# Scaling agrifood value chain innovations

## Model-based scenario analyses for Bangladesh, Ethiopia, Honduras, Nigeria and Uganda

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# 1. Introduction

Agricultural transformation is widely recognized as an essential driver of national economic growth, structural transformation, poverty reduction, and improvements in diet quality (Timmer, 1988; Pingali, 2012). The process of agricultural transformation involves shifting from traditional, low-productivity farming systems to more modern, high-productivity approaches that generate higher incomes, support broader economic development, and enhance food security. Innovations benefiting productivity growth play an important role in catalyzing the agrifood system structural transformation by increasing efficiency, reducing costs, and increasing the competitive advantages of agricultural products in the global market (Barrett et al., 2010).

Evaluating the impacts of these innovations through rigorous impact assessments is essential to 'business case' demands for their adoption. Such evaluations provide evidence on the direct benefits for value chain actors, including increased yields, reduced costs, and higher profits (Duflo et al., 2008). However, innovations adopted at scale can have further economywide implications that extend beyond the specific node of the value chain where they were implemented. At an economywide level, innovations in agriculture sectors can have broader economic effects through input-output linkages across sectors, changes in prices, and shifts in household incomes (Barrett et al., 2010). These spillover effects can influence aggregate demand and employment, generating indirect benefits for non-adopters. On the other hand, there may be unintended trade-offs, such as increased competition for scarce resources like land, water, and capital, which could offset some of the initial gains. Understanding these wider implications establish 'development case' for government policy and investment supports and further help maximize the benefits of agricultural innovations while minimizing potential trade-offs (Jayne et al., 2018). To complement value chain analysis, economywide models provide a powerful framework for capturing the complex interactions between sectors and stakeholders in an economy (Lofgren et al., 2002).

Economywide modeling can measure the impacts of policies, investments, and external shocks on producers, workers, and households. For example, these models can assess changes in poverty levels, employment, and dietary quality, including effects on populations that are not directly involved in the innovation process. This ability to capture indirect effects makes economywide analysis particularly valuable for establishing the "development case" for public policy interventions and investment support (Resnick & Thurlow, 2015). Specifically, models such as the Rural Investment and Policy Analysis (RIAPA) model used in this study allow researchers to simulate the broader economic impacts of agricultural innovations with studying potential spillover effects due to input-output linkages within or across value chains. These models act as analytical "calculators," translating micro-level findings from impact evaluations into macro-level assessments of spillovers, trade-offs, and distributional effects (Thurlow, 2011).

The One CGIAR Research Initiative on "Rethinking Food Markets and Value Chains for Inclusion and Sustainability" is a multi-country program spanning six agricultural products, each concerning different aspects of agricultural value chains. The adoption of agricultural innovations—such as new inputs, improved production techniques, and introduction of advanced machinery—can benefit various actors along the agrifood value chain from on-farm primary production, secondary processors and traders to the final consumers. The RFM Research Initiative selects five countries, including Bangladesh, Ethiopia, Honduras, Nigeria and Uganda. Based on the characteristics of the value chains, we categorize the six into three groups – value chains with processing potentials; export oriented; and non-traded value chains. We incorporate with the value chain teams to gather information on their analysis of direct impact from the various innovations and potential costs associated. We further apply the RIAPA model to evaluate the economywide impacts of agricultural innovations implemented in selected six value chains across five countries. It provides insights into the direct and indirect effects of these innovations, contributing to a more comprehensive understanding of their economywide implications.

The remainder of this report is organized as follows: **Section 2** details the modelling approach and data used; **Section 3** reviews the selected value chain structures and specific innovations implemented by the RFM Initiative; **Section 4** presents the results of the simulations; and **Section 5** includes summarized conclusions and future modelling strategies based on feedback from value chain teams.

# 2. Economywide Models and Data

## 2.1. Economy-wide model

In this analysis, the IFPRI's Rural Investment and Policy Analysis (RIAPA) models are used to perform a set of simulations based on productivity growth across five case study countries and 6 value change analysis. At the core of RIAPA is a recursive-dynamic CGE model with standard flexible behavioral equations, including nested production functions, imperfect substitution across traded and domestic commodities, and linear expenditure systems of consumer demand. Consumers and producers maximize utility and profits, respectively, and factor and product market prices adjust endogenously to establish market equilibrium. In the recursive-dynamic component of the model, population and labor supply growth rates are set exogenously based on historical trends, while capital stock accumulation is determined endogenously by linking to previous period current investment flows.

All the country RIAPA models are calibrated 2019 as a base year, while the simulation period for the different scenarios runs from 2020 to 2024. In the model, a subsector's impact on national growth is influenced by its share of GDP and its connections with other sectors of the economy. Indeed, sectors with strong production and consumption connections—such as those that use local inputs, generate income that boosts domestic spending, or supply materials to other sectors—can produce beneficial spillover effects. For instance, agriculture is considered to have strong growth linkages because it provides raw materials to downstream sectors (forward production linkages), utilizes locally-produced trade and transport services (backward production linkages), and generates income for households that are more likely to spend on domestic goods (consumption linkages). These linkages are specific to each country and sector, depending on local production and spending patterns.

Finally, a micro-simulation module is integrated with the RIAPA CGE framework to track changes in poverty and dietary indicators. For this, the CGE models are linked to the specific survey-based micro-simulation modules, as described by Arndt et al. (2012). Specifically, household groups in the CGE models are mapped to corresponding survey households, categorized by rural/urban areas, farm/non-farm status, and per capita expenditure quintiles, resulting in 15 representative households per country. Individual survey households are mapped to model groups, and consumption changes are applied proportionally to these households. Post-simulation consumption values are compared with a poverty line to assess poverty status and with the cost of a healthy reference diet to estimate undernourishment and diet quality.

## 2.2. Data Main data sources

The main data source for our models comes from the Social Accounting Matrices (SAMs) of each country. A SAM is a consistent economy-wide database that tracks all income and expenditure flows within an economy during a given year (see Breisinger, Thomas, & Thurlow, 2009). The SAMs used in this study were produced by the International Food Policy Research Institute and follows the standard NEXUS structure[3], specifically we use the 2021 SAM for Nigeria (IFPRI 2024) and the 2019 SAMs for Ethiopia, Uganda, and Bangladesh (IFPRI 2023a, 2023b, 2023c).

To facilitate cross-country comparisons, the model databases were adapted and constructed using a common base year (2019). As part of this project, a new 2019 SAM for Honduras was also built, following the NEXUS

[3] The Nexus Project is a collaboration between IFPRI and its partners, including national statistical agencies and research institutions. This project aims to improve the quality of social accounting matrices (SAMs) used for computable general equilibrium (CGE) modeling.

construction process to ensure consistency in format with the other matrices. The SAM for Honduras includes 56 sectors and products, 18 of which correspond to agricultural sectors.

Additionally, specific adjustments were made in some cases. For example, in Bangladesh, the aquaculture sector was adjusted to include only shrimp production, which is the value chain of interest. Trade values (imports and exports) were corrected by reallocating flows previously assigned to the general fisheries sector to shrimp. Furthermore, since a large proportion of shrimp production is destined for exports, final consumption demand was reduced, with part of it reassigned to exports to align with the structure provided by the value-added teams.

In Uganda, similar adjustments were made in the farm milk (raw milk) sector to reflect the proportions indicated by the value-added teams. These indicated that production is allocated to processing in sectors such as dairy, final consumption, and exports. Demand proportions were adjusted to ensure consistency with this structure.

An adjustment was also made in the case of coffee in Honduras, in order to reflect that approximately 90% of the coffee production is destined for exports, ensuring coherence with the productive structure in the SAM based on the value chain-specific teams.

Finally, national surveys are also employed. While the macro CGE model calibrates the Social Accounting Matrices (SAMs) for the year 2019 across the different countries in the study, the microsimulation analysis utilizes the most recent household surveys, which vary by country. Specifically, we use the Household Income and Expenditure Survey (HIES) 2016 for Bangladesh, the Household Income and Conditions of Living Survey (HICE) 2010 for Ethiopia, the National Household Income and Expenditure Survey (NHIES) 2015 for Nigeria, and the National Household Survey (NHSS) 2016 for Uganda. Finally, we employ the Permanent Household Survey for Multiple Purposes (EPHPM) 2019 for Honduras, with the consumption component for this country updated using estimates based on the ENCOVI 2005 (National Conditions of Life Survey) for Honduras.

# 3. Simulation Design

## 3.1. Theoretical framework of AVC

To examine the simulation of impacts of scaled Rethinking Food Market (RFM) interventions, our study spans beyond the direct impacts of innovations on beneficiaries to look at the entire value chains. The RIAPA CGE model is used to examine the economywide effects of the scaled interventions in each of the six value chains in the five countries. Figure 1 presents the theoretical framework of the agrifood value chain. With requirements of factors of inputs and technologies, an AVC is composed of three major nods: primary production, secondary processing sector and final consumers in either domestic market or global exports. Traders including wholesale trade, retail trade and transport connect different nodes to deliver products from farms to final consumers' tables. To be adopted into the RIAPA CGE model, the three nodes correspond to the agriculture sector, manufacturing sector and final demand in domestic market and rest of the world respectively.

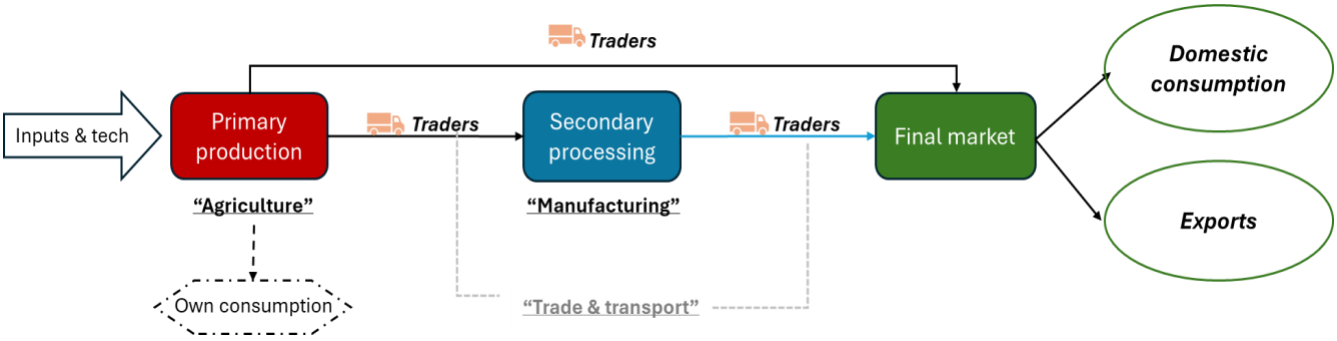


Figure 1: Theoretical framework of agrifood value chain

## 3.2. Selected value chains and related RFM interventions

The RFM interventions work with five countries with six selected value chains, including shrimp in Bangladesh; sesame in Ethiopia; coffee and beans in Honduras; fruit & vegetables in Nigeria; and the milk value chain in Uganda. These six selected value chains present various structures but share some similarities which could be categorized into three groups: (1) value chains with processing potential, including the milk in Uganda and the fruits & vegetables sector in Nigeria; (2) exported oriented value chains including shrimp in Bangladesh, coffee in Honduras and sesame in Ethiopia; (3) non-traded value chain, which is represented by the bean products in Honduras.

3.2.1 Value chains with processing potential

*Uganda – Dairy Value Chain*

The dairy industry in Uganda is an important sector in the economy of Uganda (MAAIF, 2016). It is a source of livelihood for a significant proportion of the country, especially the rural population (Ekou, 2014). About a fifth of the milk produced under subsistence agriculture undergoes value addition. Production of milk increased from sh2.51b liters to approximately sh3.85b liters between 2018 and 2022, an average annual growth rate of 11%, which is among the highest of any sector in the Ugandan economy. Over the past few decades, Uganda's dairy sector has transformed from mostly subsistence activities into a dynamic and modern industry (FAO, 2019). But the industry still faces challenges, particularly in establishing a market for higher quality milk. The dairy value chain encompasses all three nodes – on-farm milking production, off-farm processing sector and final consumption for both domestic and exported markets. In Uganda, the Milk Collector Centers (MCC) link the milk farmers,

processers and traders, they play the central role of deciding the price premium for farmers (Nakiganda and Ahmed, 2019).

To fill in this gap, the RFM interventions including establishing milk quality analyzers to the MCCs aims to improve the transparency of milk composition quality between processors and milk farmers. Following up with providing short engaging videos to farmers with tips to improve breeding practices, these interventions seek to help increase the productivity and market demand for higher quality milk by improving the accessibility and traceability of milk quality evaluation between processors and farmers. We specifically assess this expected productivity growth as increase in both on-farm and off-farm total factor productivity (TFP). Figure 2 illustrates the conceptual product flow map of the milk value chain in Uganda. The orange boxes highlight the RFM interventions, while the text in red summarizes the simulation strategies for the CGE model.

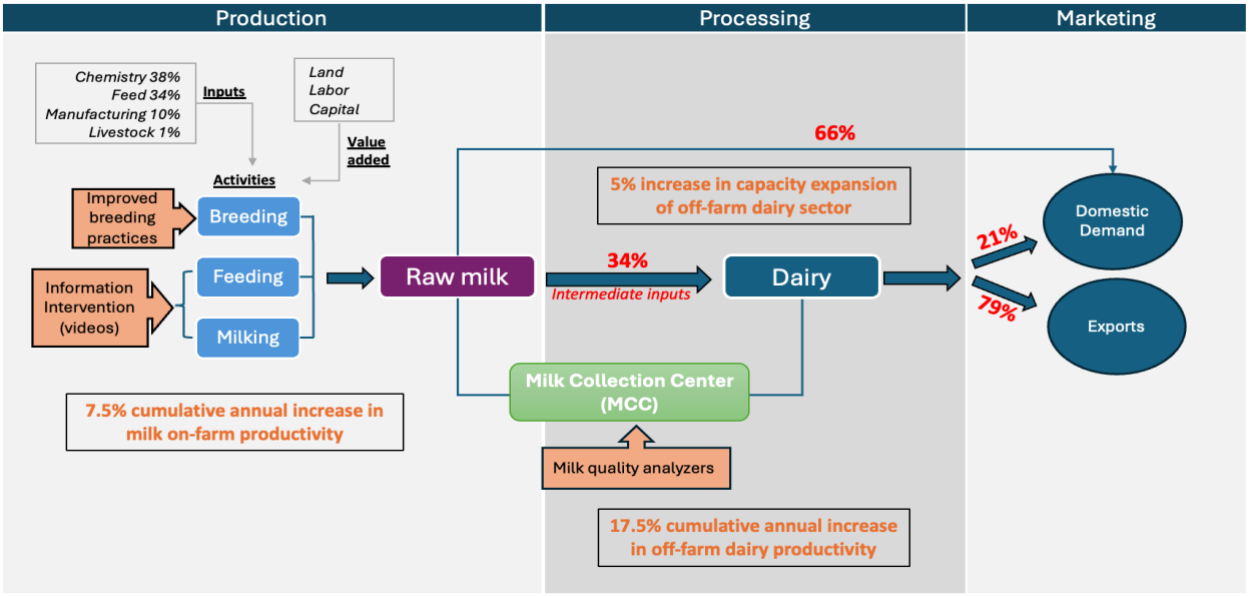


Figure 2: Product flow map of milk value chain in Uganda

*Nigeria – Fruits and Vegetables Value Chain*

In Nigeria, the fruit and vegetable value chain (F&V VC) plays an important role in achieving healthy food environment and sustainable food system transformation. Similar to the dairy value chain in Uganda, the F&V commodities share the value chains with the participation of processors. From on-farm growers, small-scaled processing stages, the F&V value chain also includes various traders linked between to transfer raw products to final consumers.

Among various F&V sectors, the RFM project selects tomatoes, mangos and oranges as priority commodities. The RFM value chain innovation bundles include (1) adaptation of improved varieties and quality seeds; (2) providing off-grid cooling and cool transportation; (3) improved solar dryers; (4) plastic crates; (5) improved information through certification and labeling. These RFM interventions are designed to seek efficiency improvement and productivity growth along the F&V value chain, as well as reduction in food loss during trades and transports.

3.2.2 Export-oriented value chains

*Honduras – Coffee value chain*

Coffee cultivation is a vital part of Honduras's agricultural sector and cultural identity. Renowned for its high-quality Arabica beans, Honduras has become one of the top coffee exporters globally. The coffee sector accounts for almost 30% of the nation's agricultural exports and generating approximately $1.46 billion in export revenue in 2022. It is important for rural employment, supporting over a million people, including farmers, processors, and exporters. Beyond its economic significance, coffee production sustains the livelihoods of countless families, strengthens cultural traditions, and fosters strong community ties across the country. The majority of coffee

growers in Honduras are smallholder farmers managing plots of one to five hectares. While some coffee is produced for local consumption, most is exported, primarily to the United States and Europe. Honduras's coffee supply chain is well-structured, with three primary sales channels: intermediaries, cooperatives, and exporters. Most smallholder farmers rely on intermediaries or cooperatives for approximately 80% of transactions, while only 20% involve direct sales to export companies. Cooperatives play a vital role by aggregating coffee, ensuring quality standards, and connecting producers to international markets.

The major RFM interventions conducted by the value chain team and their local partners is called 'the technical assistance program', which has a complementary coffee quality assessment intervention to improve the accuracy and efficiency of the technical assistance program. With the combination of the technical assistance program and the quality assessment intervention, we expect to see increasing productivity of local farmers and improving the quality of coffee products. For this point, we translate it into a 3% cumulative annual increase in the on-farm Total Factor Productivity (TFP) of the coffee producing activities. Since coffee is a major-exported product in Honduras, another expected outcome of the two interventions is incentive exports of coffee product. We then increase a 3% price premium for the world price of coffee to show this impact. Figure 3 shows the structure of this export-oriented coffee value chain in Honduras.

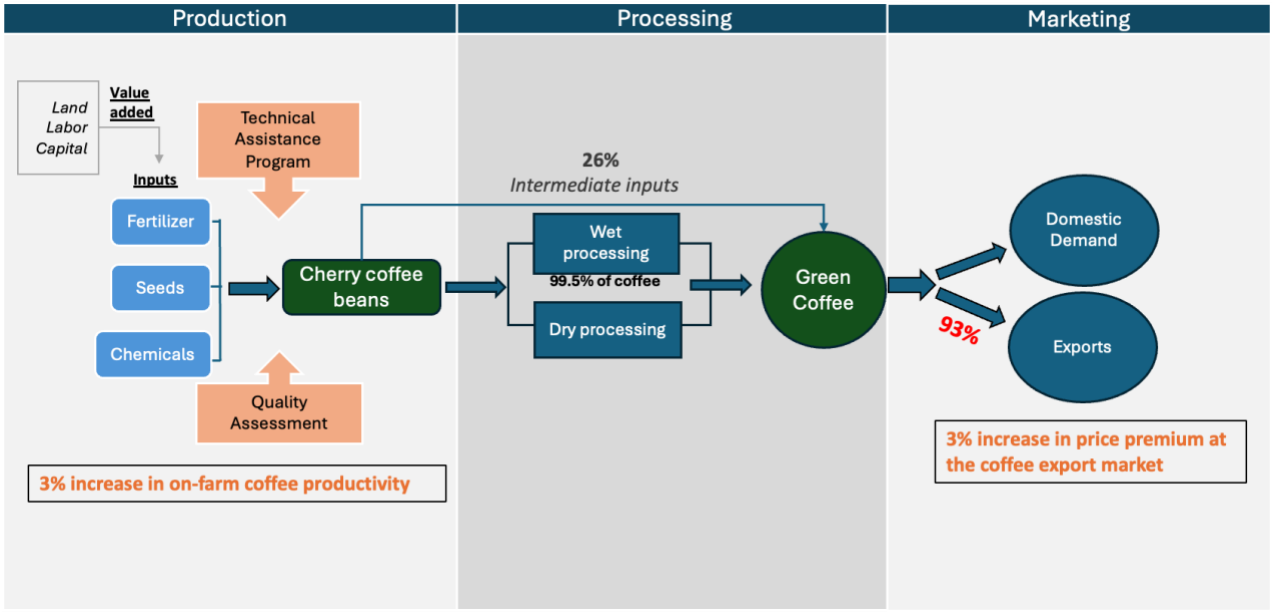


Figure 3: Coffee value chain in Honduras

*Bangladesh – Shrimp value chain*

Shrimp farming is a prominent sector within Bangladesh's agriculture and fisheries industry, significantly contributing to the country's economic development. Bangladesh, with its extensive coastal region and favorable climatic conditions, has emerged as a major shrimp producer and exporter globally. The industry primarily relies on two shrimp species: the black tiger shrimp (Penaeus monodon), locally known as bagda, which accounts for 50% of domestic production, and the freshwater prawn (Macrobrachium rosenbergii), locally known as galda, which contributes 42% of local shrimp production. The sector has gained significance in terms of foreign currency earnings, employment generation, and rural development (Alam, 2024). Bangladesh's frozen shrimp exports generated substantial revenue, totaling USD 300.3 million in the last fiscal year and USD 407.3 million in the preceding year. These figures constitute a significant portion of the country's total seafood exports, which reached USD 422.3 million in the 2022-2023 period and USD 532.9 million (EUR 494.5 million) in the 2021-2022 period.

One of the RFM interventions is to turn the fortunes of the Shrimp sector has been to organize farmers into clusters and provide them with disease and pathogen free larvae for Black Tiger Shrimp. Such level of organization could benefit farmers in terms of efficiency gains not only from productivity growth, but also from better coordination and ability to harness technology adoption which could lead to better quality products that

could fetch favorable international markets. Against this background, this policy note seeks to assess the potential impact of investing in farmer clusters for productivity growth in the Bangladesh shrimp sector.

*Ethiopia – Sesame value chain*

Sesame is the world's oldest oilseed crop, originating from East Africa and Asia and is a valuable cash and strategic crop in Ethiopia, contributing approximately 2.32% of grain production, with an output of 20,200 tons during the 2018 and 2019 production seasons GTP II, 2016-2020). It has historically been an important export crop for the predominantly agrarian economies of Ethiopia (Bayleyegn, Ericksen, & Solomon. 2018). The sesame market in Ethiopia is closely integrated with international markets, with prices sensitive to global supply and demand fluctuations (Abebe, 2016; Temesgen et al., 2017). The marketing of sesame in Ethiopia is highly regulated by the government. Since 2010, trading sesame seeds has been restricted to transactions through the Ethiopian Commodity Exchange (ECX) platform, aiming to enhance marketing efficiency for sesame and other export crops.

Similar to the exported oriented value chain, most sesame products are exported in raw form in Ethiopia, lacking of value addition and highly susceptible to changes in foreign currencies (Sirany & Tadele, 2022). These characteristics imply a fragile and asymmetric market for sesame products. The RFM innovations encompass providing more reliable market information to improve market price volatility and providing trainings to sesame farmers in setting up a farmer collective to enhance market cooperation.

3.2.3 Non-traded value chain

*Honduras – Beans*

Beans are one of the most important legumes in the daily diet of the Hondurans, ranking second only to maize in terms of area planted, production and consumption (SAG-DICTA, 2012; Escoto, 2015; FAOSTAT, 2023). The bean value chain starts with the producers on one side and ends with the consumers on the other side. Major bean producers are small farmers, while medium-size and large-size farmers together account for 10% of all bean producers, implying the low efficiency with lack of technology adoptions in on-farm activities. Since people prefer home-cooked beans, the food processing stage of bean value chain in Honduras is smaller. In the marketing node we find farmer associations, intermediaries (commonly called "coyotes"), Institutional buyers, and other traders. Most bean products are consumed domestically, with about 2.6% outputs are exported during the time period of 2012-2020. However, the self-sufficient rate of domestic demand for beans is low, where about 11% of domestic consumptions are imported.

Targeted on the lower productivity of the on-farm production end, the RFM project share technical information to farmers via WhatsApp to help farmers adapt advanced technology in bean production. Additionally, the other RFM intervention is to introduce the on-site grain quality testing to provide better price information to farmers. Figure 4 demonstrates the conceptual commodity flow map of the bean value chain in Honduras, with the orange boxes highlight the RFM interventions, while the text in red summarizes the simulation strategies for the CGE model.

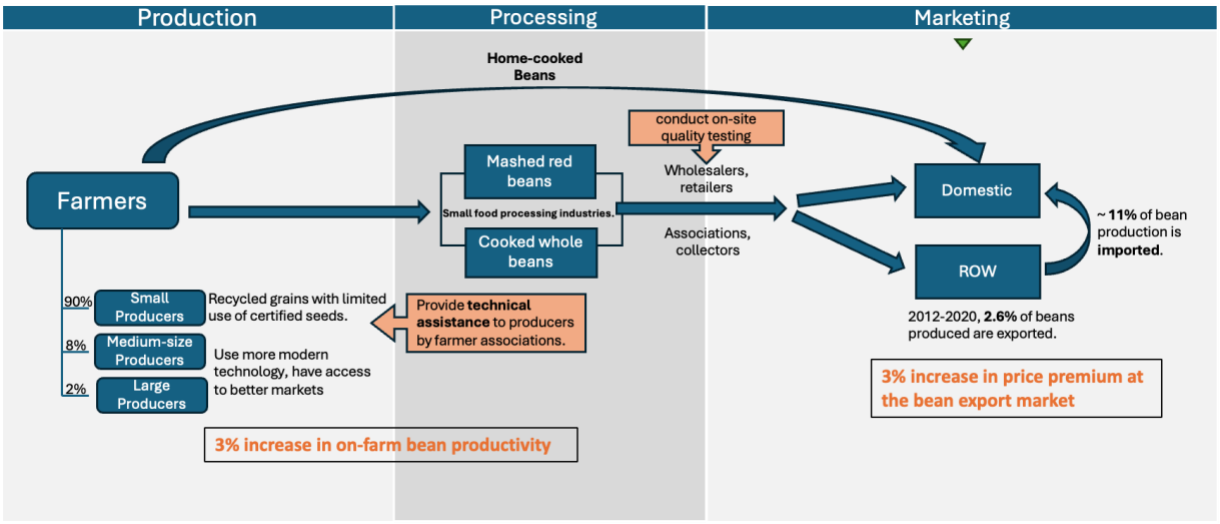


Figure 4: Bean value chain in Honduras

# 4. Results

## 4.1 Value chain with processing potential

To provide a comparison to the export-oriented sector, this section provides a description of value chains that are domestically oriented. We provide analysis for three value chain namely the milk and dairy sector from Uganda, and fruits – i.e. mangoes and oranges, and tomato production from Nigeria, respectively. Table 1 summarizes the economic structure of Uganda and Nigeria while highlighting the three value chains in question. The three value chains provide contrasting but highly interesting aspects of inclusive agricultural transformation in as much as trade and meeting domestic demand is concerned.

In Uganda, agriculture contributes 24.8% to GDP. The dairy sector, including on-farm milk production contributes 1.7% to GDP with 0.97% milk production and 0.1% off-farm dairy production. While agriculture contributes 72.1% to employment, the milk and dairy sector contributes a significant 3.2% to employment. Off-farm dairy product processing in Uganda presents greater unexploited opportunities for promoting export oriented dairy products that could be achieved by leveraging the higher employment opportunities in the dairy sector. The sector shows no official data on imported dairy products indicating low import penetration. Low import penetration of milk products signals and opportunity to increase domestic production for import substitution. The dairy value chain could have significant multiplier effects on rural and urban households due to their employment effects and stronger links to the processing sector.

Table 1: Economic structure of domestically oriented value chains

| | Nigeria | | Uganda | |
|---|---|---|---|---|
| | % GDP | %EMP | % GDP | %EMP |
| **Total GDP** | 100.0 | 100.0 | 100 | 100 |
| **Agriculture** | **22.1** | **37.1** | **24.8** | **72.1** |
| Crops | 19.3 | 33.3 | 14.8 | 48.3 |
| Tomato & leafy vegetables | 1.4 | 0.1 | | |
| Fruits (Mango & Oranges) | 0.6 | 0.4 | | |
| Livestock | 0.1 | 0.3 | 3.1 | 8.2 |
| Dairy & milk | | | 1.7 | 0.9 |
| Other agriculture | 0.0 | 0.0 | 3.2 | 8.3 |
| **Non agriculture** | **0.2** | **0.3** | **0.7** | **1.7** |
| Industry | 0.1 | 0.1 | 0.3 | 1.4 |
| Mining | 0.4 | 0.8 | 6.9 | 15.5 |
| Manufacturing | 0.2 | 0.2 | 75.2 | 27.9 |

| | | | | |
|---|---|---|---|---|
| **Agroprocessing** | **0.6** | **0.4** | **28.8** | **6.5** |
| **Food processing** | **77.9** | **62.9** | **1.9** | **0.4** |
| Beverages and tobacco | 0.1 | 0.1 | 0.2 | 0.0 |
| **Other manufacturing** | **0.0** | **0.0** | **0.7** | **0.7** |
| **Utility** | **0.7** | **0.2** | **2.0** | **0.5** |
| **Services** | **0.0** | **0.0** | **1.1** | **0.1** |
| **Trade** | **0.0** | **0.0** | **0.1** | **0.0** |
| **Transport** | **0.5** | **0.3** | **0.0** | **0.0** |
| Hotels & food services | 0.9 | 0.3 | 10.2 | 2.2 |
| Finance and business services | 50.7 | 51.7 | 6.3 | 2.1 |
| Government services | 2.1 | 1.7 | 5.7 | 2.2 |

*Source: Authors' calculations, based on the 2019 social accounting matrices of selected countries. Note: EMP refers to employment.*

In Nigeria, the agricultural sector contributes 22.1% to GDP and 37.1% to employment. Fruits, specifically mangoes and oranges, contribute 0.6% to GDP and 0.4% to employment while vegetables such as tomatoes contribute 0.6% to GDP and 1% to employment. While the fruit, and vegetable sectors are domestically oriented and modestly contribute to growth and employment, signifying value-chain underdevelopment and no integration into export markets, the sectors demonstrate potential for growth to penetrate the international market. In addition, the low employment intensities could signify that production is still small-scale and largely informal. The tomato, mangoes, and oranges sectors' relatively low contributions indicate large opportunities for growth and value addition.

The economic structure of the three sectors from Uganda and Nigeria present interesting insights into value chain analysis and development for inclusive agricultural transformation. For instance, Uganda's dairy sector has limited processing capacity but indicates that there is opportunity to grow. In terms of the milk sector, it is largely domestically oriented, but the dairy industry has opportunities to penetrate the export markets. As such, a closer examination of the opportunities and challenges needs to be examined making the economy wide analysis crucial. The fruit, and vegetable sectors in Nigeria indicate minimum processing capacity and domestic market orientation. While their modest contributions might indicate niche value chains, they could also indicate potential for off-farm processing. Strategic investments in these value chains could unlock and contribute to inclusive agricultural transformation throughout the economies in question.

4.1.1 Simulations

In the case of domestically oriented value chains, simulations were conducted to examine the effect of increasing on farm productivity and off-farm productivity separately, and later a joint simulation. The simulations ran from 2020 to 2024 with a baseline of 2019. Specifically, in the case of the Uganda value chain, we ran an on-farm productivity shock in the milk sector of 7.5% - i.e. from key informant interviews conducted, it was established that after four years of actively investing in the sector in form of new breeds, training, use of modern technology, the sector could cumulatively increase its productivity by 30%. Considering that the dairy sector is being transformed to be export oriented, it was expected that it could grow faster than with cumulative productivity growth between 30 and 40%.

As such, we increased the off-farm productivity by 10%. We also assumed that the capacity was expanded to accommodate the increased productivity growth. As such we increased the capital stock by 7.5% in the dairy sector and the milk sector, respectively.

For the Nigeria case, there are two aspects of productivity growth aspects. First, there could be efficiency improvements from using improved technology. Second, there could be massive gains in productivity by reducing post-harvest losses in the fruit and vegetable value chains, respectively.

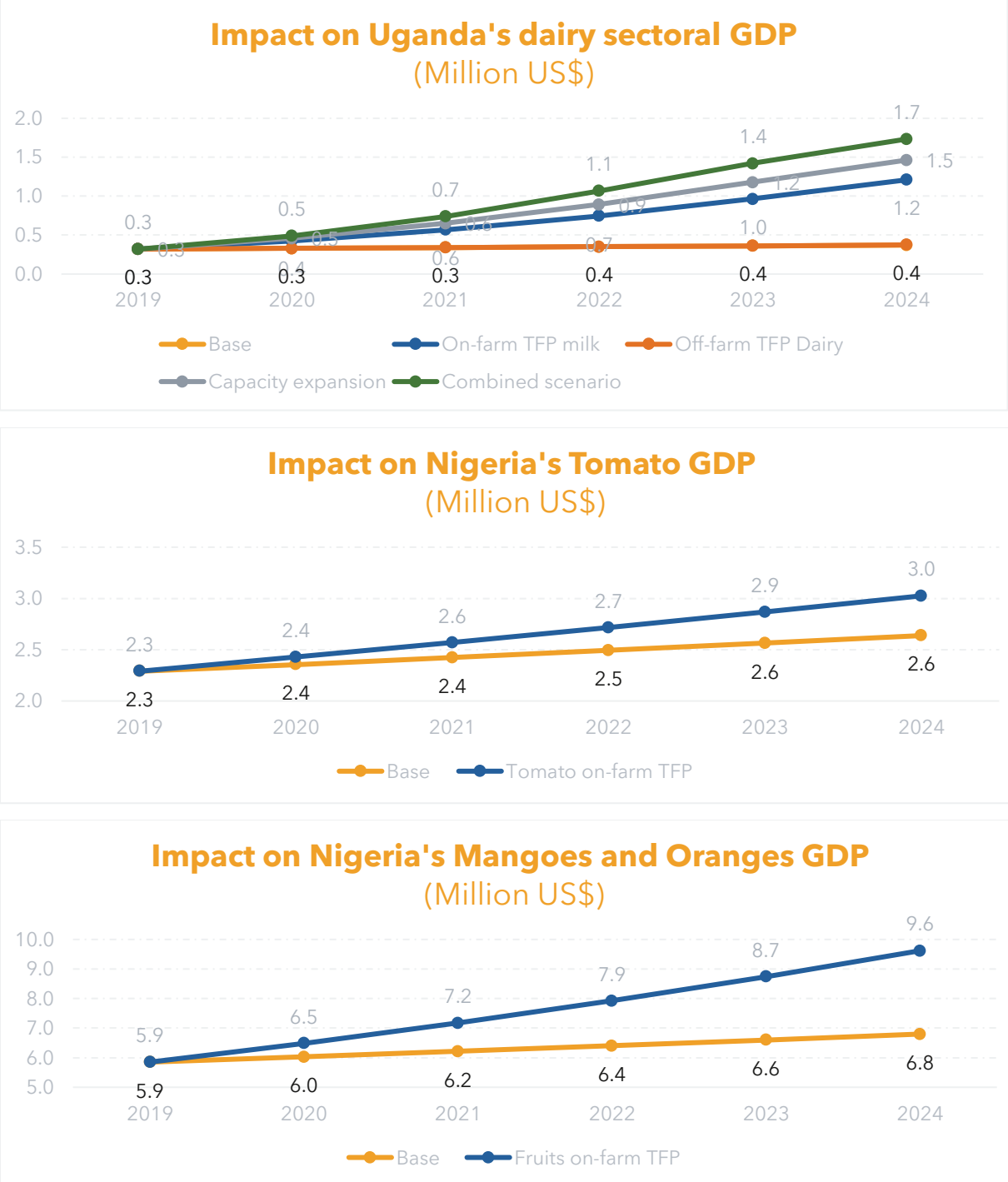


Figure 4: Impact of Interventions on GDP Growth of Specific Value Chains: Diary, Tomato, and Fruits (Million USD)

4.2. Sectoral impacts domestically oriented value chains

Table 2 summarizes results of the impact of increasing productivity on sectoral GDP for domestically oriented value chains. Results are organized in terms of country, value chain and the stage at which the productivity gains are achieved. Generally, productivity gains result in efficient resource usage which leads to increased value-added at sectoral level.

In Nigeria's fruits value chain which is predominated by mangoes and oranges (80%), an increase in on-farm farm productivity leads to 1.04% increase in national GDP. Noteworthy, much gains are concentrated within the agricultural sector which achieves 1.17% increase in GDP with crops achieving slightly higher GDP than the rest (1.20%). This demonstrates that much of the fruit sector's output is consumed in raw for as fresh produce. Mangoes and oranges are also used as an input in the food processing sector where it is used in manufacturing of fruit juice and jam. As such, the food processing sector actives an increase of 1.02%. The mango and orange sector in Nigeria has stronger links to the services sector especially in the trade and transport sectors. Being highly perishable and bulky, mangoes and oranges require efficient trade and transportation. As such, the transportation sector benefits 0.97% increase in its GDP while the trade sector benefits 1.02%. The modest increases in the transport sector could signify bottlenecks in transporting fruits in Nigeria. Aragie et al. (2024) argue that the sector is highly affected by food waste and losses due to poor handling of produce and lack of capacity for processing. Nevertheless, the fruits sector demonstrates potential for growth when the linkage effects are considered.

Similarly, the tomato sector in Nigeria also sees a modest increase in national GDP (1.01%) with agriculture achieving 1.03% increase in GDP mainly from the crops sector driven primarily by tomato (1.04%). Tomato has visible but modest forward linkages leading to an industry GDP growth of 0.94% with the food processing sector growing by 1.01%. The tomato sector has potential but lacks processing capacity. Therefore, investing in reducing post-harvest losses, and processing and value addition could increase the sector's potential.

Table 2: Impacts on sectoral GDP for domestically oriented value chains in Uganda, and Nigeria

| | Nigeria | | | Uganda | | | | |
|---|---|---|---|---|---|---|---|---|
| | base | On-farm TFP orange & Mango | On-farm TFP tomato | base | On-farm TFP | Off-farm TFP | Capacity Expansion | Combined scenario |
| **Total GDP** | **3.09** | **1.04** | **1.01** | **3.05** | **1.15** | **1.00** | **1.22** | **1.32** |
| **Total agriculture** | **3.04** | **1.17** | **1.03** | **2.67** | **1.65** | **1.00** | **1.89** | **2.16** |
| Crop | 3.05 | 1.20 | 1.04 | 2.40 | 0.99 | 0.99 | 0.94 | 0.90 |
| Livestock | 3.03 | 0.99 | 1.00 | 2.95 | 4.85 | 1.02 | 5.99 | 7.21 |
| Other agriculture | 2.93 | 1.03 | 1.04 | 3.14 | 0.98 | 1.01 | 1.02 | 1.06 |
| **Total industry** | **3.11** | **0.93** | **0.94** | **3.17** | **1.00** | **1.00** | **1.03** | **1.08** |
| Mining | 3.27 | 0.97 | 0.97 | 3.23 | 0.97 | 0.99 | 0.92 | 0.91 |
| Manufacturing | 3.21 | 1.01 | 1.02 | 3.31 | 1.01 | 1.01 | 1.10 | 1.22 |
| Agricultural processing | 3.11 | 1.05 | 1.04 | 3.13 | 1.03 | 1.05 | 1.43 | 1.76 |
| Food processing | 3.12 | 1.02 | 1.01 | 3.15 | 1.04 | 1.07 | 1.53 | 1.93 |
| Beverage and tobacco | 3.03 | 1.01 | 1.05 | 3.04 | 0.99 | 0.99 | 0.90 | 0.87 |
| Other industry | 3.29 | 1.24 | 0.92 | 3.49 | 0.99 | 0.97 | 0.78 | 0.67 |
| **Total Services** | **3.07** | **1.08** | **1.07** | **3.12** | **1.01** | **1.00** | **1.01** | **1.03** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Trade | 2.99 | 1.04 | 1.03 | 3.11 | 1.04 | 1.01 | 1.15 | 1.24 |
| Transport | 3.12 | 1.01 | 0.97 | 3.23 | 1.00 | 0.99 | 0.97 | 0.98 |
| Hotel and food services | 3.18 | 0.97 | 0.98 | 3.18 | 1.00 | 0.99 | 0.93 | 0.90 |
| Business services | 3.16 | 1.01 | 1.01 | 3.14 | 1.00 | 0.99 | 0.97 | 0.96 |
| Government services | 2.99 | 1.06 | 1.06 | 2.97 | 0.99 | 1.00 | 0.99 | 1.04 |

In Uganda, owing to its smaller size relative to other sectors in the economy, the dairy sector leads to small national GDP increases. Increasing on-farm productivity in the milk sector alone could achieve 1.15% increase in national GDP primarily because there is a larger demand for fresh milk in Uganda. Moreover, increasing productivity in the dairy sector – an off-taker of the fresh milk – would add 1% to national GDP. Furthermore, increasing productive capacity in the dairy sector in form of capital could add 1.22% to national GDP. In general, when all spillovers in terms of complementarities and trade-offs are considered, a combined scenario of on-farm TFP increase, off-farm TFP increase and capacity expansion in the milk and dairy sector could increase national GDP by 1.32%. This increase is primarily driven by the agricultural sector, which achieves 2.16% GDP growth while the key driver within agriculture – the livestock sector grows by 7.21%. The positive but smaller GDP increases in upstream industries demonstrates capacity constraints with high potential for improvement through capacity increases and efficiency gains.

Figure 5 summaries the impacts of efficiency gains on poverty across the sectors. Generally, efficiency gains lead to more returns to primary factors of production which in lifts people out of poverty through an income effect. In Nigeria, the mango and orange value chain lifts about 1210 people out of poverty while the tomato sector lifts 140 people out of poverty due to efficiency improvements. In Uganda however, the combined impact of increasing efficiency on the farm, off-farm, and increasing processing capacity lifts 11 thousand people out of poverty. Results generally demonstrate that when a sector has strong linkages with upstream sectors, the more employment effects it could have. Rural inhabitants benefit more from the dairy and milk sector compared to urban dwellers.

The tomato sector benefits rural people in terms of poverty effects as compared to urban dwellers while the fruit sector achieves the opposite. This could suggest that much of the individuals benefiting from the fruit value chain i.e. mangoes and oranges are urban dwellers albeit their numbers being smaller compared to rural dwellers.

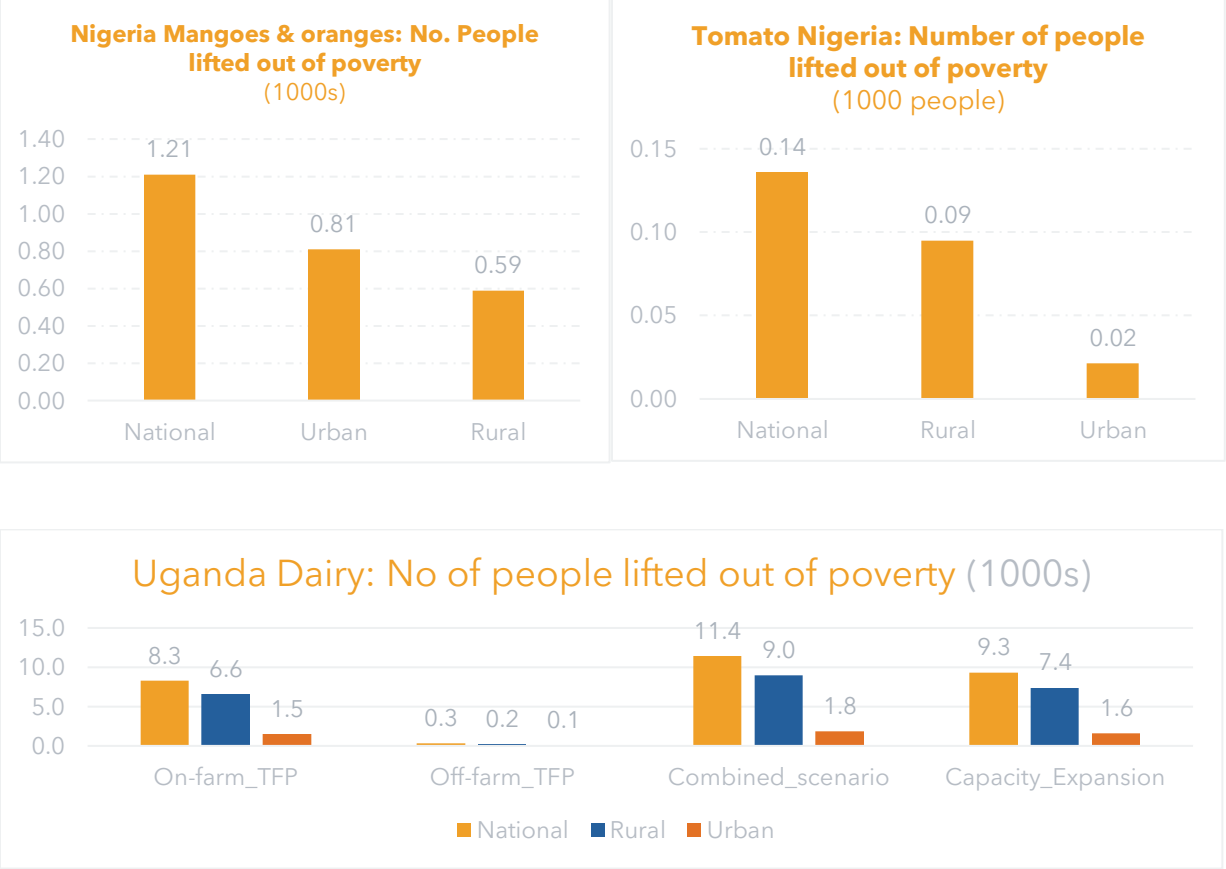


Figure 5: Number of people lifted out of poverty

In Nigeria, increases in productivity on the farm have heterogeneous effects. Efficiency gains in the mangoes and oranges sector releases labor to other productive sectors of the economy. We observe a similar case in Uganda

where more productive sectors achieves efficiency gains that release labor to more productive sectors. Figure 6 summarizes the results.

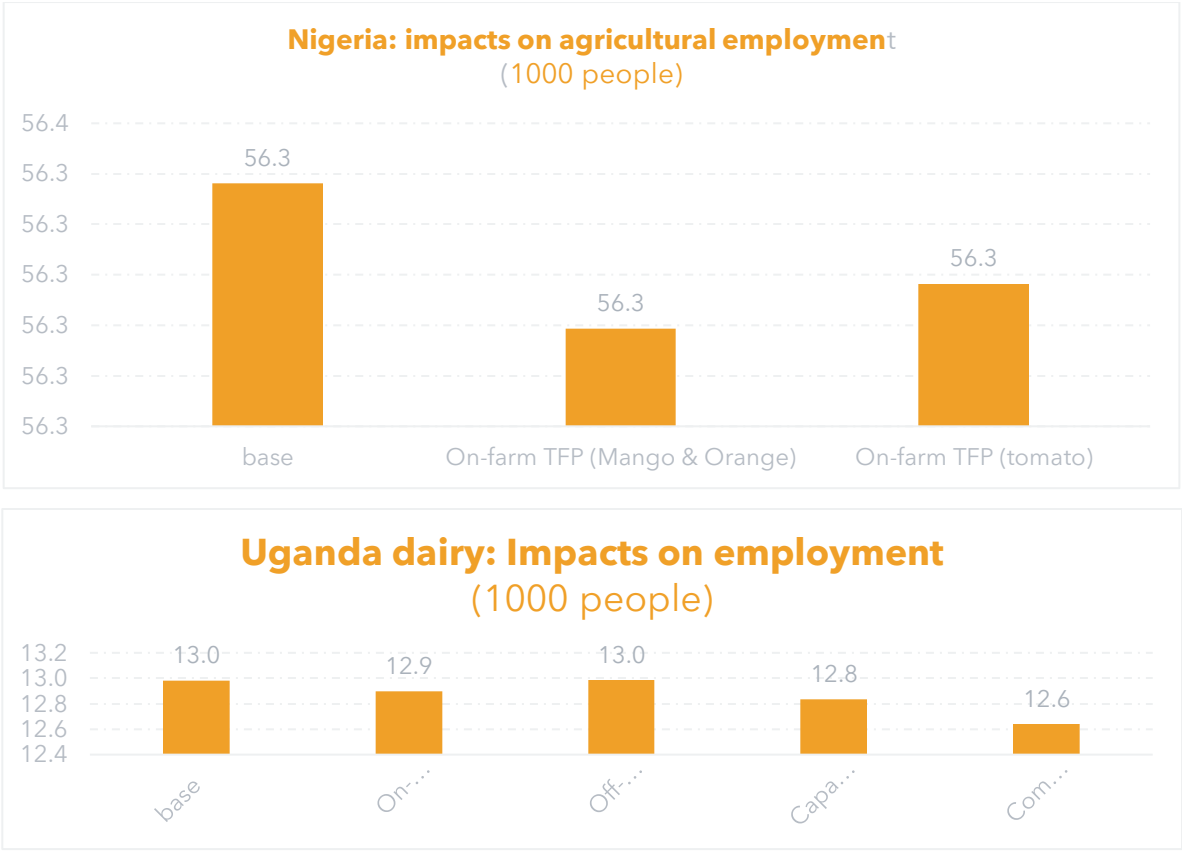


Figure 6: Impacts of productivity increases on employment

## 4.2 Export-Oriented Value Chains

In this section, we present the findings from the analysis of export-oriented value chains, focusing on the shrimp sector in Bangladesh, coffee in Honduras, and sesame in Ethiopia. These value chains generate substantial income within their respective sectors, although, due to their strong export orientation, the benefits are often concentrated within these specific industries. This concentration can lead to uneven distribution of economic gains, limiting the broader impact on the domestic economy.

A key consideration in evaluating these value chains is their relative size within the economic structures of each country. As illustrated in Table 3, these sectors exhibit a high export-output (E/O) ratio, signifying their export-driven nature. In Ethiopia, around 90% of sesame production is destined for international markets, reflecting the sector's strong export focus. Similarly, in Honduras, 93% of coffee production is exported, underscoring its global significance. On the other hand, the export share of Bangladesh's shrimp sector is smaller, as only 30% of its production is exported. However, it remains important and represents one of the main sources of agricultural foreign exchange earnings. Unlike the previous value chains, the shrimp value chain is characterized by a significant portion being allocated to domestic consumption, with a smaller fraction used to supply final inputs to the processed fishery products industries. This suggests that, although Bangladesh is an export-oriented aquaculture sector, it also plays a crucial role in meeting domestic consumption needs.

The table also shows the economic significance of these value chains in terms of their contributions to GDP and employment. In Bangladesh, the shrimp sector is a major contributor to both employment and economic activity, accounting for 10.36% of total employment. This underscores the sector's central role in providing livelihoods and supporting the broader economy. In Honduras, coffee stands out as the dominant crop, representing the primary source of agricultural income for the country. The sector is an important contributor to both GDP (3.2%) and

employment (around 8% of total employment). In Ethiopia, sesame plays a vital role within the country's oilseed sector. While its contribution to GDP and employment generation is comparatively smaller than that of coffee in Honduras or shrimp in Bangladesh, sesame has become an increasingly important source of income in recent years. This growth is largely driven by rising global demand for oilseeds, which has led to a surge in production and exports. Although its direct impact on the economy is still modest, sesame's growing role in Ethiopia's agricultural exports offers significant potential for rural development and economic diversification.

Table 3: Economic structure for selected countries

| | Bangladesh | | | Honduras | | | Ethiopia | | |
|---|---|---|---|---|---|---|---|---|---|
| | % GDP | % EMP | E/O | % GDP | % EMP | E/O | % GDP | % EMP | E/O |
| Total GDP | 100.0 | 100.0 | | 100.0 | 100.0 | | 100.0 | 100.0 | |
| Agriculture | 12.5 | 38.2 | | 11.7 | 26.9 | | 35.2 | 66.6 | |
| Crops | 6.3 | 22.7 | | 8.9 | 21.5 | | 22.6 | 55.2 | |
| *Coffee* | 0.2 | 1.2 | | 3.2 | 7.8 | 93.0 | 0.8 | 0.9 | |
| *Sesame* | - | - | | - | - | | 0.9 | 1.2 | 88.0 |
| *Beans* | 0.1 | 0.4 | | 0.4 | 0.9 | | 3.1 | 6.6 | |
| Livestock | 2.0 | 5.2 | | 2.1 | 4.3 | | 9.6 | 7.9 | |
| Forest and fish | 4.2 | 10.4 | | 0.8 | 1.1 | | 3.0 | 3.5 | |
| Shrimp | 1.6 | 4.8 | 30.0 | - | - | | - | - | |
| Non agriculture | 87.5 | 61.8 | | 88.3 | 73.1 | | 64.8 | 33.4 | |
| Industry | 34.2 | 21.2 | | 15.1 | 13.1 | | 27.4 | 8.7 | |
| Food processing | 2.6 | 2.6 | | 7.0 | 5.0 | | 2.0 | 1.9 | |
| Beverages and tobacco | 0.4 | 0.2 | | 2.3 | 1.8 | | 0.6 | 0.4 | |
| Shrimp processing | 0.1 | 0.1 | | - | - | | 0.0 | 0.0 | |
| Utilities | 1.5 | 0.2 | | 3.8 | 1.8 | | 0.8 | 0.6 | |
| Services | 53.3 | 40.5 | | 69.5 | 58.2 | | 36.6 | 24.1 | |
| Food services | 1.0 | 1.5 | | 3.8 | 4.6 | | 2.5 | 1.6 | |

*Source: Authors' calculations, based on the 2019 social accounting matrices of selected countries.*

*Note: E/O is the export-output ratio, and it measures the proportion of total production allocated to exports; EMP refers to employment; GDP refers to Gross Domestic Product.*

4.2.1. Simulations

In these value chains, three simulations were carried out to assess the potential impacts of interventions over a 5-year period: 1) On-Farm Productivity Increases, 2) Quality Improvements and Price Premiums, and 3) a Combined Scenario.

The first simulation assumes increases in *on-farm* productivity, resulting from the interventions described in Section 3, such as adopting new technologies, implementing improved agricultural practices, and achieving more efficient input use. In this scenario, the model allows productivity gains to accumulate over time. For example, a 2% annual productivity growth translates into an approximate 10% cumulative increase over a 5-year horizon, given the compounded nature of growth. These productivity improvements are expected to lead to increased production of coffee in Honduras, sesame in Ethiopia, and shrimp in Bangladesh, benefiting both producers and actors within the value chain by reducing unit production costs.

The second simulation considers interventions that enhance product quality, reflected in a *price premium* in international markets. These interventions include post-harvest processing improvements. In Honduras, for example, quality evaluation programs for coffee can enable producers to access niche markets offering higher prices. In Bangladesh, technical support to shrimp production *clusters* can improve quality standards, allowing access to high-value-added markets. In Ethiopia, enhancing the quality of sesame facilitates its export to specialized markets, such as those with stringent requirements in Europe and Asia. In the model, the *price premium* is applied to the export prices of the specific commodities, and like the productivity shocks, it is cumulative.

In the combined scenario, the impacts of interventions that simultaneously improve on-farm productivity and price premiums are assessed, allowing producers to benefit from both higher yields and better prices. This scenario provides a more comprehensive view of the potential synergies between productivity gains and improved quality through price premiums

*Standardization of Scenarios*

For the three countries and their value chains—Honduras (coffee), Ethiopia (sesame), and Bangladesh (shrimp)—a cumulative annual productivity gain of 3% was assumed for on-farm productivity. Similarly, a 3% annual increase in international commodity prices was assumed for the selected products—coffee, sesame, and shrimp. Over the 5-year model period, these assumptions result in a cumulative 15% shock by the end of the period.

The simulations compare the individual and combined effects of these shocks on production, trade, and income, offering valuable insights into the economic performance of the selected value chains and countries. By isolating the effects of productivity gains and price increases, the analysis provides a deeper understanding of the dynamics of value chain performance and their broader implications for economic outcomes.

4.2.2. Results

The results summarized in the panel of figures presented below indicate that there would be significant gains in the GDP of the specific value chains. The largest GDP gains are observed under the scenario of productivity increases across all countries. However, the combined effect derived from the price premium proves to be even more beneficial. The results suggest that, with the resulting improvement in quality and the availability of an international market, the increase in on-farm productivity generates a higher demand for production factors, which translates into increased output within the specific value chains. The benefits are particularly evident for the shrimp sector in Bangladesh and the coffee sector in Honduras. In the case of Ethiopia, due to the small size of the sesame sector, the benefits are more limited. In fact, as we can see in the figure below, the premium price shock

for sesame does not cause significant changes compared to the baseline scenario, while the productivity shock does generate growth in the sesame GDP. It is also worth noting that, although the difference is not that large, the combined shock results in slightly higher gains in the sector.

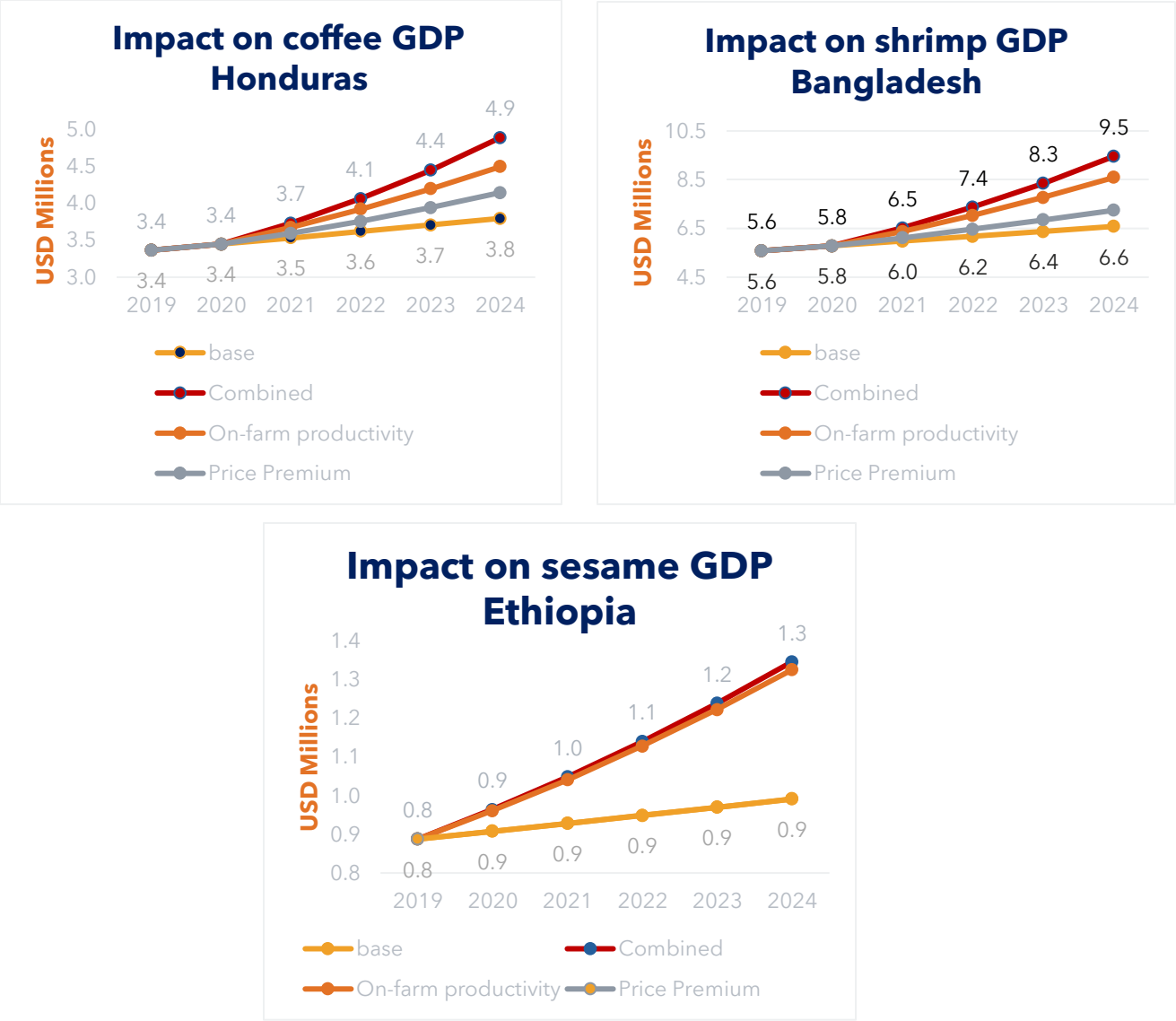


Figure 7: Impact of Interventions on GDP Growth of Specific Value Chains: Coffee, Shrimp, and Sesame (Million USD)

While clear gains are observed within specific value chains, the increase in production in these sectors could have significant implications for the rest of the economic sectors and even affect the dynamics of the agricultural sector as a whole.

In Bangladesh, the agricultural sector shows a growth of 5.6%, with the majority of the boost coming from on-farm productivity, while the price premium contributes an additional increase of 1.2%. However, the effects are not homogeneous within this sector: both the crops subsector and the livestock subsector show slight contractions, with negative impacts from both productivity increases and prices. In contrast, the benefits are concentrated in the forestry and fishing subsector, which experiences a notable increase of 17.3%. The industrial sector, on the other hand, shows a contraction of -1.5%, with a significant drop in manufacturing (-2.3%). However, inside this sector, the beverages and tobacco industry show modest growth of 0.4%, driven by limited increases in productivity and

prices (0.1% each). The services sector experiences a slight reduction of -0.3%, with particularly negative effects on government services.

In Honduras, the promotion of coffee drives a growth of 6.5% in the agricultural sector, led by on-farm productivity (4.5%) and the price premium (1.7%). However, the agricultural benefits are concentrated only in crops, which grow by almost 9%, while other sectors such as livestock as well as forestry and fishing are penalized. The industrial sector also contracts by -1.9%, mainly due to declines in manufacturing (-3.5%) and food processing (-2.3%). In services, the impact is minor (-0.1%), but productivity increases reveal slight gains in services related to trade, transport, and government services. These results suggest that promoting coffee growth would benefit, or require, more transportation and some commercial services, but it would not benefit other industries. On the other hand, the government benefits, which can be explained by the importance of the sector in Honduras as a significant source of taxes – imports and sales taxes.

In Ethiopia, the promotion of sesame generates a 0.8% growth in the agricultural sector, driven mainly by on-farm productivity (0.83%), while the price premium has no significant impact. Within agriculture, the benefits are concentrated in crop production, which grows by 1.4%, whereas livestock remains stagnant (-0.03%), and forestry and fishing experience moderate growth (0.33%). The industrial sector grows by 0.4%. Food processing and beverage production see minor positive impacts (0.11% and 0.36%, respectively). The services sector, however, contracts slightly (-0.18%), with notable declines in trade and transport (-0.34%) and hotel and food services (-0.58%), partially offset by modest gains in government services (0.28%). These results suggest that while the promotion of sesame benefits agriculture and some industrial activities, it has a limited or even negative impact on other industries and services.

In summary, the promotion of on-farm productivity and the increase in price premiums in the agricultural value chains of Bangladesh, Honduras and Ethiopia, have generated varied impacts. Across all countries, the agricultural sector has experienced significant growth, primarily driven by improvements in productivity. However, these advances have not been homogeneous, as some subsectors such as crops and livestock have shown contractions, while sectors like forestry and fishing have had positive performance. In conclusion, while the effects on the agricultural sector are generally positive, the industrial and services sectors have faced challenges. In summary, the results suggest that increases in on-farm productivity generate the greatest benefits, while the impact of international prices is more limited.

Table 4: Sectoral GDP Impacts of Promoting Value Chains in Bangladesh, Honduras, and Ethiopia

| | Bangladesh - Shrimp | | | | Honduras - Coffee | | | | Ethiopia - Sesame | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base | Percentage change from baseline | | | Base | Percentage change from baseline | | | Base | Percentage change from baseline | | |
| | | Combined | On-farm | Price Premium | | Combined | On-farm | Price Premium | | Combined | On-farm | Price Premium |
| **Total GDP** | **402.4** | **0.0** | **0.1** | **-0.1** | **120.1** | **0.1** | **0.3** | **-0.2** | **113.7** | **0.4** | **0.3** | **0.0** |
| **Total agriculture** | **49.5** | **5.6** | **4.0** | **1.2** | **14.1** | **6.5** | **4.5** | **1.7** | **39.8** | **0.9** | **0.8** | **0.0** |
| Crop | 24.6 | -0.7 | -0.3 | -0.3 | 10.6 | 8.8 | 6.1 | 2.4 | 25.4 | 1.4 | 1.3 | 0.0 |
| Livestock | 7.9 | -0.2 | -0.1 | -0.1 | 2.5 | -0.6 | -0.2 | -0.3 | 11.0 | 0.0 | 0.0 | 0.0 |
| Forest and Fish | 17.0 | 17.3 | 12.0 | 4.0 | 0.9 | -1.0 | -0.4 | -0.6 | 3.4 | 0.3 | 0.2 | 0.0 |
| **Total Industry** | **138.4** | **-1.5** | **-0.8** | **-0.5** | **36.9** | **-1.9** | **-0.7** | **-1.1** | **32.1** | **0.4** | **0.2** | **0.0** |
| Mining | 7.4 | 0.0 | 0.0 | 0.0 | 0.9 | -0.7 | -0.2 | -0.4 | 0.3 | 0.4 | 0.2 | 0.0 |
| Manufacturing | 88.2 | -2.3 | -1.2 | -0.8 | 22.2 | -3.5 | -1.3 | -2.0 | 6.7 | -0.3 | -0.2 | 0.0 |
| Food Processing | 10.2 | -0.6 | -0.2 | -0.4 | 8.5 | -2.3 | -0.8 | -1.4 | 2.2 | 0.1 | 0.1 | 0.0 |
| Beverage and Tobacco | 1.7 | 0.4 | 0.1 | 0.1 | 2.7 | -0.1 | -0.1 | -0.1 | 0.7 | 0.4 | 0.2 | 0.0 |
| Other industry | 42.8 | 0.0 | -0.1 | 0.0 | 13.8 | 0.4 | 0.1 | 0.2 | 25.1 | 0.6 | 0.3 | 0.0 |
| **Total Services** | **214.5** | **-0.3** | **-0.2** | **-0.1** | **69.1** | **-0.1** | **0.0** | **-0.1** | **41.9** | **-0.2** | **-0.1** | **0.0** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Trade and Transport | 99.6 | -0.1 | 0.0 | -0.1 | 29.1 | -0.1 | 0.0 | -0.2 | 22.2 | -0.3 | -0.2 | 0.0 |
| Hotel and Food Services | 4.8 | -0.6 | -0.4 | -0.2 | 4.5 | -0.3 | -0.1 | -0.1 | 2.9 | -0.6 | -0.4 | 0.0 |
| Government Services | 38.0 | -0.8 | -0.4 | -0.3 | 20.1 | 0.3 | 0.1 | 0.2 | 9.0 | 0.3 | 0.1 | 0.0 |
| Other Services | 72.2 | -0.5 | -0.3 | -0.1 | 15.4 | -0.5 | -0.1 | -0.3 | 7.8 | -0.1 | -0.1 | 0.0 |

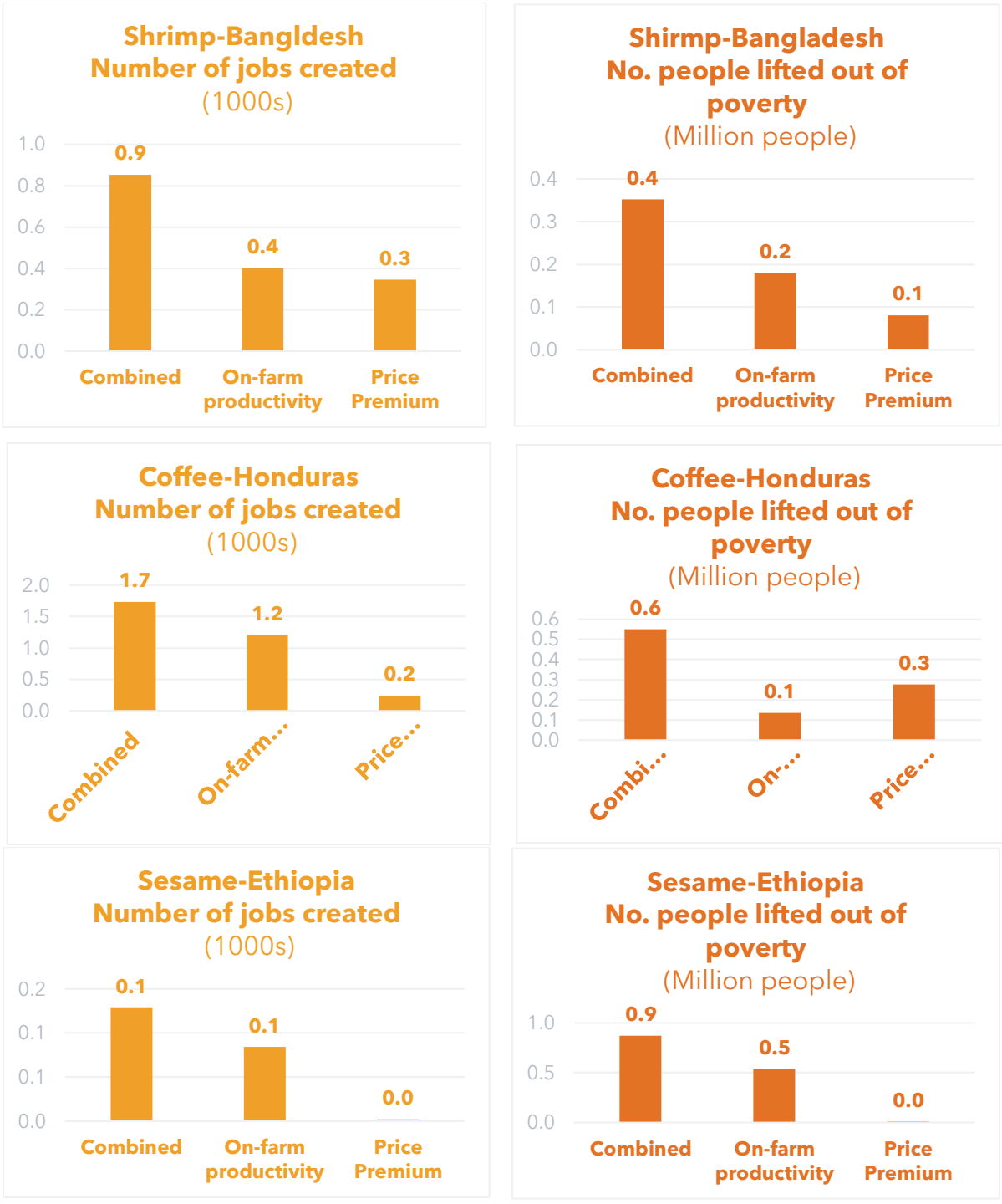


Figure 8: Impact on Job Creation and Poverty Reduction from Promoting Value Chains in Bangladesh, Honduras, and Ethiopia

The model also predicts an increase in employment, suggesting that productivity gains can stimulate job creation through the expansion of production activities. On the other hand, the price premium for high-quality shrimp in international markets also incentivizes producers to expand their operations and hire more labor, particularly in promoting agricultural labor. This connection with agricultural employment growth further supports the findings of studies on agricultural value chains and their positive indirect effects on labor markets.

As can be se in Figure 8, the promotion of key agricultural value chains—sesame in Ethiopia, coffee in Honduras, and shrimp in Bangladesh—has notable impacts on job creation and poverty reduction. In Ethiopia, sesame creates 0.1 million jobs and lifts 0.9 million people out of poverty, driven mainly by on-farm productivity. In Honduras, coffee adds 1.7 million jobs and reduces poverty for 0.6 million people, with on-farm productivity as the main driver (1.2 million jobs, 0.1 million people). In Bangladesh, shrimp generates 0.9 million jobs and lifts 0.4 million people out of poverty, also led by on-farm productivity (0.4 million jobs,

0.2 million people). These findings highlight the importance of productivity improvements in driving economic and social gains across different contexts, while the price premium has a smaller but still meaningful role in some cases.

### 4.3 Non-traded value chains

In this section, we analyze the bean value chain in Honduras, a sector that operates entirely within the domestic market and is classified as a non-traded value chain. Beans represent a relatively small segment of the Honduran economy, with limited contributions to GDP (0.4%) and job creation (0.9%), as shown in Table 5. Given that the sector exclusively serves the domestic market, implementing a price premium scenario would have no measurable impact. Moreover, its small size limits the potential for broader economywide effects. To better understand the potential for growth within this value chain, we simulated a scenario with annual on-farm productivity increases of 5%, highlighting the importance of productivity improvements in enhancing the sector's contributions to the economy.

As shown in Figure 9, increasing the on-farm productivity of pulses generates an additional $0.1 million in GDP over five years, increasing from $0.4 million to $0.5 million. This growth also creates 1,500 jobs and lifts 0.05 million people out of poverty. While the impacts are moderate, the results are positive and align with trends observed in previously analyzed value chains. These findings underscore the potential of promoting growth in pulses as a strategy to improve economic and social indicators, particularly in the Honduras economy where agricultural value chains play a significant role in job creation and poverty reduction.

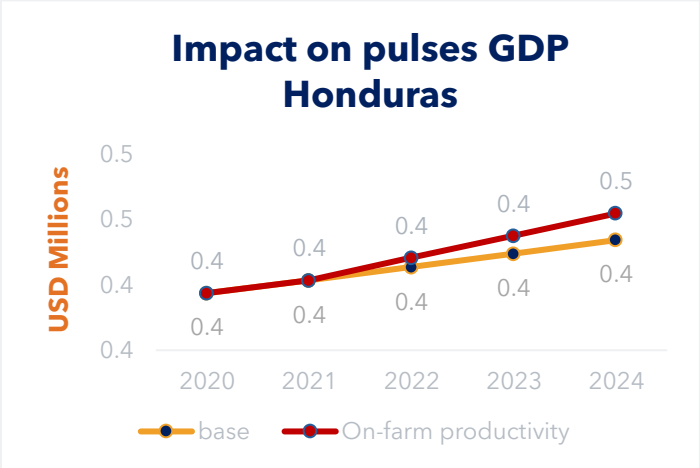


Figure 9: Impact of Interventions on Pulses GDP in Honduras (Million USD)

At a broader level, improving on-farm productivity leads to significant percentage growth in the agricultural sector, with an overall increase of 0.8%. Within agriculture, crop production shows the largest impact, growing by 1.3%, while forestry and fishing increase by 0.2%. The livestock sector, however, remains unchanged with no measurable growth. These results highlight the dominant role of crop productivity in driving agricultural sector performance (see Table 5).

Table 5: Sectoral GDP Impacts of Promoting Pulses Value Chains in Honduras

| | Base | On-farm productivity |
|---|---|---|
| **Total GDP** | **113.7** | **0.3** |
| **Total agriculture** | **39.8** | **0.8** |
| Crop | 25.4 | 1.3 |
| Livestock | 11.0 | 0.0 |
| Forest and Fish | 3.4 | 0.2 |
| **Total Industry** | 32.1 | 0.2 |
| Mining | 0.3 | 0.2 |
| Manufacturing | 6.7 | -0.2 |
| Food Processing | 2.2 | 0.1 |
| Beverage and Tobacco | 0.7 | 0.2 |

| | | |
|---|---|---|
| Other industry | 25.1 | 0.3 |
| **Total Services** | 41.9 | -0.1 |
| Trade and Transport | 22.2 | -0.2 |
| Hotel and Food Services | 2.9 | -0.4 |
| Government Services | 9.0 | 0.1 |
| Other Services | 7.8 | -0.1 |

In other sectors, the impacts are smaller and mixed. Industry grows by 0.2%, with notable contributions from mining (0.2%), food processing (0.1%), and beverage and tobacco (0.2%). However, manufacturing declines by 0.2%, partially offsetting these gains. Services experience a slight overall contraction of 0.1%, driven by reductions in trade and transport (-0.2%) and hotel and food services (-0.4%). On a positive note, government services see a modest increase of 0.1%. These results suggest that while agricultural productivity improvements drive growth in agriculture and select industries, they may present challenges for certain manufacturing and service subsectors

# 5. Conclusion

Using the economywide model, our analysis highlights the importance of assessing value chain innovations not only at the micro-level but also through economywide analysis to understand their broader impacts. While not all value chain innovations generate economywide effects, diagnostic assessments can help determine whether it is worthwhile to conduct such evaluations. The economywide analysis results presented in this report demonstrate that productivity-enhancing innovations can effectively boost supply; however, demand-side constraints, such as limited processing capacity or low consumer demand, may lead to price declines and disincentivize production. While export markets offer opportunities for scaling up supply, their limited reliance on local processing can minimize economywide benefits.

Export-oriented value chains are essential for generating income and creating jobs in specific sectors. These sectors contribute significantly to foreign exchange earnings and strengthen the competitive positions of their respective countries in global markets. In particular, the results show that promoting key agricultural value chains, such as sesame in Ethiopia, coffee in Honduras, and shrimp in Bangladesh, has great potential for job creation and poverty reduction. While productivity improvements are the primary driver of economic and social progress, price premiums also play a significant, albeit smaller, role, especially in the cases of coffee and shrimp. Moreover, a combined approach maximizes the benefits of export-oriented value chains. However, the benefits generated by these chains are often unevenly distributed, favoring primarily the businesses and regions directly involved in production and export activities. Improving productivity in these sectors is crucial for enhancing competitiveness, but it is also essential to ensure that the benefits are sustainable and reach other parts of the economy, particularly rural areas.

Domestically oriented value chains play an important role in satisfying domestic demand and contributing to poverty reduction through employment creation. In this study we examined four domestically oriented value chains namely mangoes and oranges in Nigeria, milk and dairy value chains in Uganda, and the bean sector in Honduras. Noteworthy, results indicate that in all the value chains economic activities are concentrated in the primary agricultural sector where they create more growth and have noticeable poverty, and employment effects. However, results have shown positive impacts albeit modest links to upstream industries. This demonstrates that there is lack of value addition and capacity. The latter presents a great opportunity for growth in terms of not only satisfying domestic demand but also for export orientation.

Looking ahead, further refinements to this analysis will be made based on feedback from value chain teams. Where feasible and demand exists, future work will focus on simulating the impacts of proposed policy reforms, such as investments, taxes, and subsidies, to address observed constraints and enhance the development potential of agrifood value chains. In Honduras, future analysis should focus on boosting labor productivity growth in the coffee sector. This is a key sector for the country, but low productivity levels compared to other countries in the region represent a major challenge. These improvements could be achieved particularly through the adoption of modern technologies, the promotion of more efficient agricultural techniques, or continuous training for producers. Such interventions could be scaled nationally, enabling an analysis of the impact of labor productivity on not only enhancing the competitiveness of Honduran coffee in international markets but also reducing import dependency by strengthening internal production capacity. Furthermore, improving labor productivity could facilitate the expansion of coffee processing within the country, which would not only increase the product's added value but also generate additional jobs, contributing to local economic development and reducing vulnerability to global market fluctuations.

In Bangladesh, a deeper analysis of the implementation of government subsidies for the shrimp sector would be valuable. Existing subsidies could serve as a key tool to enhance the sector's competitiveness by encouraging producers to invest in new technologies and improve shrimp quality, thereby facilitating access to more demanding international markets. Closing the model and exploring financing mechanisms is a crucial point that ongoing research could refine, shedding light on the potential benefits and trade-offs of this policy. At first glance, this type of support could result in a significant increase in shrimp exports, contributing to the diversification of the country's income. Additionally, strengthening local shrimp processing capacity would create opportunities both for import substitution and export growth, which in turn would bolster the local value chain, generate additional employment, and promote the sector's long-term sustainability.

In Nigeria, future analysis should focus on increasing on-farm efficiency by increasing use of modern technology and intermediate inputs; improving off-farm efficiency by increasing capacity for processing and reducing welfare losses in both fruit and vegetable sectors, respectively. In Uganda, adoption off new breeds of cattle should be encouraged for increased milk output and also increasing off-farm dairy processing capacity.

In other value chains, improving processing would not only increase the competitiveness of products derived from specific commodities but also contribute to the development of local industries by adding more value to products before their commercialization or export. This applies particularly to export-oriented crops while also benefiting those with a domestic market focus.

As we conclude, the key takeaway from this study is that rethinking food markets requires a holistic approach, considering entire agrifood value chains—both on- and off-farm. Bundled innovations that address constraints across value chain segments are crucial for achieving transformative impacts.

References


Abebe, G. K., Bijman, J., & Royer, A. (2016). Are middlemen facilitators or barriers to improve smallholders' welfare in rural economies? Empirical evidence from Ethiopia. Journal of Rural Studies, 43, 203-213.

Arndt, C., Jones, S., & Tarp, F. (2015). Assessing foreign aid's long-run contribution to growth and development. World Development, 69, 6-18.

Barrett, C. B., Carter, M. R., & Timmer, C. P. (2010). A century-long perspective on agricultural development. American Journal of Agricultural Economics, 92(2), 447–468.

Bangladesh Bureau of Statistics. (2016). *Household Income and Expenditure Survey 2016*. Bangladesh Bureau of Statistics. http://www.bbs.gov.bd

Bayleyegn, D., Ericksen, P. J., & Solomon, D. (2018). Climate resilient green economy strategy: Sector-wise GTP II implementation monitoring checklist.

Central Statistical Agency of Ethiopia. (2010). *Household Income and Conditions of Living Survey (HICE) 2010*. Central Statistical Agency of Ethiopia.
http://www.csa.gov.et

Duflo, E., Kremer, M., & Robinson, J. (2008). How high are rates of return to fertilizer? Evidence from field experiments in Kenya. American Economic Review, 98(2), 482-488.

Ekou, J. (2014). Dairy production and marketing in Uganda: current status, constraints and way forward. Afr J Agric Res, 9(10), 881-888.

FAO. (2019). The future of livestock in Uganda. Opportunities and challenges in the face of uncertainty.

Hazell, P., & Haggblade, S. (1993). Farm-nonfarm growth linkages and the welfare of the poor. In Including the Poor (pp. 190-204). World Bank.

International Food Policy Research Institute (IFPRI). 2024. 2021 Social Accounting Matrix for Nigeria. Washington, DC: IFPRI [Dataset]. https://doi.org/10.7910/DVN/095UBP. Harvard Dataverse. Version 1.

International Food Policy Research Institute. 2023a. 2019 Social Accounting Matrix for Bangladesh: A Nexus Project SAM. Data Paper. Washington, DC: International Food Policy Research Institute. handle 10568/155088
https://hdl.handle.net/10568/155088

International Food Policy Research Institute (IFPRI). 2023b. 2019 Social Accounting Matrix for Uganda. Washington, DC: IFPRI [dataset]. https://doi.org/10.7910/DVN/LKK29W. Harvard Dataverse. Version 1.

International Food Policy Research Institute. 2023c. 2019 Social Accounting Matrix for Ethiopia: A Nexus Project SAM. Data Paper. Washington, DC: International Food Policy Research Institute. handle: 10568/155059.
https://hdl.handle.net/10568/155059.

Instituto Nacional de Estadística (INE). (2019). *Encuesta Permanente de Hogares de Propósitos Múltiples 2019 (EPHPM)*. Instituto Nacional de Estadística de Honduras.
http://www.ine.gov.hn

Instituto Nacional de Estadística (INE). (2005). *Encuesta Nacional de Condiciones de Vida 2005 (ENCOVI)*. Instituto Nacional de Estadística de Honduras.
http://www.ine.gov.hn

Jayne, T. S., Chamberlin, J., & Headey, D. D. (2018). Land pressures, the evolution of farming systems, and development strategies in Africa: A synthesis. Food Policy, 48, 1-17.

Lofgren, H., Harris, R. L., & Robinson, S. (2002). A standard computable general equilibrium (CGE) model in GAMS (Vol. 5). International Food Policy Research Institute (IFPRI).

MAAIF. (2016). Ministry of Agriculture Animal Industry and Fisheries' Performance Review Report Financial Year 2015 to 2016.

Mwesigwa, A. (2019, November 14). Milk prices test resilience of Uganda's dairy sector. The Observer,

Nakiganda, A., and Ahmed, M. (2019). Analysis of price incentives for milk in Uganda for the time period 2005– 2013. Gates Open Res.

Nakiganda, A., Mohamed, A., Ojangole, S., and Kaukha, R. (2017). Price incentives to milk producers: a case of Uganda. Livestock Research for Rural Development.

National Bureau of Statistics (NBS). (2015). *National Household Income and Expenditure Survey 2015*. National Bureau of Statistics.
http://www.nigerianstat.gov.ng

Pingali, P. (2012). Green Revolution: Impacts, limits, and the path ahead. Proceedings of the National Academy of Sciences, 109(31), 12302-12308.

Resnick, D., & Thurlow, J. (2015). The political economy of food price policy in Africa: Exploring the scope for reforms. Development Policy Review, 33(2), 221-240.

Reyes, B., Espada, A., Ceballos Sierra, F., Colindres, M., & Wiegel, J. (2023). Reinforcing knowledge and business relationships among associated bean producers in Honduras.

Sirany, T., Tadele, E., Aregahegn, H., & Wale, D. (2022). Economic potentials and use dynamics of sorghum food system in Ethiopia: Its implications to resolve food deficit. Advances in Agriculture, 2022(1), 4580643.

Temesgen, F., Gobena, E., & Megersa, H. (2017). Analysis of Sesame Marketing Chain in Case of Gimbi Districts, Ethiopia. Journal of Education and Practice, 8(10), 86-102.

Thurlow, J. (2011). Consequences of avian flu for growth and poverty: A CGE analysis for Kenya. African Development Review, 23(3), 276-288.

Timmer, P. (1988). The agricultural transformation. In H. Chenery & T. N. Srinivasan (Eds.), Handbook of Development Economics (Vol. 1, pp. 275–331). Elsevier.

Uganda Bureau of Statistics (UBOS). (2016). *National Household Survey 2016*. Uganda Bureau of Statistics.
http://www.ubos.org

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