Value Chain Prioritization for Inclusive Agricultural Transformation through the PPVC Approach: A Case Study on Ghana

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Abstract

In resource-constrained settings like Ghana, prioritizing agricultural investments is crucial for inclusive agricultural transformation (IAT). This study uses Policy Prioritization through Value Chain Analysis (PPVC) methodology to assess and rank sixteen agricultural value chains based on their potential to drive economic growth and social development. The PPVC framework, developed by the Bureau for Food and Agricultural Policy (BFAP) and the International Food Policy Research Institute (IFPRI), integrates quantitative modeling with stakeholder-driven qualitative assessments. Conducted across Ghana's diverse agro-ecological zones, it combines national-level data with regional stakeholder insights for contextual relevance. Historical data from 2007 to 2023 were analyzed, with projections to 2035. Key components included partial equilibrium modeling for market behavior, a computable general equilibrium model (RIAPA) for broader economic impacts, and farm-level benchmarking for cost-efficiency and yield gaps. These were complemented by qualitative scans of policy support, investment potential, and resource availability. Ground-truthing and stakeholder consultations ensured accuracy and policy alignment. Value chains were ranked based on a composite indicator system grouped into business and development case categories. Top-performing value chains—rice, fisheries, and tomatoes—showed high scores in competitiveness, intensification potential, and poverty reduction. In contrast, value chains like goats and sorghum scored lower due to limited scalability, weak trade performance, and minimal policy support. These findings offer a robust, evidence-based framework to guide policymakers in efficiently allocating resources across the agricultural sector. By integrating both quantitative rigor and qualitative insights, the PPVC approach provides a replicable model for national planning, aimed at fostering sustainable and inclusive growth in Ghana's agricultural sector.

Keywords: *Agriculture, CGE, Diet quality, Inclusive growth, Poverty, Prioritization, Value chain*

1.0 Introduction

Agriculture plays a pivotal role in Ghana's economic development, contributing significantly to employment, food security, and gross domestic product (GDP). Recent estimates show that the sector employs 38.3% of the population aged 15 and above, yet its average contribution to GDP has hovered around 21% from 2013 to 2023 (GSS, 2023). This disparity signals an urgent need for transformation and strategic resource allocation to maximize agricultural output relative to labour input.

Despite its centrality to national development, Ghana's agricultural sector faces constraints due to limited public financing, climate vulnerabilities, and structural inefficiencies (Mintah et al., 2025). The sector operates in a policy environment shaped by diverse and sometimes conflicting monetary, fiscal, and legislative instruments. This has necessitated prioritization to ensure that investments are targeted toward high-impact value chains capable of stimulating growth and alleviating rural poverty.

Over the years, various policy initiatives, such as the Medium-Term Agricultural Development Programme (MTADP) and the Planting for Food and Jobs (PFJ) initiative, have attempted to revitalize the sector. While some have led to modest gains in productivity and food security, they have also faced numerous implementation challenges, including funding shortages, post-harvest losses, and limited market access (Agbolosoo & Hutagaol, 2024).

Prior research has emphasized the need for agricultural policy prioritization, especially in regions heavily reliant on farming like Northern Ghana. However, many of these exercises, such as those guided by the Monitoring and Analysing Food and Agricultural Policies (MAFAP) framework, have largely relied on quantitative indicators such as yield potential, input-output ratios, or revenue generation. While these methods offer critical insights, they often overlook important qualitative dimensions such as stakeholder perceptions, local knowledge, policy feasibility, and implementation challenges (Abukari et al., 2016; Pernechele et al., 2018).

This study addresses this gap by answering the question of which value chain is the best case for business and development. We answer this question by adopting a mixed-methods prioritization framework—the Policy Prioritization through Value Chain analysis (PPVC) that integrates both quantitative metrics and qualitative stakeholder insights. By including voices from policymakers, farmers, and market actors, this approach ensures a more nuanced understanding of which agricultural value chains hold the greatest potential for transformation. Additionally, unlike previous studies that focus solely on current or historical data, this research evaluates value chains across a 29-year window—analysing past trends from 2007 to 2023 and projecting potential growth trajectories up to 2035.

In doing so, this study not only enhances the strategic relevance of value chain prioritization but also strengthens its alignment with long-term national development goals and global commitments such as the Sustainable Development Goals (SDGs). It aims to provide policymakers with a more holistic decision-support tool that promotes inclusive agricultural transformation and sustainable economic growth.

The remainder of the paper is organized as follows: Section 2 reviews the relevant literature underpinning the study; Section 3 outlines the research methodology; Section 4 presents and discusses the findings; and Section 5 provides the conclusions and policy recommendations

2.0. Literature Review

2.1 Policy Landscape Overview

The agricultural policy landscape in Ghana has evolved significantly since independence, shaped by various socio-economic, political and environmental factors. The interplay between policy initiatives and agricultural performance reveals a complex relationship, where policies have both positively and negatively influenced the sector. The policies have oscillated between socialist models and liberalized market strategies, impacting agricultural performance aimed at enhancing food security, improving rural livelihoods, and transitioning from subsistence to commercial agriculture. However, these policies have faced numerous challenges, including institutional failures, inadequate resource access, and socio-political dynamics. This complexity suggests that a more integrated approach, considering local contexts and stakeholder collaboration, may be necessary for future policy success.

2.2. Historical Policy Framework

Ghana's transitioned from a socialist model in the 1960s to a liberalized market approach in the 1980s and 1990s, particularly under structural adjustment programs (Asuming-Brempong, 2013). Lambert (2019) points to Kwame Nkrumah's government approach of initially promoting smallholder farming but later shifted to large-scale state farms, the aim was to reduce dependence on cocoa and diversify agriculture. These led to inefficiencies and reduced productivity and others exacerbating environmental degradation (Lambert, 2019; Asuming-Brempong, 2013). Structural adjustment programs were introduced which led to market deregulation, aimed to enhance agricultural productivity. These programs have promoted cash crops and improved rural incomes. However, these faced challenges, such as institutional failures and inadequate private sector engagement (Asuming-Brempong, 2013, 2004; Puplampu, 1999).

Asuming – Brempong (2013, 2004) further argues that the varied effects of such policies - improved farmer incomes through cash crop promotion–have exacerbated issues such as price volatility and food insecurity due to reliance on rain-fed agriculture. In addition, inadequate infrastructure and institutional failures have hindered long-term growth.

2.3 Current Policies

Recent efforts have focused on addressing institutional failures and enhancing rural financial markets to support agricultural innovation and sustainability (Asuming-Brempong, 2004) (Asuming-Brempong, 2004). Asuming- Brempong (2004) emphasized the strengthening of rural institutions to better respond to agricultural challenges and technological advancements. The Ghana Poverty Reduction Strategy I (GPRS I) 2003-2005 and Growth and Poverty Reduction Strategy II (GPRS II) 2006-2009 were also introduced in the 2000s aimed to raise crop productivity in order to lower the high rate of poverty in the agricultural sector (Atta Oppong et al., 2021). These policies primarily focus on smallholder farmers who dominate agriculture in Ghana and face challenges such as inadequate technology, resource management, and climate dependency hinder growth (Darfour & Rosentrater, 2016). Climate variability (Teye et al., 2015), tenure insecurity (Amanor. 2010) further compounds productivity challenges of the sector. Agbolosoo & Hutagaol, (2024) point to one of the recent policies, "Planting for Food and Jobs" initiative, aimed to boost productivity and mitigate persistent challenges that have faced its own set of challenges in implementation, funding, and market access**.**

The agricultural policy landscape in Ghana is increasingly focused on environmental sustainability, particularly soil conservation and water management. Various studies highlight the detrimental impacts of current agricultural practices on the environment, emphasizing the need for sustainable approaches. Adomako and Ampadu (2015) underscore the negative and unsustainable practices, like slash-and-burn agriculture and excessive use of agro-chemicals, which degrade soil health and contribute to carbon emissions, threatening environmental sustainability. Dagunga (2021) pointed to implementing practices such as crop rotation, contour ploughing, and manure application, which have shown positive effects on soil health, enhance resilience against erosion, and support sustainable production. Ineffective irrigation management has led to water scarcity issues, necessitating the adoption of sustainable irrigation techniques and effective water user associations to protect water resources (Mensah & Ibrahim, 2017). However, Habib et al., (2017) indicated that the Establishment of riparian buffer systems can improve water quality and biodiversity while also serving as a climate adaptation measure by reducing freshwater evaporation.

The agricultural policy landscape in Ghana reflects a growing trend towards the adoption of technological innovations, particularly mechanization and digital tools. Despite the slow uptake of land productivity-enhancing technologies, farmers are increasingly utilizing labour-saving technologies such as mechanization and herbicides, supported by emerging private supply channels. This shift is crucial for enhancing productivity and freeing up labour for more intensive agricultural tasks. The following sections discuss the key aspects of this landscape.

Farmers are increasingly adopting mechanization to improve efficiency and productivity, particularly in areas close to urban markets. Mechanization allows agricultural labour to be redirected towards more labour-intensive tasks, thereby enhancing overall productivity (Houssou et al., 2016). There are ongoing efforts to strengthen the private mechanization supply chain, which is essential for meeting the rising demand for tractor services (Houssou et al., 2016; Diao et al., 2017).

Miine et al., (2023) asserts digital tools are enhancing farmers' access to markets, finance, and agricultural information, which is critical for smallholder farmers. They highlight other factors, such as membership in farmer-based organizations, access to credit, and agronomic training, which significantly influence the adoption of digital solutions.

3.0. Research methodology

3.1. Study Area

This study was conducted in Ghana, a West African country with a diverse agro-ecological landscape and a largely agrarian economy. Agriculture contributes around 21% to GDP (GSS, 2024), and employs about 35% of the total workforce, serving as the primary source of livelihood for the majority of rural populations (Trading Economics, 2024). This sector spans various value chains, including food staples, cash crops, horticulture, livestock, and fisheries, which are critical for both food security and trade.

Ghana's ecological zones, from humid forests in the south to savannahs in the north support a wide range of agricultural activities but also pose region-specific challenges such as infrastructure gaps and climate risks (Asante & Amuakwa-Mensah, 2021). This study takes a national perspective and incorporates regional dynamics and value chain-specific characteristics. Stakeholder consultations and data collection were conducted throughout the country. This approach ensures that value chain prioritization reflects both national and local goals.

3.2. Research Design

This study employs a mixed-methods design that integrates quantitative modeling with qualitative assessments to prioritize agricultural value chains in Ghana. This approach supports evidence-based policy under the Prioritizing Policy for Value Chains (PPVC) framework developed by the Bureau for Food & Agricultural Policy (BFAP) and the International Food Policy Research Institute (IFPRI) by combining economic analysis with stakeholder insights to capture both market potential and development impact (BFAP & IFPRI, 2024).

The analysis focused on sixteen value chains across crops, horticulture, livestock, and fisheries, selected for their strategic relevance, data availability, and alignment with national priorities. Historical data from 2007 to 2023 inform the analysis, with projections to 2035 supporting forward-looking planning.

Six methodological components structure the research: partial equilibrium models simulate value chain dynamics; a CGE model (RIAPA) estimates broader economic impacts; benchmarking compares local production efficiency with global standards; qualitative scans assess policy support, investment, scalability, and resource availability; ground-truthing validates data through stakeholder consultations; and composite indicators synthesize findings. All indicators are normalized and weighted equally to produce final business and development case rankings. This structured and balanced approach ensures a credible basis for prioritizing value chains that support inclusive agricultural transformation in Ghana.

3.3. Data Sources and Collection

The study draws on both primary and secondary data sources to ensure a comprehensive and well-grounded analysis of agricultural value chains in Ghana. Primary data were collected through a series of stakeholder interviews and participatory validation processes. These engagements included representatives from the Ministry of Food and Agriculture (MoFA), the Council for Scientific and Industrial Research (CSIR), the Tree Crop Development Authority, and key actors from the private sector. In addition to one-on-one interviews, the research team facilitated expert workshops and focus group discussions aimed at validating model assumptions, refining qualitative assessments, and resolving data inconsistencies. These interactive sessions played a critical role in contextualizing model outputs and informing the qualitative scoring of value chains.

Secondary data was sourced from a range of institutional and national databases. Key datasets were obtained from MoFA, the Food and Agriculture Organization (FAO), the World Bank, and the International Food Policy Research Institute (IFPRI). National-level data were drawn from the Ghana Living Standards Survey (GLSS) 2016/17, the 2021 Ghana Social Accounting Matrix (SAM), and various official statistics on trade, production, and agricultural employment. To support the benchmarking of Ghanaian value chains against global standards, additional data were collected from peer countries such as Brazil, Nigeria, and the Philippines. These international benchmarks informed the comparative analysis of input costs, yields, and production efficiency. Together, these primary and secondary data sources provided the empirical foundation for the modeling exercises, qualitative assessments, and composite indicator development that underpin the PPVC value chain prioritization framework.

3.4. Value Chain Identification and Shortlisting

The process of value chain identification and shortlisting began with the construction of a comprehensive long list of potential agricultural value chains. This initial list was derived from an empirical assessment of multiple performance metrics that reflect the economic relevance and development potential of each commodity within the Ghanaian context. Key criteria included the gross production value of the commodity, historical growth rates over a five-year period, the level of farmer participation, and trade performance indicators such as export volumes, import levels, and trade balance trends. These metrics were selected to ensure that the long list captured both the scale and dynamism of each value chain, as well as its importance to livelihoods and the national economy.

To refine the long list into a manageable set of priority value chains for detailed analysis, a series of alternative weighting strategies were applied to aggregate the underlying indicators into composite scores. These strategies included a Balanced Weighting approach, in which all variables were assigned equal importance; a Trade-Focused approach, which emphasized export and import growth; a Development-Oriented approach, which prioritized factors such as production value and farmer engagement; and a Gross Value-Added approach, which concentrated solely on economic value creation. Each approach generated a ranked list of value chains, allowing the research team to identify those commodities that consistently scored highly across different strategic lenses.

The final shortlist of sixteen value chains was determined through an iterative validation process involving key stakeholders. Representatives from the Ministry of Food and Agriculture, the Council for Scientific and Industrial Research, and other relevant institutions reviewed the preliminary rankings, provided contextual insights, and identify any missing considerations that might affect prioritization. This participatory approach ensured that the final selection of value chains was not only grounded in empirical data but also aligned with national policy priorities and informed by sector-specific expertise. The resulting shortlist included a mix of field crops, cash crops, horticultural products, and livestock commodities, offering a diverse and representative sample for subsequent phases of the PPVC prioritization exercise.

Table 1: Shortlisting different weighted approaches to select value chains

Rank	Balanced	Trade Favored	Trade Only	GVA	Ag Development
1	Rubber	Rubber	Rubber	Coconut	Cocoa
2	Cocoa	Cocoa	Fisheries	Fisheries	Maize
3	Rice	Soyabean	Cocoa	Soyabean	Rice
4	Maize	Fisheries	Oil Palm	Rubber	Yam
5	Yam	Rice	Goat	Sugar Cane	Cassava
6	Fisheries	Sugar Cane	Cattle	Cassava	Rubber
7	Soyabean	Maize	Mango	Yam	Fisheries
8	Sugar Cane	Oil Palm	Rice	Pawpaw	Soyabean
9	Cassava	Yam	Soyabean	Plantain	Cocoyam
10	Cocoyam	Tomato	Pineapple	Maize	Sugar Cane
11	Cattle	Goat	Cashew	Cocoa	Sorghum
12	Sorghum	Cassava	Maize	Cocoyam	Groundnut
13	Pineapple	Coconut	Sugar Cane	Groundnut	Plantain
14	Cashew	Cattle	Citrus	Tomato	Cowpea
15	Goat	Mango	Yam	Oil Palm	Coconut
16	Oil Palm	Pineapple	Poultry	Cucumber	Tomato
17	Pawpaw	Citrus	Cotton	Rice	Cashew
18	Tomato	Poultry	Coconut	Pineapple	Cotton
19	Coconut	Cashew	Tomato	Cowpea	Poultry
20	Cowpea	Cotton	Banana	Sorghum	Banana

Source: Own compilation

Table 2: Shortlisted value chains used in PPVC

Category	Value Chain
Field Crop	Rice
Field Crop	Maize
Field Crop	Soybean
Field Crop	Yam
Field Crop	Cassava
Field Crop	Sorghum
Cash Crop	Cocoa
Cash Crop	Oil Palm
Cash Crop	Rubber
Cash Crop	Cashew
Horticulture	Pineapple
Horticulture	Tomato
Horticulture	Plantain
Livestock	Poultry
Livestock	Goat
Livestock	Fisheries

Source: Own compilation

3.5. Analytical Framework and Ranking Methodology

3.5.1. Partial Equilibrium Modeling (PE)

A core component of the PPVC analytical framework is the use of Partial Equilibrium (PE) modeling to simulate the market behavior of individual value chains. Commodity-specific PE models were developed to capture the supply and demand dynamics of each selected agricultural commodity. These models are grounded in the principle of market equilibrium, in which total supply, including domestic production and imports equals total demand, which comprises local consumption and exports. This modeling approach allows for a detailed evaluation of price, production, and trade responses to changes in key drivers such as productivity, demand growth, and market conditions.

The PE models were calibrated using high-quality historical data spanning 2007 to 2023, incorporating official national statistics and validated secondary sources. This historical calibration establishes a reliable baseline from which forward-looking projections can be made. The models simulate market conditions up to 2035, enabling the estimation of long-term trends and policy-relevant indicators.

Key outputs from the PE models include projections of domestic consumption growth, which reflect changing demand driven by population growth and income dynamics. The projected average annual growth in domestic consumption ($Y_{Consumption\ Growth}$) is then calculated using the least-squares growth method; intensification potential, calculated as the inverse of the ratio1 of local projected yields from the PE model ($YLD_{Local\ avg\ 2035}$) and a reference yield ($YLD_{Reference\ yield}$):

$$YIntensification = 1 - \frac{YLD_{Local\ Avg\ 2035}}{YLD_{Reference\ Yield}}$$

Production volatility serves as a proxy for climate resilience. It utilizes yield and production data for the 16 value chains in Ghana, as generated by the PE-models based on historical trends. The indicator is represented by the coefficient of variation (CV) of the error term, which serves as a statistical measure of volatility. The CV is calculated using the following equation:

$$coefficient\ of\ variation = \frac{\sigma}{\mu}\ X\ 100$$

σ represents the standard deviation of the error terms and μ is the mean of the error terms for each value chain's yield or production. Regional Export Potential is the average annual growth in import volumes of Ghana's potential trade partners in regional or global markets over the past 5 years. For ranking purposes, the focus was on the combination of raw and processed products. The RTA combines a nation's export and import share of a commodity in the international market, as well as the nation's export and import share of all commodities:

$RTA_{ij} = RXA_{ij} - RMA_{ij}$

RTA_{ij} = Relative Trade Advantage for country i and commodity j

RXA_{ij} = Relative Export Advantage for country i and commodity j

RMA_{ij} = Relative Import Advantage for country i and commodity j

X = Exports,

M = Imports,

k index of all commodities,

n index of all countries.

An RXA value greater than 1 signifies that the country holds a competitive advantage in the specified commodity, reflecting a robust export sector and heightened competitiveness. Conversely, an RMA value of less than 1 indicates a comparative advantage, as the country relies less on imports for that commodity.

The average growth in the RTA over the past three years was calculated for each value chain. The RTA ranges from -∞ to ∞, with 0 representing the "competitive-advantage-neutral" point. A negative RTA indicates a relative competitive disadvantage, whereas a positive RTA reflects competitive advantage. The magnitude of the RTA underscores the relative significance of imports (negative RTA) or exports (positive RTA) in the country's overall trade balance.

An RXA greater than 1 indicates that the country has a competitive advantage in the commodity under consideration; it reveals a higher state of competitiveness since it has a strong export sector. In the case of RMA, a value of less than 1 indicates a comparative advantage, as the country is less dependent on imports for that commodity.

These indicators provide a foundational set of market-based metrics that are used in the broader composite ranking of value chains. Thus, the PE modeling framework offers a structured, data-driven basis for comparing the future growth prospects and market performance of Ghana's priority agricultural value chains.

3.5.2. Farm-Level Benchmarking

To complement the market-level insights generated through partial equilibrium modeling, the study incorporates farm-level benchmarking to assess the competitiveness of Ghanaian agricultural production systems. This analysis involves a systematic comparison of production costs and yields in Ghana with those observed in international benchmark countries, including Nigeria, Brazil, the Philippines, and others with similar agro-ecological or market characteristics.

The benchmarking exercise focuses on two primary indicators. The first is the input cost efficiency ratio, which measures the cost incurred per unit of output efficiency. This ratio is calculated by dividing the local production cost per hectare (or per unit weight for livestock) by the corresponding yield and then comparing this figure with international benchmarks (e.g., Nigeria, Ivory Coast, Thailand, Philippines, Costa Rica, Brazil, Colombia). A higher ratio indicates lower cost efficiency, signaling the need for interventions aimed at improving productivity or reducing input costs.

$$Input\ cost\ efficiency\ ratio = \frac{\frac{Production\ cost_{local}}{YLD_{local}}}{\frac{Production\ Cost_{World\ Benchmark}}{YLD_{World\ Benchmark}}}$$

The second key indicator is the yield gap, which contributes to the intensification potential discussed above. This metric captures the difference between projected average yields in Ghana (based on the PE model) and reference yields typically achieved by commercial producers or in best-practice settings. A wider yield gap suggests greater potential for intensification through improved technologies, inputs, or management practices.

Together, these indicators provide a grounded understanding of how Ghanaian value chains perform at the farm level relative to global standards. They also offer critical inputs into the composite ranking framework, particularly with regard to assessing economic viability and competitiveness under the business case dimension.

3.5.3. CGE Modeling (RIAPA)

The study employs a Computable General Equilibrium (CGE) modeling approach using the Rural Investment and Policy Analysis (RIAPA) framework developed by the International Food Policy Research Institute (IFPRI). This model provides an economy-wide perspective on the impacts of agricultural value chain development by simulating how productivity growth in specific value chains affects broader economic and social outcomes. The RIAPA model is recursive-dynamic and grounded in a Social Accounting Matrix (SAM) framework, capturing interlinkages across production sectors, labour markets, households, and consumption patterns.

For this analysis, the model was calibrated using Ghana's updated 2021 SAM, which aligns with the country's rebased national accounts and incorporates detailed data from the Ghana Living Standards Survey (GLSS 7) conducted in 2016/17. The model represents 90 economic sectors, including 36 agricultural sub-sectors, and disaggregates households by income quintile and urban-rural status to reflect distributional impacts.

The RIAPA model simulates the effects of value chain-specific productivity growth relative to a business-as-usual scenario. Key outcome indicators include changes in the Agri-Food System (AFS) GDP, which reflects the extent to which on-farm gains stimulate downstream growth in agro-processing and food-related services. This indicator is calculated as the change in AFS GDP per unit of growth in the on-farm component of the targeted value chain, providing a comprehensive measure of its impact on the agri-food system.; AFS job creation, capturing employment effects both on- and off-farm, it is expressed as the percentage change in AFS employment per unit increase in agricultural GDP within the targeted value chain, providing a measure of its overall contribution to job creation.; poverty reduction, measured through changes in the national poverty headcount rate and calculated as the percentage change in the national poverty headcount rate for every unit increase in agricultural GDP within the targeted value chain, providing a direct measure of its impact on poverty alleviation.; and improvements in diet quality, assessed using the Reference Diet Deprivation (ReDD) index, The ReDD index measures the incidence, breadth, and depth of dietary deprivation (i.e., consumption shortfalls) across six essential food groups required for a healthy diet. The diet quality indicator is expressed as the percentage change in the ReDD index per unit increase in agricultural GDP within the targeted value chain, highlighting the value chain's contribution to improving nutritional outcomes.

A distinctive feature of the RIAPA model is the incorporation of resource constraints, particularly land, labour, and capital. These constraints mean that expanding production in one value chain may require reallocating resources from others, thereby introducing trade-offs that are essential for understanding the opportunity costs of different investment choices. By accounting for these dynamics, the CGE-RIAPA modeling framework provides critical insights into the inclusive and transformative potential of each value chain and ensures that prioritization decisions are based on both efficiency and equity considerations.

3.5.4. Qualitative Value Chain Scans

In addition to quantitative modeling components, this study incorporates qualitative value chain scans to assess context-specific factors that are not easily captured through economic or statistical models. These scans were conducted for all sixteen prioritized value chains to gather critical insights into their current status and future development potential. The purpose of this study was to evaluate qualitative dimensions that influence the viability and scalability of value chains, particularly in relation to enabling environments and resource conditions.

Each value chain is assessed across four qualitative indicators: policy support, investment support, scalability, and natural resource availability. These were evaluated using a structured Likert-scale scoring system (See in appendix), where value chains were assigned a score from 1 (low) to 3 (high) based on the degree to which each criterion was met. Policy support measures the extent of current or anticipated public sector commitment to the value chain; investment support evaluates the level of ongoing or planned private, donor, or public investment; scalability considers the potential for the value chain to expand across regions or stimulate complementary developments; and natural resource availability assesses the ecological suitability for production expansion, including access to arable land, water, and favorable climatic conditions.

The scoring process was informed by a combination of desktop research, literature reviews, and input from industry experts and national stakeholders. Consultations were held with representatives from key institutions, including the Ministry of Food and Agriculture, research organizations, and sector-specific agencies, to validate and refine qualitative assessments. This mixed-source approach ensured that the qualitative evaluations were evidence-based, contextually relevant, and reflective of on-the-ground realities. The resulting scores contributed to the broader composite ranking, complementing the quantitative indicators with nuanced insights into the enabling environment and structural conditions influencing each value chain's potential.

3.5.5. Ground-Truthing and Validation

A critical component of the methodological framework is ground-truthing, which serves to validate and refine the data, assumptions, and outputs generated through both quantitative modeling and qualitative assessments. This process ensures the accuracy, credibility, and contextual relevance of the value chain rankings by systematically addressing data inconsistencies and verifying findings with local knowledge.

Ground-truthing involved two complementary strategies. The first was quantitative validation, which focused on identifying and resolving discrepancies in key data points across different sources. Examples include variations in reported carcass weights for livestock, inconsistencies in goat production figures relative to slaughter volumes, and questions surrounding rice milling equivalence ratios. These anomalies were investigated through cross-referencing multiple data sources, checking definitional differences, and applying correction factors where appropriate.

The second strategy was qualitative verification through stakeholder engagement. This involved a series of interviews with technical experts and institutional representatives. These sessions enabled stakeholders to provide feedback on model assumptions, contextualize anomalies, and offer sector-specific insights that informed the final scoring and ranking.

All findings and resolutions from the ground-truthing process were documented in "back-to-office" reports, which were subsequently reviewed by the core analytical team. These reports played a key role in refining the final value chain rankings by integrating real-world feedback, correcting inconsistencies, and ensuring that both quantitative outputs and qualitative judgments were grounded in validated evidence. Ground-truthing thus functioned as a final quality control mechanism, reinforcing the methodological rigor of the PPVC framework.

3.6. Ranking Criteria

The selection and ranking of value chains within the PPVC framework are based on a structured, indicator-driven methodology that assesses each value chain's potential to contribute to inclusive agricultural transformation in Ghana. To ensure a balanced evaluation, the criteria used for ranking are grouped into two broad categories: the business case and the development case. Each category reflects a distinct set of policy objectives; economic viability and market potential on the one hand, and social inclusiveness and transformation impact on the other.

The business case composite indicator evaluates the commercial attractiveness and competitiveness of a value chain. It focuses on factors such as productivity growth potential, domestic demand trends, trade performance, cost efficiency, and investment readiness. In total, nine equally weighted sub-indicators are used to construct the business case score: intensification potential, domestic consumption growth, regional export potential, input cost/use ratio, relative trade advantage, investment support, scalability, natural resource availability, and production volatility. These indicators are derived from both modeling outputs (e.g., partial equilibrium simulations, farm benchmarking) and qualitative assessments.

Conversely, the development case composite indicator is designed to capture the broader societal and structural impacts of value chain development. It includes six sub-indicators, each equally weighted, that reflect a value chain's capacity to reduce poverty, enhance diet quality, reduce hunger, generate employment across the agri-food system, drive agriculture food systems growth, and align with public policy priorities. These indicators are primarily informed by simulations from the CGE-RIAPA model and qualitative stakeholder insights.

To calculate the final rankings, each composite indicator; business case and development case is assigned an equal weight of 0.5, reflecting the dual emphasis on economic and developmental outcomes as depicted in Table 3. Within each composite, sub-indicators are standardized using min-max normalization techniques to ensure comparability across different units and scales. This equal-weighting approach ensures that no single indicator or perspective dominates the overall ranking, thereby allowing for a more holistic assessment of each value chain's strategic relevance. The final scores thus represent a composite measure of each value chain's potential to contribute to both market-led growth and inclusive development, offering a robust and transparent basis for policy and investment decision-making.

Table 3: Indicators and weights used for final ranking

Composite Indicator	Weights	Sub-indicators	Weights
Business case	0.5	Potential for intensification	0.11
		Domestic consumption growth	0.11
		Regional export potential	0.11
		Input cost/use ratio	0.11
		Relative trade advantage	0.11
		Private sector investment plans	0.11
		Scalability	0.11
		Natural resource availability	0.11
		Production Volatility	0.11
Development case	0.5	Poverty	0.20
		Diet quality	0.20
		Agri-food system GDP growth	0.20
		AFS job creation	0.20
		Policy support (expenditure priorities)	0.20
Total	1		2

Source: Own Compilation

4.0 Results and Discussion

This section presents and discusses the results for sixteen agriculture value chains in Ghana. Hence, first, results from the three PPVC analytical techniques namely, partial equilibrium (PE), general equilibrium (using Computable General Equilibrium [CGE]) and the qualitative expert scores, as outlined in the preceding sections are presented. Both raw and normalized indicator scores are shown for targeted as well as aggregate value chain groupings. Subsequently, normalized indicators are weighted into two indicator clusters: business and development case. Finally, an overall composite score and ranking produced by further weighting of business and development case indicators is generated for each targeted value chain.

4.1 Results

Analyses from the three integrative PPVC approaches generate important results towards the final ranking of targeted value chains as shown in Table 1 (see, Appendix 1 for results for all sixteen value chains).

4.1.1 Results from the PE Model

In the first place, the 5-year (2023-2028) domestic consumption outlook which includes food use, processing, feed use and other household and industrial uses indicates that domestic consumption of rice, maize and cocoa are expected to rise between about 2 to 4.5 percent, with cocoa leading among the three (see Table 1). This result reflects a continued rise in per capita consumption, including industrial uses, of cocoa, maize and rice products in households and industry over the 5-year outlook period, which outpaces population growth-driven consumption increases. Also, exports potential of cocoa and rice are expected to be positive while the outlook for maize declines by more than a tenth. This decline in exports of maize is explained by falling imports demand of Ghana's regional export destinations in recent years which could be due to rice in local production or a switch to cheaper alternatives among the importing countries.

Under the potential for intensification, the results further reveal that there are significant gaps in the yields of cocoa and maize whereby the projected average yield of the ordinary farmer is significantly lower than large-scale and commercial farmer, thus presenting an opportunity to close the yield gap. Although Ghana is the second largest producer of cocoa in the world by scale, there persist huge gaps in productivity, On the other hand, cost efficiency ratio shows that production of maize is relative competitive compared to rice and cocoa. Despite maize being competitive over rice, for example, it has a lower advantage in export trade compared to rice. This could be because of non-farm bottlenecks such as transportation, storage and regulatory impediments to maize exports. Finally, production is shown to be very stable for rice, maize and cocoa for the past two decades with maize being the most stable. Volatility is thus almost negligible.

Table 4: Raw indicator scores

Technique	Indicator	Unit	Rice	Maize	Cocoa
Partial Equilibrium	Domestic consumption growth	Percent	2.12	3.43	4.45
	Regional export potential	Percent	3.19	-13.17	4.98
	Potential for intensification	Ratio	0.02	0.18	0.25
	Input cost/use ratio	Ratio	1.34	3.42	0.70
	RTA	Ratio	2.20	1.02	-0.83
	Production volatility	Ratio	2.7E-16	2.5E-16	2.9E-16
Qualitative Scans	Scalability	Scale: 1-3	2.73	2.85	2.77
	Investment Support	Scale: 1-3	2.65	2.75	2.85
	Natural resource availability	Scale: 1-3	2.51	2.62	2.34
	Policy support	Scale: 1-3	2.69	2.77	2.88
General Equilibrium	AFS growth	Elasticity	2.36	1.76	1.02
	Poverty	Elasticity	-0.65	-0.08	-1.09
	Jobs	Elasticity	0.26	0.14	0.22
	Diet quality	Elasticity	0.53	0.53	0.53

Source: Authors' construction

4.1.2 Results from the Qualitative Scans

By the expert knowledge of relevant actors within the agriculture sector in Ghana, rice, maize and cocoa perform quite well in all four dimensions of the qualitative assessments. Nevertheless, in relative terms, maize was deemed to have higher complementarity along its value chains and was connected strongly with other value chains like poultry. Private investments are much more in cocoa than in rice and maize in a similar fashion to policy support for these crops. This suggests that public policy could be a signal of private investment. Lastly, natural resource constraints are more binding on cocoa due to the rising activities of illegal mining (locally known as 'Galamsey') and the decimation of land and forest reserves.

4.1.3 Results from the Computable General Equilibrium Model

The agri-food system connects production activity from the farm with other activities along the value chains such that an on-farm productivity rise would trigger complementary growth in connected chain activities. Thus, the AFS growth indicator shows the effectiveness of on-farm productivity growth in a value chain in driving growth across the entire agri-food system (AFS). Hence, results in Table 1 show that per unit growth in on-farm rice activity would generate more than twice as much across the entire value chain while cocoa, on the other hand, generates only 2 percent more. Nonetheless, the benefits households receive through employment income from cocoa, compared to rice and maize, would make cocoa better at poverty reduction (-1.09). Thus, the degree effect of growth on poverty is high for cocoa, followed by rice and maize. Jobs, on flip the side, are more likely to be created in rice than cocoa and main for every unit change in agriculture GDP. Finally, the three value chains: rice, maize and cocoa have equal contribution to diet quality. Changes in food consumption patterns are influenced by both income variations and shifts in relative food prices, which lead consumers to modify their consumption baskets. Cocoa's contribution to diet quality will mainly be through income effects as cocoa beans and products are less consumed by households.

4.1.4 Normalized indicator scores for targeted value chains in the Business Case

Next, we compare the relative performance of targeted value chains in the Business Case using the normalized indicator scores. From the outset, the ranking results for each of the 9 indicators used in the business-case cluster indicator show that no single value chain scores the highest in every indicator, yet some score consistently high, whilst others do not.

In Figure 1, the top three value chains with the most significant opportunity for intensification are poultry, rubber and cocoa. This reflects the current low level of productivity compared to the yields of large-scale commercial farms in these sectors. Thus, there is an opportunity for intensification.

4.1.4.1 Domestic consumption growth

In addition, the domestic consumption of poultry, tomatoes, and cashews is expected to grow the most from the base year (2023) to 2028, relative to other value chains (Figure 1). Poultry stands out largely due to the expectation of a continued rise in per capita consumption of poultry products in the diet of the Ghanaian over the next half-a-decade, which outpaces population growth-driven consumption increases. The positive outlook for domestic per capita consumption of both poultry and tomatoes reinforces their high rankings. While poultry are largely driven by food use, cashews are driven by processing and industrial uses. Tomatoes, on the other hand, are equally driven by food and processing use. Curiously, cashews and cocoa, which are considered export crops, have seen growth in domestic consumption and use. But the reality is that due to their initial small domestic consumption base relative to other value chains, the change in growth shot up quite high.

4.1.4.2 Exports growth

The goat value chain received the highest score for export growth due to the sharp rise in imports of Ghana's neighbors. Goat imports by Ghana's neighboring countries increased sharply after 2020 from a relatively low base years prior. Tomato, oil palm, and soyabeans completed the top four value chains.

Traditional export-oriented value chains, such as cocoa, rubber, and cashew, do not have a strong feature in the top half due to the relatively slow growth in internationally traded values over the past 5 years.

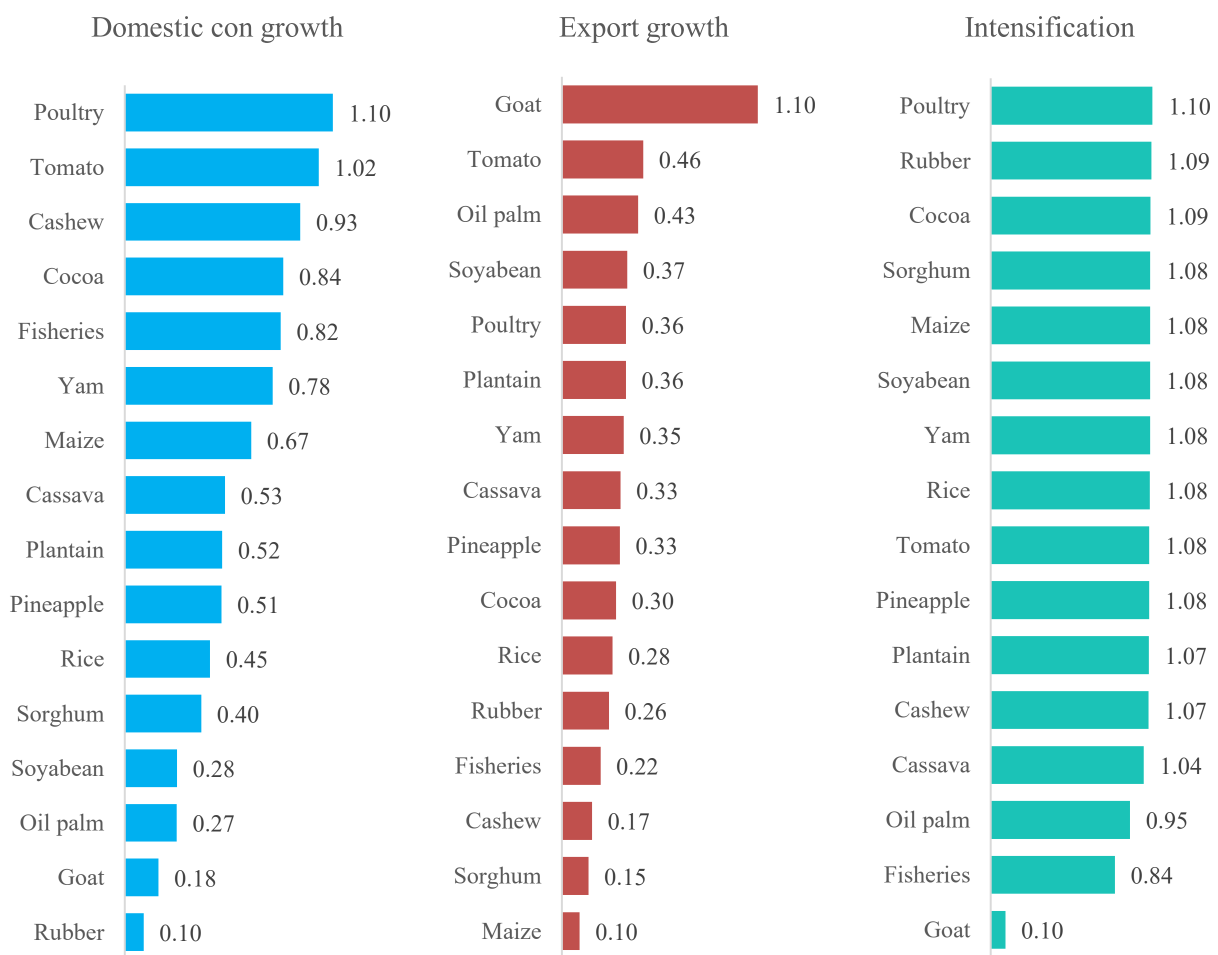


Figure 1: Business-case indicator: domestic consumption, export growth and intensification
Source: Author's own construction

4.1.4.3 Input costs/output

The results in Figure 2 reveal that all value chains, except goats, are competitive in producing output per unit. Notable among these are export-oriented value chains, including pineapple, plantain, rubber, and cocoa. These commodities, especially pineapple, rubber, and cocoa, compete in global markets and thus are expected to be competitive compared to commodities produced mainly in the domestic market. Goats are the least competitive value chain due to low intensification and low-quality breeds.

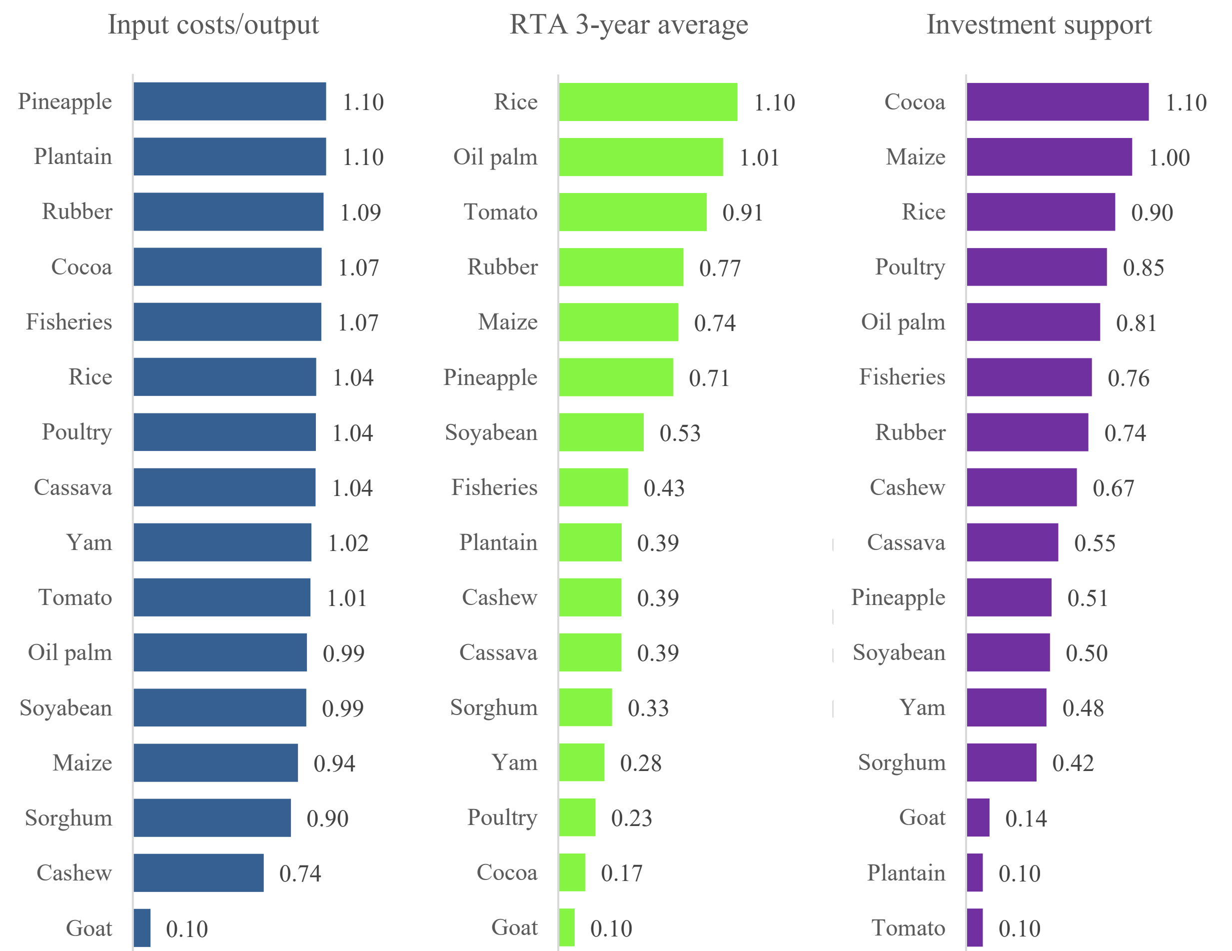


Figure 2: Business-case indicator: input cost-output, RTA and investment support
Source: Author's own construction

4.1.4.4 Relative trade advantage

When compared with the input-costs-per-output ranking, the relative trade advantage (RTA) is less skewed (Figure 21). The RTA is analyzed using a 3-year average post 2020 (i.e., 2021 – 2023) due to missing 2020 trade data for Ghana in the ITC Trademap database. The skewness of the indicator ranking to the left highlights the difficulty in increasing exports or producing sufficient value chains to bridge the domestic consumption gap currently being filled by imports, despite the competitive production of current production. Thus, export opportunities are constrained by rather high off-farm costs that are associated with weak transport and storage infrastructure

4.1.4.5 Investment support

Cocoa tops all the value chains in terms of the Investment Support indicator (Figure 2), followed by maize, rice, and poultry. Overall, the top four value chains have the highest investment support. For instance, every year, over a billion US dollars are secured to fund cocoa purchases, support farmers, and sustain industry operations and infrastructure. In 2020, Ghana allocated over USD200 million of the USD600 million syndicated loan facility secured from the African Development Bank (AfDB) to the national rehabilitation program. In 2012, the World Bank approved \$100 million aimed at commercializing and developing the rice value chain in Northern Ghana. Surprisingly tomato is least ranked in terms of investment support although it has relatively moderate mention in policy discourses. This implies that policies have not necessarily translated into actual investments in tomatoes.

4.1.4.6 Scalability

Mize tops in the Scalability indicator, followed by cocoa and poultry (Figure 3). This is somewhat related to the investment environment but also based on the relative ease with each value chain selected value chain can induce complementary development in other value chains or a boost to regional market growth. The forward linkage of maize feed to the poultry sector, for instance, creates payoff complementarity through investments in the maize value chain. Similarly, cocoa trees are often interplanted with annual crops including plantain, cassava and maize. Poultry also integrates backwards with rice (i.e., bran) as feed. Tomato, plantain and yam create the least comparative complementary development in other value chains.

4.1.4.7 Natural resource availability

In the context of Ghana's fast depleting natural resource capital through illegal mining (Galamsey), land erosion and deforestation, to name a few, the results indicate that perennial and less-intensive production systems are at risk (Figure 22). In this regard, the poultry value chains performed well in this ranking. The reason poultry and, somewhat, fisheries (including aquaculture) were ranked high is due to their relatively lower requirement for land in intensive production systems. Staples like cassava and maize, ranked 2nd and 3rd, will continue to have very high natural resource availability due to Ghana's climatic suitability for growing these staples, which require less use of natural resources like land. On the other side, non-staples and perennial crops like cocoa and rubber suffer from land tenure constraints and soil degradation

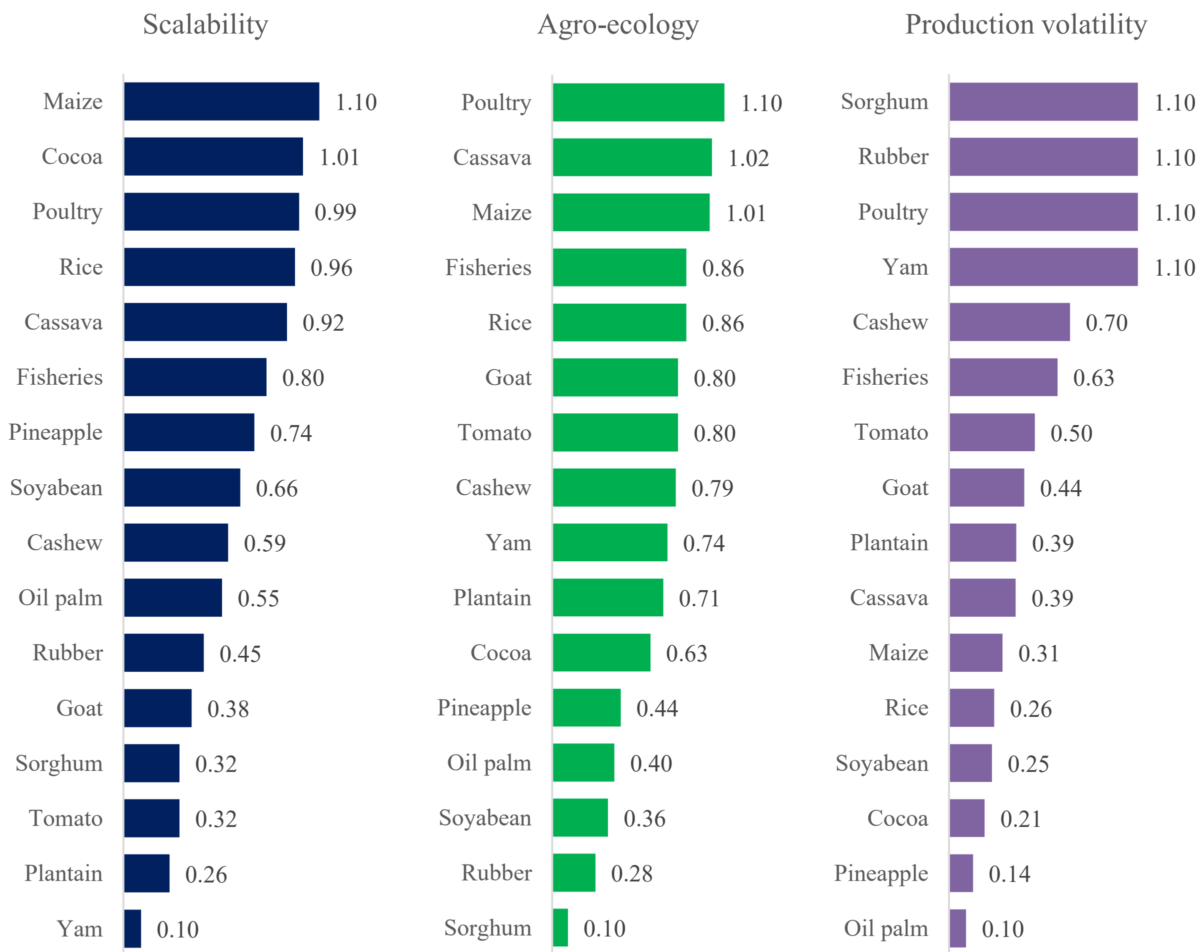


Figure 3: Business-case indicator: scalability, natural resource availability and production volatility
Source: Author's own construction

4.1.4.8 Production volatility

Production volatility measured over 10 years prior to the base year in 2022 is used as a proxy for climate resilience (Figure 3). We believe that the volatility in production adequately captures the variability in weather patterns as well as other climate-induced impacts on selected value chains. Sorghum, rubber, and poultry were the best ranked compared to all other value chains, in terms of production volatility, with yam making up the top four. This indicator, thus, measures the resilience to consistently produce volume in the face of weather shocks. In contrast, plantain was ranked lowest on this indicator, largely depicting a value chain that is highly dependent on rainfall, which has been unpredictable in recent years. Production is similarly volatile in the yam and tomato and goat value chains.

4.1.5 Normalized indicator scores for targeted value chains in the Development Case

4.1.5.1 Policy support

Cocoa ranked highest for policy support, and this is not a surprise. The cocoa industry has a special place in central government's policies and planning including the Cocoa Sector Development Strategy II (CSDS II), which aims to empower smallholder cocoa farmers with modern technologies, key for productivity and sustainability. Cocoa has been the most important foreign exchange earner for the country for many decades. Cocoa is followed by maize, rice and poultry which have, over the past decade, been the targets of several agricultural policy initiatives including direct fertilizer subsidies, Planting for Food and Jobs I & II, among others. These policies have, among others, sought to improve production of small-scale farmers, improve livelihoods and foster vibrant and sustainable production. Goats, plantain and pineapple are shown to have the least policy support relative to the other value chains.

4.1.5.2 Agriculture food system (AFS) growth

In Figure 25, the best performing value chains in terms of the AFS growth indicator are rice, maize and oil palm, followed by fisheries, sorghum and goats. The rice value chain has strong off-farm processing linkages, both within the value chain (i.e., rice milling) and to other downstream industries (e.g., hotels and restaurants), which allows rice to have disproportionate AFS growth effects. Rice and other cereals, however, has weak impacts on diet quality, in part because it does not have strong income effects for low-income households in Ghana, but more importantly, because rice like other staples is already a significant part of food served in Ghanaian homes with little addition to a healthy diet. The relatively strong off-farm links of oil palm to food and chemical industries explains the value chain's high ranking in terms of AFS growth effects. It could come as a surprise that soybeans are ranked last but one on AFS growth since it is known for its downstream linkages to animal feed and oil crushing. Ghana continues to be a net importer of crude soybean oil and exports considerable quantities of raw soybean, suggesting that the primary production and linkages to the rest of the manufacturing sector are somewhat disconnected. Thus, although we would expect growth in this value chain to translate into strong growth beyond the farm, our model results suggest otherwise. Perhaps, due to the inability of our CGE model to adequately capture linkages with the soyabean processing sector, the total multiplier effect may have been underestimated. Hence, caution should be attached to interpreting the overall performance of the soyabean value chain.

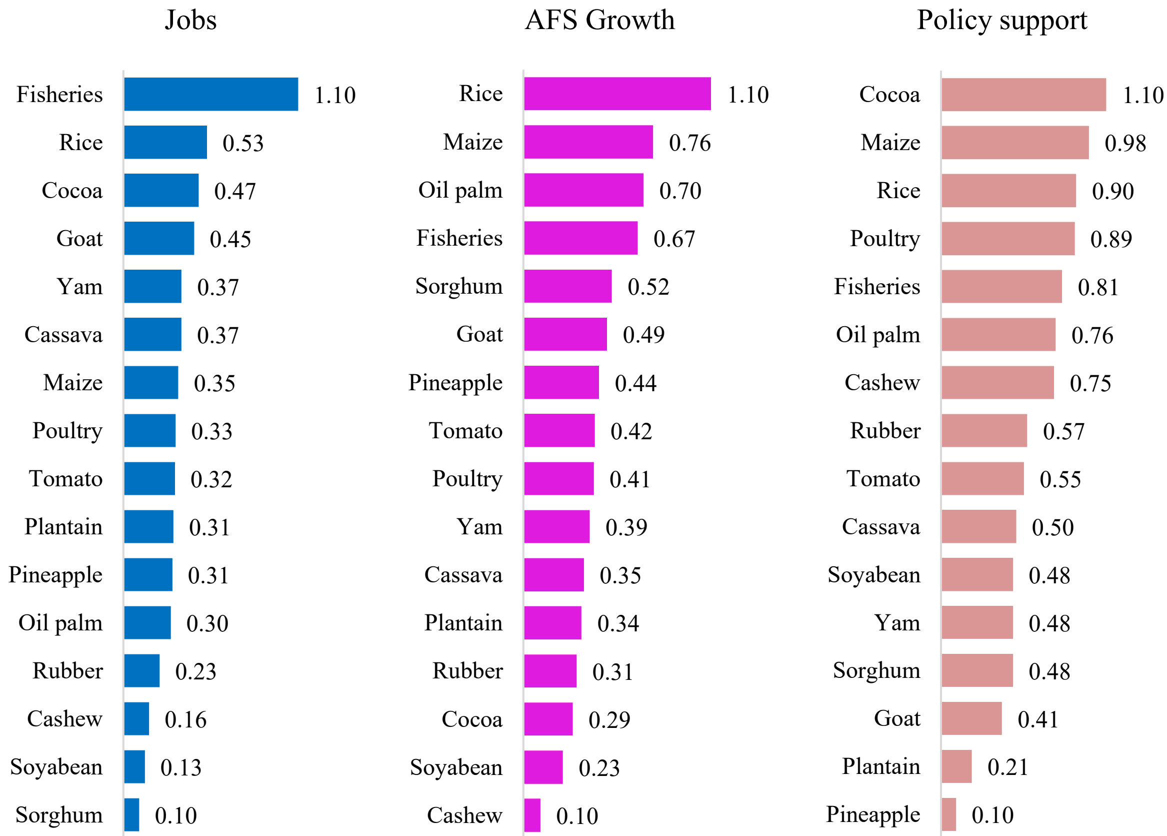


Figure 4: Development case indicators: AFS growth, jobs and policy support
Source: Authors' compilation

4.1.5.3 Job creation

The fisheries sector ranks highest in job creation. Its strong employment effect reflects the relatively labour-intensive nature of the sector such that a relatively small change in GDP poses a great number of off-farm jobs. The degree of job responsiveness to changes in GDP is thus influenced by the relative share of labour to value added. The second, third and fourth highest ranks are occupied by rice, cocoa and goat value chains, respectively.

4.1.5.4 Poverty alleviation

Tomato, pineapple, and cashew all have strong poverty-reducing effects. The strong poverty effect of Ghana's tomato sector likely reflects the strong backward linkages to fertilizer and other input sectors as well as downstream linkages to food processing and restaurants. (i.e., apparently, every meal in Ghana has tomato as an ingredient). Many of the actors involved in tomatoes, pineapple and especially, cashews tend to be poor, which may explain the strong poverty effects. Both the rubber and cocoa are major cash crops with large share of value-added (or profits) accruing to farmers, which results in relatively strong poverty effects for these two sectors.

4.1.5.5 Diet quality

Fruits, vegetables, oils and animal-source foods are an important element in a healthy diet, thus these value chains also perform relatively high on the diet quality indicator (see Figure 24). In this regard, productivity growth in these sectors raises supply and reduces prices of these products, thus reducing consumption shortfalls. The best-performing value chains in terms of diet quality are fruits and vegetables (i.e., pineapples and tomato, respectively). As in many other countries in Sub-Saharan Africa, fruit and vegetable consumption in Ghana is well below the required levels; therefore, growth in fruit and vegetable value chains has significant potential to reduce consumption gaps and improve the diet quality score.

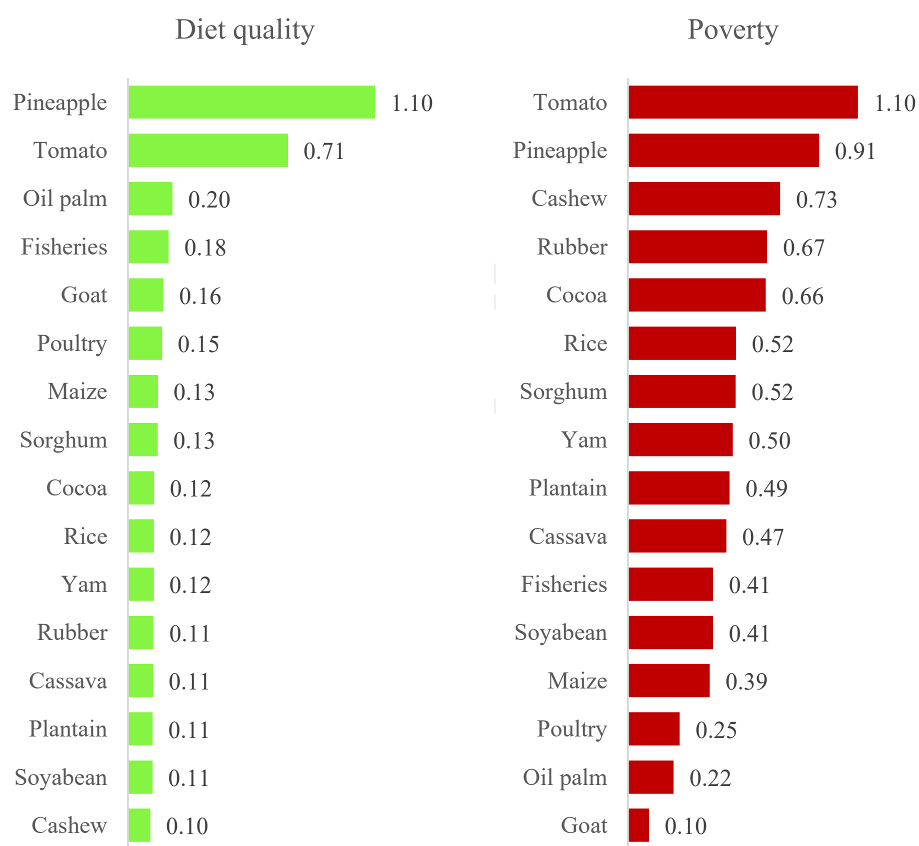


Figure 5: Development case indicators: diet quality and poverty alleviation
Source: Authors' compilation

4.1.6 Composite Indicator Scores

4.1.6.1 Aggregate Business Case scores and ranking

The final step is to combine all business-led indicators into a single composite indicator, as shown in Figure 23. The bars were decomposed to show the contribution of each indicator to the final composite score. The colors correspond to those used in Figures 19–22, while the labels show the initial ranking of a value chain in that indicator. Poultry, maize, and rice were ranked the highest in the business case. Poultry topped the overall ranking owing to its potential for intensification, expected domestic consumption growth, natural resource availability, and low production volatility. Similarly, maize came second because of its good performance in investment support, scalability, and natural resource availability. Rice and fisheries comprise the top four owing to their relatively high export advantage for rice and natural resource availability for fisheries, respectively. The least-ranked value chains are plantain, sorghum, and goats due to consistently low scores on all the indicators, particularly domestic consumption growth expectations, and lower scores for relative trade advantage and input costs per output.

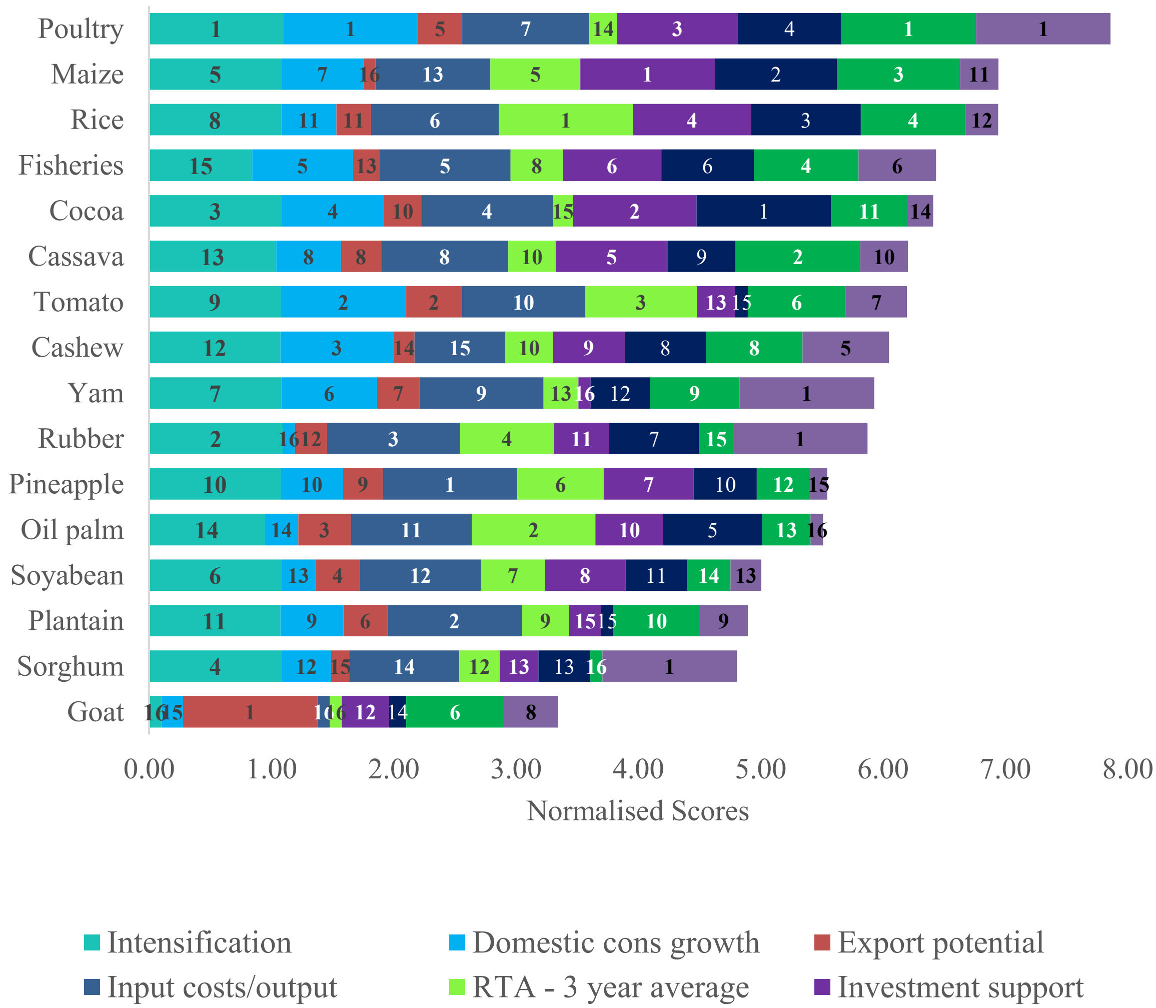


Figure 6: Business-case composite indicator ranking
Source: Author's construction

4.1.6.2 Aggregate Development Case scores and ranking

The final step is to combine all 6 indicators into a single composite development-case indicator, as shown in Figure 26. Fisheries, tomatoes, and rice were ranked highest in hunger alleviation, inclusive growth, and jobs. The rank for fisheries was mainly driven by high scores in job creation and hunger-reducing effects. On the other hand, other top-ranked value chains were due to higher poverty and hunger-reducing effects. Plantain, soyabean, and sorghum were the least ranked value chains due to their consistently low scores in hunger-reducing effects, diet quality, AFS growth, and potential for job creation.

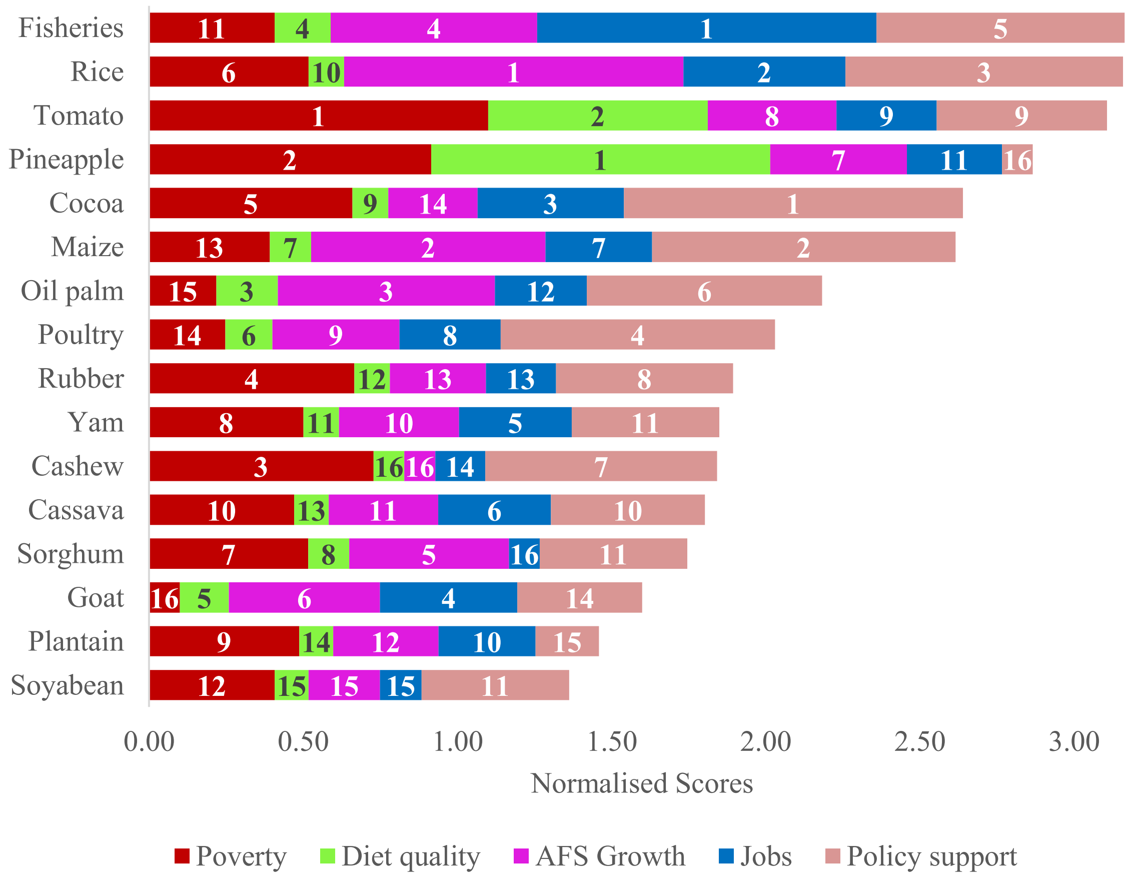


Figure 7: Development-case composite indicator ranking
Source: Author's construction

4.1.6.3 Combined Aggregate Scores and Ranking

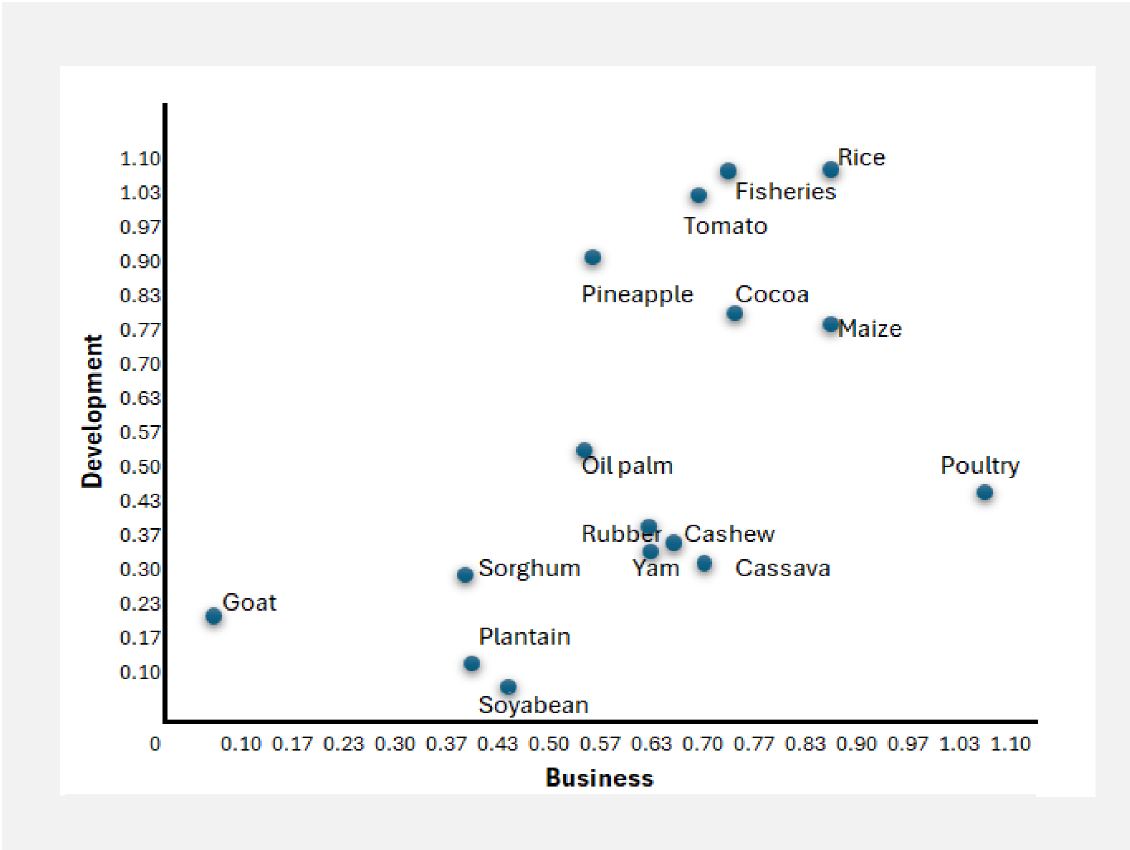
All individual indicators are combined into a single composite indicator to come up with a final value chain ranking. As has been evident from the discussion, each value chain had a unique set of rankings and often scored well in some indicators and poorly in others. The PPVC approach allows us to assess the various trade-offs in the selection and prioritization of value chains. Table 2 presents the ranks of the composite business and development indicators, and final rankings based on equal weighting of the composite scores.

Table 5: Composite business and development case ranking

Value Chain	Business	Development	Final Ranking
Rice	3	2	1
Fisheries	4	1	2
Tomato	7	3	3
Maize	2	6	4
Cocoa	5	5	5
Poultry	1	8	6
Pineapple	11	4	7
Oil palm	12	7	8
Cassava	6	12	9
Cashew	8	11	10
Rubber	10	9	11
Yam	9	10	12
Sorghum	15	13	13
Plantain	14	15	14
Soyabean	13	16	15
Goat	16	14	16

Source: Authors' computation

Rice production in Ghana is relatively competitive with further potential for intensification and import substitution. Thus, investments in the rice value chain, especially in high-yielding seed varieties, will unlock the massive potential to feed local demand and replace rising import bills. Reducing volatility in production through quality seeds and irrigation will have great impacts in food system transformation, poverty alleviation and job creation. Sufficient investment in processing technology will improve the quality of rice to satisfy domestic consumption and unlock export opportunities. Likewise, riding on existing policies to attract additional investments in the maize value chain can increase intensification and promote food system transformation. Tackling the rising soil degradation and weather variabilities that affect cocoa production, the value chain still holds much for intensification and overcomes the dwindling exports over recent years.



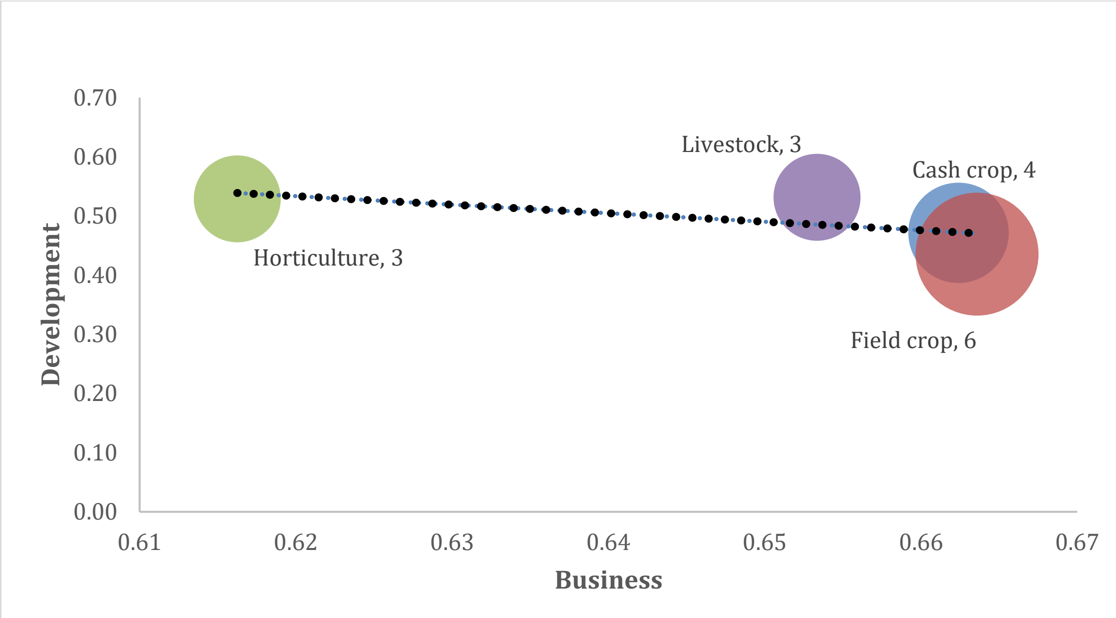
Indicators	v1	v2	v3	v4	v5	v6	v7	v8	v9	v10	v11	v12	v13	v14	v15	v16
Business	0.90	0.78	0.73	0.90	0.78	1.10	0.59	0.58	0.73	0.70	0.66	0.67	0.42	0.44	0.47	0.10
Development	1.10	1.10	1.07	0.80	0.81	0.47	0.93	0.56	0.34	0.37	0.39	0.37	0.31	0.15	0.10	0.23

v1=Rice, v2=Fisheries, v3=Tomato, v4=Maize, v5=Cocoa, v6=Poultry, v7=Pineapple, v8=Oil palm, v9=Cassava, v10=Cashew, v11=Rubber, v12= Yam, v13=Sorghum, v14=Plantain, v15=Soyabean, v16=Goat

Figure 8: Combined business and development-case indicator ranking
Source: Author's construction

4.1.6.4 Composite indicator scores for aggregate value chains

Horticultural crops (i.e., tomato, pineapple, and plantain) make a lot of development sense, especially in poverty alleviation, but not so elegant in business or market potential. This means that the as-is and projected state of horticultural value chains indicate lower opportunities for yield increase, relative trade disadvantages, lower policy, and investment support, despite a strong consumption growth outlook and potential for reducing poverty and improving diet quality (see Appendices 2 and 3 on detailed presentation of business and development case results for aggregate value chains). On the other hand, field crops, as well as cash crops, have high potential for intensification and high input-cost efficiency, among others, but are slack towards achieving development goals, including poverty alleviation and diet quality. However, livestock has very good outcomes in both business and development cases. This result is particularly interesting, as it provides a vivid description of where the opportunities and weaknesses reside in each aggregate value chain for prioritization.



Cash crop – Cocoa, Cashew, Rubber & Oil palm
Field crop – Rice, Maize, Cassava, Yam, Soyabean & Sorghum
Horticulture – Tomato, Pineapple & Plantain
Livestock – Fisheries, Poultry & Goat

Figure 9: Aggregate value chain ranking in combined business and development-case scores
Source: Author's construction

4.2 Discussion

A market-led approach to value chain prioritization ensures that selection is demand-driven that crowds-in investments (Promkhambut et al., 2023), self-sustaining through thriving business goals as well as achieving political feasibility by addressing structural development challenges (Woolfrey et al., 2021). From an economic perspective, a structural transformation of legacy value chains requires shifting scarce resources to targeted sectors, triggering diverse impacts in markets and households. Hence, using the PPVC approaches, the current ranking result for Ghana provides uncommon portfolio insights into each value chain, whether highest or least ranked, which has not yet been done.

The results from the case study indicate a delicate trade-off between sixteen value chains based on business and development significance. Particularly, rice consumption has risen exponentially over past two decades (i.e., 15.2kg[1] per capita in 2004 to 61kg in 2023[2]). Production is, however, yet to catch up and import bills

[1] Statistical, Research and Information Directorate, SRID, (2006)
[2] Statistical, Research and Information Directorate, SRID, (2021).

rising aggressively. Despite being on the front-burner of prioritization over the past decade, the sector is yet to achieve food sufficiency, create enough jobs and incomes for farmers and curtailing the country's import bills. Thus, investments in the value chain, especially in high-yielding seed varieties due to currently high yield gaps (i.e., high potential for intensification), could unlock massive growth to feed local demand and replace rising import bills. Thus, reducing volatility in production through quality seeds and irrigation would promote food sufficiency, poverty alleviation, and create jobs.

Similarly, the fisheries sector, specifically aquaculture, is one of the most competitive value chains. It has a relatively high score for intensification, which implies that sector yields are more likely to continuously increase over the next five years. Hence, supported by the relatively strong domestic consumption of fish and the large number of people employed, the sector holds the greatest prospects for creating jobs, growth, and improving the diet quality of Ghanaians.

Insofar as tomatoes feature prominently in every meal of Ghanaian, consumption is expected to continue to rise. Although the tomato sector is cost efficient and most effective at alleviating poverty through increased incomes of households connected to the sector, the sector is severely underfunded. Thus, despite the profitability of the sector, job creation remains relatively low, mainly due to low labour-intensiveness, but partly due to inadequate investments and low linkages with other sectors, like tomato processing.

Maize and cocoa complete the top five ranked value chains. These two sectors have consistently featured in successive government interventions in agriculture; hence, they are ranked (second and first, respectively) value chains in terms of policy support. Maize, for instance, is a key crop under the government's fertilizer subsidy program (2013-2016), Planting for Food and Jobs policies (I &II) (2017-2024). Despite their prominence in policy and investment discourses, Ghana yet imports maize from neighbouring Burkina Faso. In addition, the recent El Niño-Southern Oscillation (ENSO) spell in 2024 badly exposed vulnerable maize and cocoa sectors (Adimassu et al., 2024).

The bottom five value chains, yam, plantain, soyabean, sorghum, and goats, generally suffer low to moderate policy and investment support and slim intensification because reference commercial yields are still quite low. Plantain, for instance, until recently put under the PFJ II program, the value chain had not received much direct policy and investment interventions – often an orphan crop left to benefit indirectly from interventions in other value chains interplanted with plantains, such as cocoa, cashew, and maize. Thus, the key stakeholders in Ghana's agricultural value chain have low policy and investment support scores. The domestic consumption of plantain is projected to grow moderately compared with other value chains. This growth is partly accounted for by the boom in the fried plantain ('plantain chips') business.

Given their relatively high environmental support, plantains can alleviate hunger. However, this only occurs with increased and targeted investments in the value chain.

The opportunity for intensification was the lowest, implying a smaller gap between the projected yield of goats and the projected yields being slim when compared with the other value chains. This implies that more investment and effort will be required to revolutionize mutton production in slaughter weight, as well as to reduce the input cost per output ratio. Again, the sector has several business and development constraints such as low domestic consumption growth. Moreover, it has the least competitive production technique through an extensive free-range production system. The sector lacks critical investment, and the current production system is constrained by limited green pastures and water throughout the year.

4.3 Sensitivity Analysis

This section explores the robustness of the results by assessing the degree to which they are affected by variations in the long-run income elasticity estimates. One way to address this problem is to assume varying elasticities within feasible bounds if economic transformation. According to Muhammad et al., (2011) and Seale Jr et al. (2003), low-income countries are more responsive to income changes than high-income countries. Specifically, Muhammad et al., (2011, p25) estimated the average responsiveness of food commodities to income by the least developed countries to be 0.779, while for middle-income countries, it was 0.657 and 0.495 for high-income countries. Also, a meta-analysis of income elasticities for food, calories, and nutrients across Africa by Colen et al., (2018) predicted the mean income elasticity to be 0.61. Notwithstanding, we test the sensitivity to fluctuations in elasticity from 0.5 (moderately inelastic) to unity and present the evidence in Figure 10. Clearly, for as much as 50 percent variation in income elasticity, the results are stable and somewhat precise, with a maximum one-point rise from elasticity of 0.5 to 1.

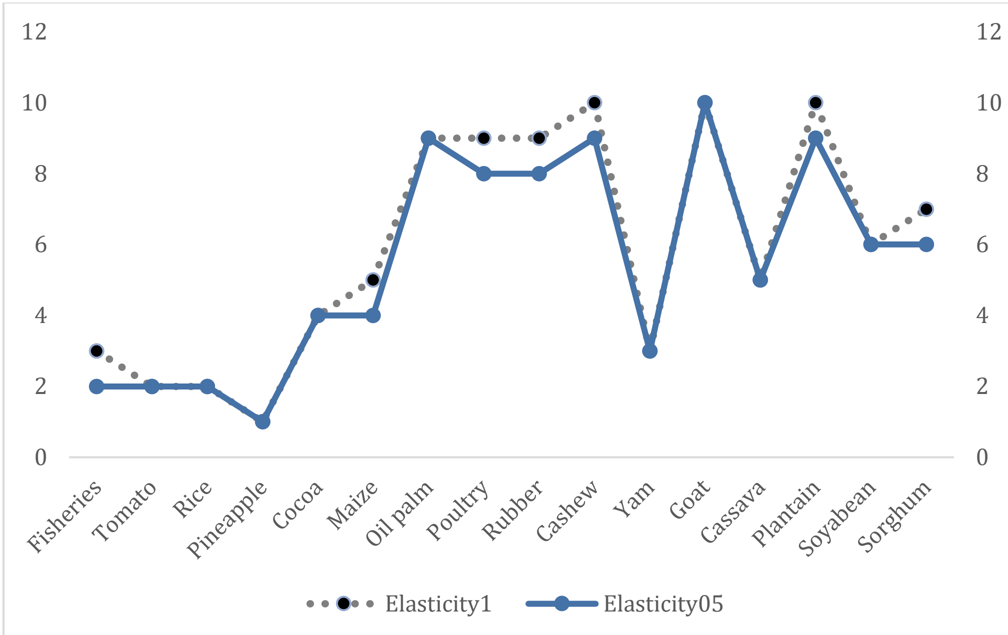


Figure 10: Sensitivity to variations in income elasticity
Source: Author's construction

4.4 Conclusion

Inclusive agricultural transformation has been almost elusive in most agriculture value chain prioritizations practiced for several decades in Africa. The PPVC market-led approach produces a unique portfolio blend of current and projected business and development outcomes that promotes enterprise profits, income, and inclusive transformation. The strengths of this new prioritization methodology include a unique blend of data and expert insights through stakeholder collaborations, from identification to the selection of ranked value chains for a subsequent deep dive.

Our case study results for Ghana reveal new insights into value chains that hitherto had not been sufficiently prioritized. The top three value chains, namely fisheries, rice, and tomatoes, offer the best business and development opportunities that can inclusively transform Ghana's agriculture sector. Nonetheless, for specific policy targeting, a deep dive to unravel detailed temporal and spatial dynamics of each value chain will be required to determine the exact mix of policy levers that could uplift a value chain from as-is state to an ideal state.

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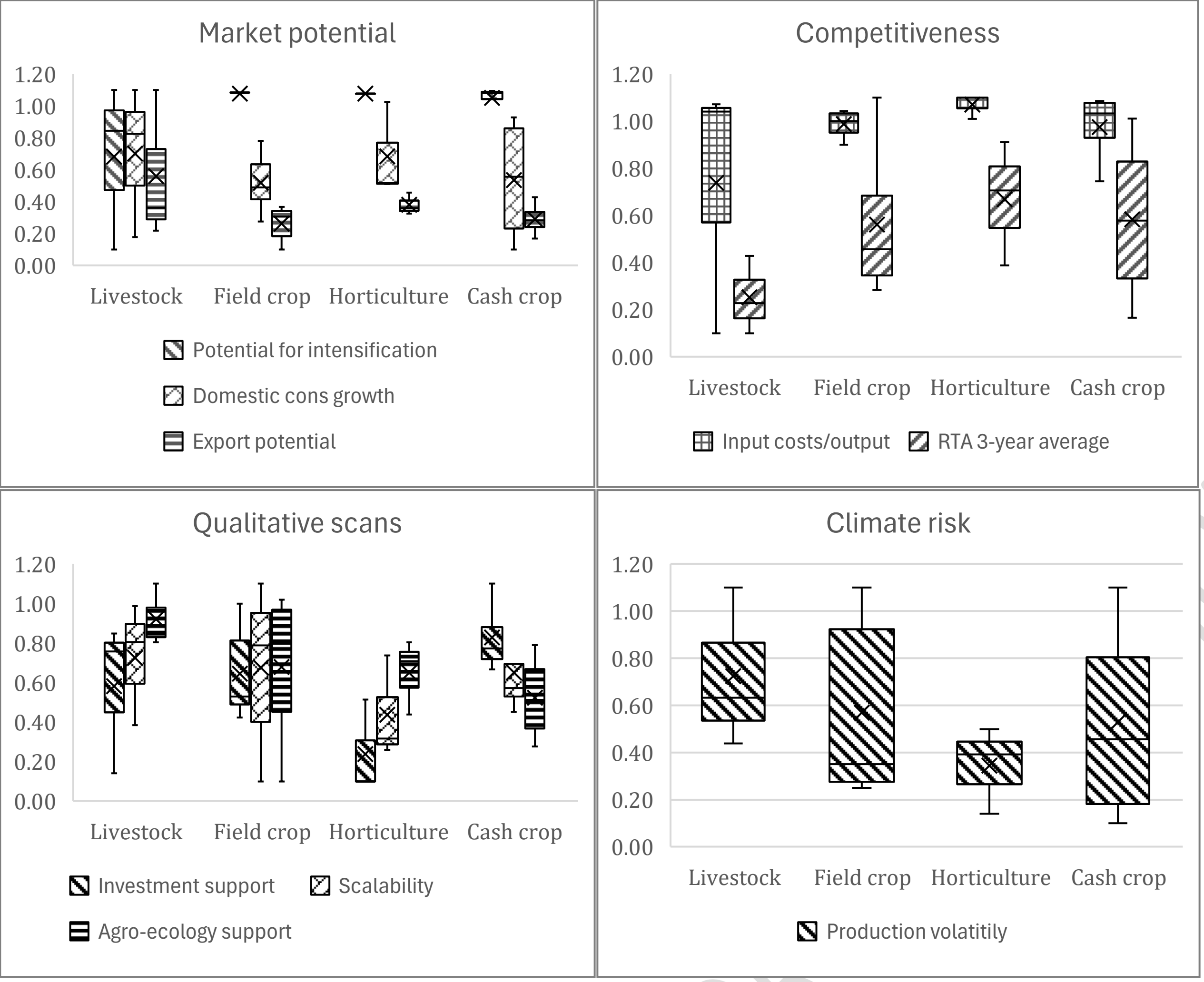
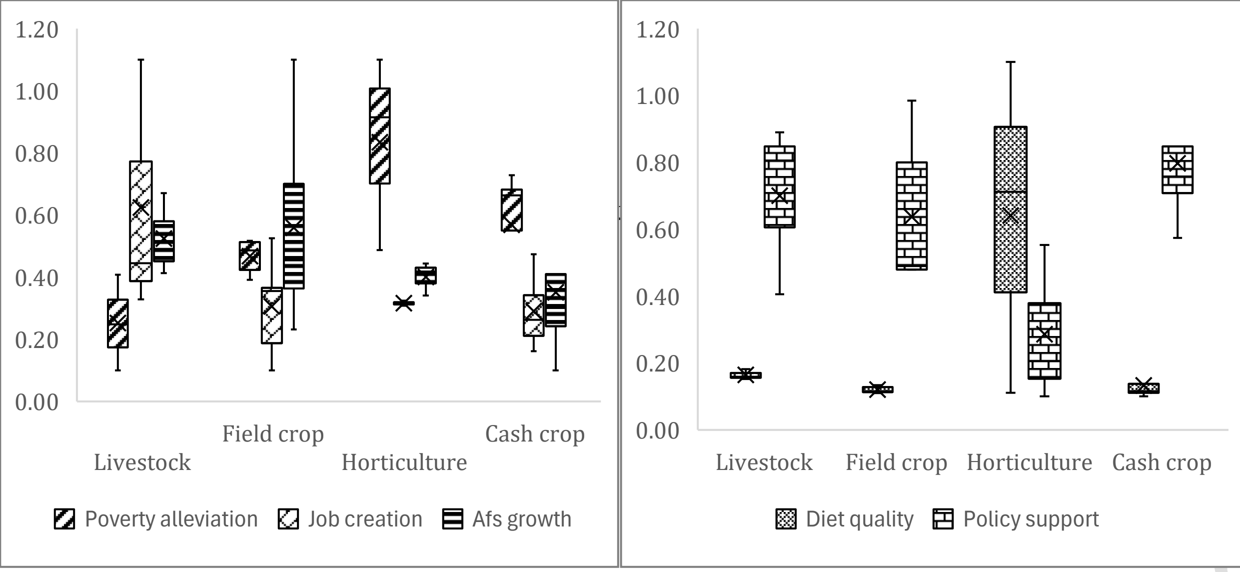
Appendices

Appendix 1. Raw Indicator Scores

Method	Indicator	Unit	Rice	Maize	Cocoa	Oil palm	Fisheries	Soyabean	Yam	Pineapple	Cassava	Tomato	Poultry	Rubber	Cashew	Sorghum	Goat	Plantain
Partial Equilibrium	Domestic consumption growth	Percent	2.12	3.43	4.45	1.05	4.37	1.06	4.11	2.48	2.59	5.58	6.03	0.00	4.99	1.83	0.47	2.50
	Regional export potential	Percent	3.19	-13.17	4.98	16.05	-2.71	10.60	8.82	6.86	7.21	18.52	9.99	1.42	-7.02	-8.75	75.75	9.89
	Potential for intensification	Ratio	0.02	0.18	0.25	-8.21	-14.43	0.15	0.13	-0.27	-2.51	-0.21	1.14	0.74	-0.48	0.20	-59.69	-0.43
	Input cost/use ratio	Ratio	1.34	3.42	0.70	2.38	0.76	2.48	1.89	0.19	1.41	2.00	1.38	0.49	7.34	4.22	20.29	0.20
	RTA	Ratio	2.20	1.02	-0.83	1.91	0.02	0.33	-0.45	0.92	-0.11	1.59	-0.63	1.13	-0.11	-0.30	-1.05	-0.11
	Production volatility	Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Qualitative Scans	Scalability	Scale: 1-3	2.73	2.85	2.77	2.37	2.59	2.46	1.97	2.53	2.69	2.16	2.75	2.28	2.40	2.16	2.22	2.11
	Investment Support	Scale: 1-3	2.65	2.75	2.85	2.56	2.51	2.26	2.24	2.27	2.31	1.86	2.60	2.49	2.42	2.18	1.90	1.86
	Natural resource availability	Scale: 1-3	2.51	2.62	2.34	2.17	2.51	2.14	2.42	2.20	2.63	2.47	2.69	2.08	2.46	1.95	2.47	2.40
	Policy support	Scale: 1-3	2.69	2.77	2.88	2.56	2.6	2.29	2.29	1.93	2.31	2.36	2.68	2.38	2.55	2.29	2.22	2.03
Ge	Poverty	Elasticity	-0.65	-0.08	-1.09	0.59	0.00	0.00	-0.39	-2.11	-0.28	-2.78	0.45	-1.02	-1.35	-0.48	1.07	-0.32



Cash crop –Cocoa, Cashew, Rubber & Oil palm
Field crop – Rice, Maize, Cassava, Yam, Soyabean & Sorghum
Horticulture – Tomato, Pineapple & Plantain
Livestock – Fisheries, Poultry & Goat



Case

Cash crop –Cocoa, Cashew, Rubber & Oil palm
Field crop – Rice, Maize, Cassava, Yam, Soyabean & Sorghum
Horticulture – Tomato, Pineapple & Plantain
Livestock – Fisheries, Poultry & Goat