed as growth elasticities, which neutralize sector size effects and emphasize structural characteristics and economic linkages, productivity growth in processing and distribution proves marginally more effective at reducing poverty per unit of GDP growth, while their relative impacts on healthy-diet affordability vary across countries. This finding underscores the growing importance of off-farm agrifood activities as economies become more urbanized and consumers rely increasingly on markets to meet food demand.

Across agrifood value chains, clear trade-offs emerge. Growth elasticities reveal that productivity growth in staple crops has strong poverty and healthy-diet affordability effects but contributes little to diet quality. In contrast, horticulture and pulses generate the largest improvements in diet quality, with horticulture also emerging as the most effective value chain across all outcomes. These results highlight the importance of aligning productivity investments with societal priorities: policies focused narrowly on income or calorie availability may fall short of improving diet quality, while investments in nutrient-dense agrifood value chains may require complementary off-farm interventions to enhance affordability and access to healthy diets.

Taken together, these findings suggest that agrifood investment priorities should evolve as economies grow and transform, while remaining responsive to country circumstances and policy objectives. Continued productivity growth in farming remains essential, but the potential contributions of processing and distribution should not be overlooked. Moreover, because improvements in incomes and healthy-diet affordability do not necessarily translate into better diets, complementary investments in rural livelihoods, food system infrastructure, and nutrition knowledge may be needed to improve dietary outcomes (Bai and Masters, 2024; Spronk et al., 2014). Rather than prescribing universal priorities, our findings therefore favor portfolios of interventions tailored to the structural characteristics of countries' agrifood systems and the outcomes policymakers seek to improve.

Finally, our analysis represents productivity-enhancing investments through common productivity shocks to facilitate cross-country and cross-sector comparisons, rather than explicitly modeling the costs or implementation of specific interventions. The three outcomes considered capture important dimensions of agrifood system development, but the analytical framework could be extended to evaluate specific policy interventions and additional outcomes, including environmental sustainability and resilience. Such extensions could further inform investment priorities and support progress across multiple dimensions of agrifood system transformation.

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Appendix

Table A 1. Detailed Poverty Results

Sector		Change in percentage points (per 10% growth in TFP)								Growth Elasticity (per 1% GDP growth)											
		Countries					Average / Rank			Countries					Average / Rank						
		MWI	ETH	TZA	GHA	NGA	AVG	SD	L1	L2	MWI	ETH	TZA	GHA	NGA	AVG	SD	L1	L2		
L1	Farming	-2.3	-4.7	-4.8	-2.1	-2.5	-3.3	1.3	1		-0.7	-0.7	-0.5	-0.7	-1.2	-0.8	0.2	3			
L1	Processing	-0.8	-0.8	-0.6	-0.6	-0.7	-0.7	0.1	3		-0.7	-1.5	-1.6	-1.1	-0.9	-1.2	0.4	1			
L1	Distribution	-0.5	-1.9	-1.1	-1.1	-1.5	-1.2	0.5	2		-0.7	-1.5	-1.0	-1.0	-1.0	-1.0	0.3	2			
Farming																					
L1	Staples	-1.3	-2.0	-1.5	-0.8	-0.7	-1.3	0.5	1		-0.4	-0.4	-0.6	-0.1	-0.1	-0.3	0.2	3			
L2	Cereals	-1.2	-2.0	-1.4	-0.2	-0.5	-1.0	0.7		1	-0.4	-0.4	-0.7	-0.1	-0.2	-0.4	0.2		4		
L2	Root crops	-0.3	0.0	-0.3	-0.6	-0.3	-0.3	0.2		7	-0.1	0.0	-0.4	-0.1	0.0	-0.1	0.2		9		
L1	Horticulture	-0.7	-0.4	-0.4	-0.7	-0.6	-0.6	0.2	3		-0.2	-0.8	-0.4	-0.8	-0.2	-0.5	0.3	1			
L2	Fruits	-0.2	-0.3	-0.1	-0.5	-0.6	-0.3	0.2		4	-0.1	-3.8	-0.1	-0.9	-0.3	-1.0	1.6		1		
L2	Vegetables	-0.6	-0.4	-0.5	-0.4	-0.2	-0.4	0.2		2	-0.2	-0.8	-1.2	-1.1	-0.2	-0.7	0.5		2		
L1	Animal Sources	-0.2	-0.5	-1.4	-0.1	-0.5	-0.5	0.5	4		-0.1	-0.1	-0.3	-0.1	-0.9	-0.3	0.4	5			
L2	Meat	0.0	-0.1	-0.9	-0.1	-0.5	-0.3	0.4		5	0.0	0.0	-0.3	-0.1	-0.9	-0.3	0.4		6		
L2	Dairy	-0.1	-0.4	-0.7	0.0	0.0	-0.2	0.3		9	0.0	-0.1	-0.4	-0.1	NA	-0.2	0.2		8		
L1	Pulses	-0.3	-1.4	-0.8	-0.3	-0.3	-0.6	0.5	2		-0.1	-0.5	-0.4	-0.2	-0.2	-0.3	0.2	4			
L2	Pulses	-0.4	-0.4	-0.5	-0.1	-0.1	-0.3	0.2		6	-0.1	-0.3	-0.5	-0.1	-0.1	-0.2	0.2		7		
L2	Oilseeds	0.1	-1.2	-0.4	-0.1	-0.1	-0.4	0.5		3	0.0	-0.9	-0.4	-0.2	-0.2	-0.3	0.4		5		
L1	Cash crops	-0.4	-0.4	-0.1	-0.4	0.0	-0.3	0.2	5	8	-0.1	-0.4	-1.1	-0.2	-0.2	-0.4	0.4	2	3		
Processing																					
L2	Meat and dairy processing	-0.2	0.0	-0.1	-0.2	0.0	-0.1	0.1		3	-0.6	-0.5	-0.8	-1.6	-0.8	-0.9	0.4		4		
L2	Oilseeds processing	0.0	-0.1	-0.1	0.0	0.0	-0.1	0.0		4	-0.3	-2.1	-3.8	-0.4	-1.1	-1.5	1.5		2		
L2	Milling processing	-0.2	-0.2	-0.1	-0.3	0.0	-0.2	0.1		2	-1.2	-1.9	-1.6	-1.4	-1.8	-1.6	0.3		1		
L2	Other processing	-0.4	-0.4	-0.4	-0.1	-0.7	-0.4	0.2		1	-0.8	-1.3	-1.8	-0.7	-0.9	-1.1	0.5		3		
Distribution																					
L2	Food trade	-0.4	-1.7	-0.7	-0.8	-1.2	-1.0	0.5		1	-0.9	-1.9	-1.2	-1.8	-1.0	-1.4	0.5		2		
L2	Food transport	0.0	-0.1	-0.3	-0.2	-0.1	-0.1	0.1		3	-0.4	-2.3	-1.9	-1.9	-1.1	-1.5	0.7		1		
L2	Restaurants	-0.1	-0.2	-0.3	-0.3	-0.1	-0.2	0.1		2	-0.4	-0.6	-1.2	-0.6	-0.7	-0.7	0.3		3		

Notes. ^a MWI = Malawi, ETH = Ethiopia, TZA = Tanzania, GHA = Ghana, and NGA = Nigeria. ^b All rankings are based on the simple average across countries (AVG). L1 and L2 indicate main and sub-sectors. ^c Results for dairy in Nigeria are excluded due to their small agricultural GDP footprints.

Table A 2. Detailed Diet Affordability Results

Sector		Change in percentage points (per 10% growth in TFP)								Growth Elasticity (per 1% GDP growth)									
		Countries					Average / Rank			Countries					Average / Rank				
		MWI	ETH	TZA	GHA	NGA	AVG	SD	L1	L2	MWI	ETH	TZA	GHA	NGA	AVG	SD	L1	L2
L1	Farm	0.9	5.5	3.5	2.5	2.5	3.0	1.7	1		0.2	0.9	0.9	0.9	0.7	0.7	0.3	1	
L1	Processing	0.3	0.7	0.2	0.3	0.6	0.4	0.2	3		0.2	1.3	0.4	0.5	0.7	0.6	0.4	3	
L1	Distribution	0.1	1.7	0.4	0.6	0.8	0.7	0.6	2		0.2	1.3	0.4	0.5	0.5	0.6	0.4	2	
Farm																			
L1	Staples	0.5	2.1	0.7	1.1	0.7	1.0	0.6	1		0.2	0.4	0.3	0.1	0.1	0.2	0.1	4	
L2	Cereals	0.4	2.1	0.6	0.2	0.3	0.7	0.8		1	0.1	0.4	0.3	0.1	0.1	0.2	0.1		4
L2	Root crops	0.1	-0.1	0.1	0.5	0.4	0.2	0.2		3	0.0	-0.1	0.1	0.1	0.1	0.0	0.1		9
L1	Horticulture	0.2	0.4	0.1	0.4	0.9	0.4	0.3	4		0.1	0.8	0.1	0.5	0.4	0.4	0.3	1	
L2	Fruits	0.1	0.3	0.1	0.2	0.7	0.3	0.2		8	0.0	3.1	0.0	0.4	0.4	0.8	1.3		1
L2	Vegetables	0.2	0.4	0.1	0.2	0.3	0.2	0.1		4	0.1	0.8	0.3	0.5	0.3	0.4	0.3		2
L1	Animal Sources	0.1	0.9	0.8	0.1	0.5	0.5	0.4	2		0.0	0.2	0.2	0.1	0.8	0.2	0.3	2	
L2	Meat	0.0	0.4	0.5	0.1	0.5	0.3	0.2		2	0.0	0.1	0.2	0.1	0.8	0.2	0.3		3
L2	Dairy	0.1	0.4	0.2	0.1	0.0	0.2	0.2		6	0.0	0.1	0.1	0.2	0	0.1	0.1		8
L1	Pulses	-0.1	1.3	0.3	0.1	0.3	0.4	0.5	3		0.0	0.5	0.1	0.1	0.2	0.2	0.2	3	
L2	Pulses	-0.1	0.4	0.1	0.1	0.2	0.1	0.2		7	0.0	0.3	0.1	0.1	0.2	0.1	0.1		7
L2	Oilseeds	-0.1	1.0	0.1	0.1	0.1	0.2	0.4		6	0.0	0.7	0.1	0.2	0.2	0.2	0.3		5
L1	Cash crops	0.0	0.4	0.0	0.2	0.1	0.1	0.2	5	9	0.0	0.5	0.3	0.1	0.3	0.2	0.2	5	6
Processing																			
L2	Meat and dairy processing	0.0	0.0	0.0	0.1	0.0	0.0	0.0		3	0.1	0.1	-0.5	0.6	1.8	0.4	0.9		4
L2	Oilseeds processing	0.0	0.1	0.0	0.0	0.0	0.0	0.0		4	0.1	2.2	1.5	-0.3	2.4	1.2	1.2		1
L2	Milling processing	0.0	0.1	0.1	0.1	0.0	0.1	0.1		2	0.0	1.4	0.6	0.4	2.3	0.9	0.9		2
L2	Other processing	0.1	0.4	0.1	0.1	0.5	0.2	0.2		1	0.3	1.4	0.4	0.6	0.6	0.7	0.4		3
Distribution																			
L2	Food trade	0.1	1.4	0.2	0.3	0.7	0.5	0.5		1	0.2	1.6	0.3	0.7	0.5	0.7	0.6		2
L2	Food transport	0.0	0.1	0.1	0.0	0.1	0.0	0.0		3	0.0	2.1	0.4	0.1	0.8	0.7	0.9		1
L2	Restaurants	0.0	0.2	0.1	0.2	0.1	0.1	0.1		2	0.1	0.5	0.4	0.4	0.4	0.4	0.2		3

Notes. ^a MWI = Malawi, ETH = Ethiopia, TZA = Tanzania, GHA = Ghana, and NGA = Nigeria. ^b All rankings are based on the simple average across countries (AVG). L1 and L2 indicate main and sub-sectors. ^c Results for dairy in Nigeria are excluded due to their small agricultural GDP footprints.

Table A 3. Detailed Diet Quality Results (Mean adequacy)

Sector		Change in index points (per 10% growth in TFP)								Growth Elasticity (per 1% GDP growth)									
		Countries					Average / Rank			Countries					Average / Rank				
		MWI	ETH	TZA	GHA	NGA	AVG	SD	L1	L2	MWI	ETH	TZA	GHA	NGA	AVG	SD	L1	L2
L1	Farm	5.9	14.8	4.8	11.2	6.8	8.7	4.2	1		1.4	2.3	1.2	3.9	2.0	2.2	1.1	1	
L1	Processing	1.0	0.6	0.1	-0.4	-0.5	0.2	0.7	3		1.0	0.6	0.1	-0.4	-0.5	0.2	0.7	3	
L1	Distribution	0.6	2.3	0.7	0.0	0.5	0.8	0.8	2		0.6	2.3	0.7	0.0	0.5	0.8	0.8	2	
Farm																			
L1	Staples	-0.4	1.0	-0.5	0.4	-0.4	0.0	0.7	5		-0.1	0.2	-0.2	0.0	0.0	0.0	0.1	5	
L2	Cereals	-0.3	1.2	-0.3	1.5	-0.1	0.4	0.9		7	-0.1	0.3	-0.2	0.5	0.0	0.1	0.3		7
L2	Root crops	-0.1	-0.3	-0.2	-0.8	-0.3	-0.3	0.3		9	0.0	-0.4	-0.2	-0.1	0.0	-0.2	0.2		9
L1	Horticulture	2.9	0.7	1.2	3.5	3.0	2.3	1.2	3		0.9	1.6	1.1	3.9	1.1	1.7	1.3	1	
L2	Fruits	0.6	1.1	0.7	2.7	2.6	1.5	1.0		2	0.2	12.6	0.5	4.9	1.6	4.0	5.2		1
L2	Vegetables	2.3	0.7	0.8	0.7	0.3	1.0	0.8		6	0.7	1.6	1.8	2.2	0.4	1.3	0.8		4
L1	Animal Sources	0.9	8.9	3.2	0.8	0.8	2.9	3.5	1		0.3	1.5	0.8	0.6	1.3	0.9	0.5	3	
L2	Meat	0.0	3.7	1.7	0.3	0.8	1.3	1.5		4	0.0	1.3	0.7	0.3	1.3	0.7	0.6		6
L2	Dairy	0.9	7.0	1.6	0.5	0.0	2.0	2.9		1	0.3	2.2	1.0	1.1	NA	1.2	0.8		5
L1	Pulses	1.6	2.1	0.8	5.8	2.2	2.5	1.9	2		0.5	0.8	0.4	4.5	1.3	1.5	1.7	2	
L2	Pulses	1.9	1.4	0.2	2.3	0.9	1.4	0.8		3	0.6	1.1	0.2	4.0	0.9	1.4	1.5		3
L2	Oilseeds	-0.4	0.7	1.1	3.5	1.4	1.3	1.4		5	-0.1	0.5	1.1	4.9	2.0	1.7	2.0		2
L1	Cash crops	0.5	0.6	0.0	0.1	0.0	0.2	0.3	4	8	0.2	0.7	-0.1	0.0	-0.1	0.1	0.3	4	8
Processing																			
L2	Meat and dairy processing	0.3	0.1	-0.2	0.0	0.0	0.0	0.2		2	0.9	2.3	-2.9	-0.3	-1.6	-0.3	2.0		2
L2	Oilseeds processing	0.7	0.5	0.4	0.0	0.1	0.3	0.3		1	3.7	11.3	18.4	-0.4	6.7	7.9	7.3		1
L2	Milling processing	0.1	0.1	0.0	-0.3	0.0	0.0	0.2		3	0.6	1.2	-0.2	-1.4	-2.1	-0.4	1.4		3
L2	Other processing	-0.1	-0.1	-0.1	-0.1	-0.6	-0.2	0.2		4	-0.1	-0.2	-0.3	-0.9	-0.7	-0.4	0.3		4
Distribution																			
L2	Food trade	0.6	0.9	0.4	2.3	0.5	0.9	0.8		1	1.4	1.0	0.7	5.5	0.4	1.8	2.1		1
L2	Food transport	-0.2	0.0	0.0	0.1	0.1	0.0	0.1		2	-3.1	1.3	0.1	0.9	1.8	0.2	1.9		2
L2	Restaurants	-0.6	-0.1	0.0	-0.1	0.0	-0.2	0.2		3	-3.3	-0.4	-0.1	-0.3	0.0	-0.8	1.4		3

Notes. ^a MWI = Malawi, ETH = Ethiopia, TZA = Tanzania, GHA = Ghana, and NGA = Nigeria. ^b All rankings are based on the simple average across countries (AVG). L1 and L2 indicate main and sub-sectors. ^c Results for dairy in Nigeria are excluded due to their small agricultural GDP footprints.

Table A 4. Detailed Diet Quality Results (ReDD)

Sector		Change in index points (per 10% growth in TFP)								Growth Elasticity (per 1% GDP growth)										
		Countries					Average / Rank			Countries					Average / Rank					
		MWI	ETH	TZA	GHA	NGA	AVG	SD	L1	L2	MWI	ETH	TZA	GHA	NGA	AVG	SD	L1	L2	
L1	Farm	2.8	5.0	4.3	3.5	3.6	3.9	0.8	1		0.7	0.8	1.0	1.2	1.1	1.0	0.2	1		
L1	Processing	0.5	0.3	0.0	0.0	0.0	0.2	0.2	3		0.4	0.6	-0.1	0.1	0.0	0.2	0.3	3		
L1	Distribution	0.3	0.8	0.3	0.1	0.5	0.4	0.3	2		0.4	0.7	0.3	0.1	0.3	0.4	0.2	2		
Farm																				
L1	Staples	0.8	0.7	0.4	0.8	0.3	0.6	0.2	4		0.2	0.1	0.1	0.1	0.0	0.1	0.1	4		
L2	Cereals	0.6	0.8	0.4	0.6	0.2	0.5	0.2		3	0.2	0.2	0.2	0.2	0.1	0.2	0.0		7	
L2	Root crops	0.2	0.0	0.0	0.2	0.1	0.1	0.1		9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		9	
L1	Horticulture	1.3	0.5	0.6	1.0	1.3	0.9	0.4	2		0.4	1.1	0.6	1.1	0.5	0.7	0.3	1		
L2	Fruits	0.1	0.2	0.3	0.5	0.8	0.4	0.3		7	0.0	2.4	0.2	0.9	0.5	0.8	0.9		2	
L2	Vegetables	1.2	0.5	0.8	0.5	0.5	0.7	0.3		1	0.4	1.1	1.7	1.4	0.5	1.0	0.6		1	
L1	Animal Sources	0.3	2.8	1.4	0.3	0.5	1.0	1.1	1		0.1	0.5	0.3	0.2	0.8	0.4	0.3	3		
L2	Meat	0.0	1.0	0.8	0.2	0.5	0.5	0.4		4	0.0	0.4	0.3	0.2	0.8	0.3	0.3		6	
L2	Dairy	0.2	1.9	0.6	0.2	0.0	0.6	0.8		2	0.1	0.6	0.4	0.4	NA	0.4	0.2		5	
L1	Pulses	0.2	0.5	1.4	1.3	1.2	0.9	0.5	3		0.1	0.2	0.7	1.0	0.7	0.5	0.4	2		
L2	Pulses	0.3	0.4	0.7	0.5	0.5	0.5	0.1		5	0.1	0.3	0.6	0.9	0.5	0.5	0.3		4	
L2	Oilseeds	-0.2	0.2	0.7	0.8	0.7	0.4	0.4		6	-0.1	0.1	0.8	1.1	1.0	0.6	0.5		3	
L1	Cash crops	0.2	0.2	0.0	0.1	0.0	0.1	0.1	5	8	0.1	0.2	0.3	0.0	0.0	0.1	0.1	5	8	
Processing																				
L2	Meat and dairy processing	0.2	0.0	-0.1	0.1	0.0	0.0	0.1		2	0.4	0.8	-1.3	0.4	0.3	0.1	0.8		2	
L2	Oilseeds processing	0.2	0.2	0.1	0.0	0.1	0.1	0.1		1	1.1	4.8	4.8	0.1	7.9	3.7	3.1		1	
L2	Milling processing	0.1	0.1	0.0	0.0	0.0	0.0	0.0		3	0.4	0.5	0.0	-0.1	-0.8	0.0	0.5		4	
L2	Other processing	0.1	0.0	0.0	0.0	-0.1	0.0	0.1		4	0.2	0.1	0.0	0.0	-0.1	0.0	0.1		3	
Distribution																				
L2	Food trade	0.2	0.8	0.2	0.3	0.5	0.4	0.3		1	0.6	1.0	0.4	0.6	0.4	0.6	0.3		1	
L2	Food transport	0.0	0.0	0.1	0.0	0.0	0.0	0.0		2	0.7	1.2	0.4	-0.1	0.4	0.5	0.5		2	
L2	Restaurants	0.0	0.0	0.0	-0.1	0.0	0.0	0.1		3	0.0	-0.1	0.1	-0.3	0.0	-0.1	0.1		3	

Notes. The Reference Diet Deprivation (ReDD) index is an alternative measure of diet quality (see Pauw et al., 2023) to mean food group adequacy ratio used in the main analysis (compare Table A 3). Using the ReDD index results in marginally different rankings but results are generally robust. ^a MWI = Malawi, ETH = Ethiopia, TZA = Tanzania, GHA = Ghana, and NGA = Nigeria. ^b All rankings are based on the simple average across countries (AVG). L1 and L2 indicate main and sub-sectors. ^c Results for dairy in Nigeria are excluded due to their small agricultural GDP footprints.

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