VCA4D
VALUE CHAIN ANALYSIS FOR DEVELOPMENT

agrinatura for European Commission

Value chain analysis of coffee in Tanzania

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The information and knowledge produced through the value chain studies are intended to support the Delegations of the European Union and their partners in improving policy dialogue, investing in value chains and better understanding the changes linked to their actions

VCA4D uses a systematic methodological framework for analysing value chains in agriculture, livestock, fishery, aquaculture and agroforestry. More information including reports and communication material can be found at: https://europa.eu/capacity4dev/value-chain-analysis-for-development-vca4d-

For this VCA4D study COLEAD (https://www.colead.link/) has provided information on market trends on national, regional and international markets and useful complementary elements or sources.

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ACRONYMS (in alphabetical order)

AMCOS: Agricultural Marketing Cooperative Societies
AVC: Arabica Value Chain
CBD: Coffee Berry Disease
CCROs: Certificates of Customary Right of Occupancy
CMA: Commission for Mediation and Arbitration
CPUs: Central Pulping Units
CVC: Coffee Value Chain
CWD: Coffee Wilt Disease
DRC: Domestic Resource Cost
EUDR: EU Deforestation Regulation
FGD: Focus Group Discussion
GDP: Gross Domestic Product
HH: Household
HHPs: Highly Hazardous Pesticides
ICA: International Coffee Agreement
IPM: Integrated Pest Management
ISFM: Integrated Soil Fertility Management
ITC: Information and Communication Technology
MTZS: Million Tanzanian Shillings
NOP: Net Operating Profit
NPC: Nominal Protection Coefficient
PACSMAC: Participatory Analysis and Capacity Strengthening for Market Access and Competitiveness
RVC: Robusta Value Chain
SACCOS: Savings and Credit Cooperative Societies
SMEs: Small and Medium-sized Enterprises
TCB: Tanzania Coffee Board
TMX: Tanzania Mercantile Exchange
USP: Unique Selling Point
VCA4D: Value Chain Analysis for Development
VGGT: Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries, and Forests in the Context of National Food Security
VICOBA: Village Community Banks
VSLAs: Village Savings and Loan Associations

DEFINITION OF ECONOMIC TERMS

Economic terms	Definition
Net operating profit (NOP) (without valuing unpaid family labour)	(Revenues – Expenses) – Depreciation
Direct value added (VA)	The sum of the VA generated by all the actors operating within the VC limits (i.e. actors producing, processing or channeling the VC product)
Indirect VA	The sum of the VA generated by all the suppliers external to the VC (i.e. actors providing intermediate goods and services to the VC actors, therefore not handling nor processing the VC products)
Total VA	The sum of the direct and indirect VA
Rate of integration within the domestic economy	The portion of the value of the VC production which eventually remains within the national economy Rate of integration = Total VA / Production of the VC
Driving effect ratio	It informs on the involvement of domestic business in supporting the activities of the VC. Driving effect ratio = Indirect VA / Direct VA
Public funds balance	Impact on public funds= Benefits [*Total taxes* + *Total OP of public companies*] - Costs [*Subsidies* + *other public outlays*]
Balance of trade	Impact of the VC on balance of trade = VC exports – VC Total imports (inputs/ good and services/intermediate consumptions)
Nominal Protection Coefficient (NPC)	It compares the national and international prices of every VC product. NPC= Domestic price of the product / International parity price of the product
Domestic Resource Cost Ratio (DRC)	It compares (i) the actual internal cost for the economy given by the actual remuneration of the domestic non-tradeable factors (e.g. labour, capital, land, environmental goods) mobilised in the VC, and (ii) the net value created within the economy: estimated using international parity prices (of IC and production), i.e. from the opportunity standpoint of international markets. DRC= Non-tradeable domestic factors at market price (excluding transfers) / (Production at international price – Tradeable intermediate goods and services at international prices)

EXECUTIVE SUMMARY

Within the framework of the EU-Agrinatura VCA4D programme, a comprehensive analysis has been conducted on Tanzania's coffee value chain to evaluate its performance and sustainability. The study examined economic contributions, social inclusiveness, and environmental impacts in order to understand the sector's role in development and identify where support could enhance its benefits. The coffee sector in Tanzania is a cornerstone of the national economy, acting as a vital agricultural export and supporting the livelihoods of an estimated 2.6 million people. Tanzania stands as Africa's fourth-largest coffee producer, having significantly increased its annual output from around 37,000 tonnes in 1997/98 to 82,500 tonnes in 2022/23. Despite holding less than 1% of the global market, Tanzania's Arabica coffee commands premium prices, and its early harvest season provides a competitive edge. This analysis delves into the functional, economic, social, and environmental aspects of the Tanzanian coffee value chain (CVC).

Overview of the Tanzania Coffee Value Chain

Key Aspects of Coffee Production and Trends

Shifting Species Dominance: Historically, Arabica coffee constituted 70-75% of total production. However, over the past two decades, Robusta's share has grown significantly, reaching approximately 53% of total coffee exports by 2022/23, largely due to expanded cultivation in the Kagera region.

Regional Variations: Robusta is predominantly grown in the Western Zone, with Kagera accounting for over 95% of Tanzanian Robusta and 45-60% of the country's total coffee output. Arabica is primarily cultivated in the Southern Highlands (Songwe, Ruvuma, Mbeya) and the Northern Zone (Kilimanjaro, Arusha). Kagera's production surged by nearly 150%, while Ruvuma's Arabica output more than doubled. Conversely, the Northern zone has seen stagnant or slightly decreased production.

Smallholder Dominance: Smallholder farmers account for an estimated 90-95% of national coffee production, typically on holdings less than 1 hectare. While 100% of Robusta comes from smallholders, Arabica sees 90-95% smallholder contribution, with the remainder from estates. The exact number of smallholder farmers (estimated between 320,000 and 600,000) remains uncertain, partly because only about 50% are registered with the Tanzania Coffee Board (TCB).

Challenges in Coffee Production: Global coffee price fluctuations are a major driver of production changes. Other significant challenges include aging coffee plants, reliance on older varieties susceptible to pests and diseases (e.g., Coffee Leaf Rust, Coffee Berry Disease, Coffee Wilt Disease), and the exacerbating effects of climate change, which causes erratic yields and increased pest prevalence. Regionally, Kilimanjaro faces land scarcity and potential labour shortages due to urban migration and tourism competition. Kagera struggles with climate-induced erratic rainfall and the Black Coffee Twig Borer. The Southern Highlands face declining rainfall, rising temperatures, and increased vapour pressure deficit, necessitating adaptation strategies.

Governmental Policies and Regulations: The Coffee Industry Act of 2001 re-established the TCB as the main authority, aiming to enhance production, processing, marketing, and quality control through mandatory grower registration, licensing, and the Coffee Development Fund. While these measures have improved quality grading and market centralisation, smallholder farmers often lack access to resources like fertilisers and training, leading to inconsistent quality. Although there are no licensing fees and the statutory levy is limited to 1% of export value, administrative inefficiencies and additional contributions imposed at various stages still impede the system's effectiveness. The Direct Export of Premium Coffee License, intended to empower producers, sees limited uptake. Trade is regulated by

the TCB, with efforts to modernise the auction system via the Tanzania Mercantile Exchange (TMX). Taxation involves multiple levies, impacting profitability, especially for smallholders.

The Coffee Value Chain Structure: The CVC is complex, with distinct Arabica and Robusta structures.
Input Provision: Road transport is crucial, but poor rural roads increase costs. Electricity infrastructure is improving but still lags in productive coffee regions. Financing is a mix of donor funds, government initiatives (e.g., Tanzania Agricultural Development Bank), and private sector involvement, but smallholders still face limited access to affordable credit. Research by TaCRI focuses on disease resistance, yield, and quality. Seedling production and distribution efforts aim to address low yields. Agro-input use varies, with estates having detailed plans while smallholders rely on sub-optimal practices. Water use differs by region and processing method. Farmer training and extension services are generally inadequate.
Primary Processing: Arabica undergoes 'wet' processing (pulping, fermentation, sun-drying) to produce 'parchment coffee'. Most smallholder Arabica farmers process at home, impacting quality. Robusta undergoes minimal primary processing, mainly sun-drying. Informal cross-border trade of 'wetter' Robusta to Uganda is common.
Secondary Processing: This involves hulling, polishing, grading, roasting, and soluble coffee production.
Export, Quality, Marketing, and Consumption: Tanzania's Arabica is prized for its quality, with about 70% exported directly. Robusta, known for its robust body, is gaining global demand for blending. Direct sales now account for over 80% of coffee exports, bypassing auctions and providing higher, more stable incomes. Domestic consumption remains low (7-10%).
VCA4D Farmer Typology: The 2018 study categorised smallholders by land size. This typology has been retained for the present 2025 national study, but is adapted to reflect localised definitions of scale and the national heterogeneity in coffee farming systems.

Main Findings: Economic Contribution

The Tanzanian coffee value chain significantly contributes to national economic growth, though with distinct dynamics between Robusta and Arabica.

Profitability and Sustainability

Both Robusta and Arabica chains are profitable at each stage, but profit distribution and sustainability vary.
Robusta Coffee Chain Profitability: Primary producers collectively capture the largest share of Net Operating Profit (NOP) (over 60%), with large producers securing the highest NOP share (24%). Large Robusta producers show very high profit margins (nearly 78% return on turnover), followed by medium (68%) and small (55%) producers. Midstream actors (cooperatives, processors) operate on thinner margins (5-15%). Downstream actors (exporters, soluble coffee manufacturers) capture substantial profits (10-11% of total chain profit). Functionally, primary producers retain only 21.6% of total profits, while trade and export functions appropriate the largest share (43.9%), indicating market power asymmetry. Organic inputs dominate costs (66.0%), followed by labour (10.7%).
Arabica Coffee Chain Profitability: Profitability is more polarised, with medium-scale producers dominating (55% of total NOP) and achieving very high returns on turnover (around 67%). Smallholder Arabica producers hold a marginal position (4% of total chain profits). Large Arabica producers and estates account for 15-16% of total profit, but estates have lower margins (26%) due to high operating costs. Midstream actors also show limited profitability (around 4%). Arabica exporters claim a significant profit share (about 17%). Functionally, primary producers receive 21.6% of profits, while

trade secures the largest share (44.8%). Fertiliser is the dominant cost (57.7%), reflecting high input intensity.

Comparison of Profitability and Sustainability: While Robusta appears to have a broader distribution of profits across actor groups, it masks severe individual-level income inequality, with an exceptionally high Gini coefficient of approximately 0.83. This is because 96% of actors (primarily farmers) collectively earn only 30% of the total income, while 4% of actors secure 70%. The Arabica chain, despite profit concentration among medium farms, exhibits a lower Gini coefficient (approximately 0.46), indicating relatively more equitable distribution among its actors. Both chains are profitable overall, but strategic investments are needed for mid-chain actors and inclusive strategies are imperative to uplift smallholders.

Contribution to National Economy (GDP, Public Finances, Balance of Trade)

Value Added Generation: The Robusta value chain generates a Total Value Added (VA) of approximately 556,000 million Tanzanian Shillings (MTZS), with a positive indirect VA, indicating a healthy driving effect. The Arabica value chain has a lower Total VA of 357,203 MTZS, with a negative indirect VA due to heavy reliance on subsidised, likely imported, fertilisers. The National Coffee Value Chain generates a total VA of 913,203 MTZS.

Contribution to Gross Domestic Product (GDP): The combined National Coffee Value Chain contributes approximately 0.5% to Tanzania's total GDP and about 8.3% to the agricultural GDP, highlighting its significant role within the agricultural sector.

Economic Integration and Driving Effects: The Robusta chain shows a high integration rate of 95%, primarily using local resources, with a positive Driving Effect Ratio (0.16). The Arabica chain has a lower integration rate (67%) due to significant dependency on imported inputs, leading to a negative indirect VA. Overall, the national CVC is strongly inward-oriented (81% of value added domestically), but this average hides the disparity between the two sub-chains.

Contribution to Public Finances: The Robusta chain is a net contributor to the state budget, with a positive balance of 22,866 MTZS. The Arabica chain, however, is a net recipient of public funds, with a deficit of 51,021 MTZS, primarily due to substantial fertiliser subsidies. In aggregate, the national coffee sector is a net recipient of public funds, with a combined deficit of 28,155 MTZS.

Contribution to the Balance of Trade: Both chains contribute positively to the balance of trade. The Robusta chain shows a substantial positive trade balance of 536,494 MTZS, with minimal imports. The Arabica chain also has a positive trade balance (365,529 MTZS), but with considerably higher imports, mainly for fertilisers. The National Coffee Value Chain generates a combined trade balance of 901,745 MTZS.

International Competitiveness and Viability

The Nominal Protection Coefficient (NPC) for Robusta is 0.93 (slight implicit tax), while for Arabica it is 1.16 (implicit subsidy, largely due to fertiliser subsidies). The Domestic Resource Cost (DRC) for Robusta is 0.04, and for Arabica, it is 0.06. Both values are well below 1, indicating that both value chains are inherently viable and competitive in the global economy, efficiently utilising domestic resources. Robusta's competitiveness is robust, while Arabica relies more on policy support.

Main Findings: Social Sustainability

The Arabica and Robusta CVCs contribute to inclusive growth by providing market access for approximately 465,216 smallholder households and around 42 estates, benefiting an estimated 2.6 million people. Smallholders dominate production (95% of Arabica, 100% of Robusta).

Working Conditions
The sector relies heavily on highly seasonal and predominantly informal labour, with most workers in production and primary processing. A significant portion is unpaid household labour, largely unrecognised and outside formal legal protections. While Tanzania has a robust legal framework, it primarily benefits formal employees on large estates. Social insurance uptake for informal workers is low. Certification schemes promote better practices but have limited sector-wide coverage. Child labour has reportedly declined, but children often contribute to family farms. Job safety risks persist in informal settings due to limited awareness and a lack of Personal Protective Equipment (PPE).

Land and Water Rights
Most smallholders operate under customary land tenure, with formal titles (Certificates of Customary Right of Occupancy or CCROs) being rare and slow to formalise. Gender inequality is evident, with women often excluded from land titles. Land access influences coffee expansion, with more availability in Ruvuma and Kagera contrasting with scarcity in Kilimanjaro. Large Arabica estates operate under older, less transparent land rights. Water rights formalisation can disadvantage small-scale users. TCB's re-registration efforts for EU Deforestation Regulation (EUDR) compliance are slow, with only about 50% of farms reportedly re-registered.

Gender and Youth Dynamics
Despite national progress in gender equity, structural, institutional, and social inequalities persist in the coffee sector. Men predominantly control resources, production, marketing, and income. Women contribute significantly to labour (especially harvesting and post-harvest) but often have limited control over sales proceeds, leading to "side selling". Emerging cultural shifts are observed, with some women reporting land ownership and increased involvement in decisions. Youth face barriers to land access and income control. The gender gap in coffee income represents 44% of women's structural disadvantages. Women are often excluded from training and credit, though they access informal support groups like Village Savings and Loan Associations (VSLAs). Decision-making over coffee income is a critical area, often leading to intra-household conflict. Women's heavy workload contributes to time poverty, hindering participation in training and other activities.

Food and Nutrition Security
Coffee income can enhance household food security by increasing purchasing power and enabling investment in staple crops. Male farmers generally report better food security outcomes. The seasonal nature of coffee income creates financial challenges, leading to "side selling" or selling immature coffee as a coping mechanism. Farmers widely adopt mixed cropping systems and livestock keeping to diversify livelihoods and ensure year-round food availability. Delayed payments from AMCOS exacerbate resilience challenges. Some coffee-growing regions show high rates of malnutrition, suggesting that income alone does not guarantee nutritional adequacy, possibly due to demanding workloads for women.

Social Capital
The capacity and trustworthiness of Agricultural Marketing Cooperative Societies (AMCOS) are critical concerns. Many AMCOS struggle with weak governance, poor management, and limited infrastructure, leading to delayed payments, lack of pre-season credit, and insufficient input support. This erodes farmer confidence and fuels informal "side-selling". The 2018 "Mlangoni Mmoja" directive led to rapid AMCOS creation, but many remain basic. Financial capital is a major constraint for AMCOS. Information asymmetry persists, with farmers often having limited market price knowledge. Online

trading (TMX) aims to improve transparency. Women often form informal support groups (VSLAs) to gain capital and collective bargaining power.

Living Conditions

Coffee farming, when supported by robust institutions, training, and market access, positively influences smallholder livelihoods. Farmers invest coffee income in housing, healthcare, and education. Coffee income is crucial for healthcare access, though regional disparities in facilities persist. It also enables access to education, with school fees being a priority, but delayed payments and competing demands can hinder consistent benefits. The next generation of coffee farmers is likely to achieve higher education levels.

Main Findings: Environmental Sustainability

The environmental analysis reveals a nuanced picture: coffee production in Tanzania has significant environmental impacts, but there is substantial scope to improve sustainability through better farming practices. The analysis indicates that the cultivation stage is the predominant driver of environmental impact across the entire value chain, influencing human health, fossil fuel resource depletion, and ecosystem quality. Coffee yield and efficient agro-input use are key determinants. High mineral fertiliser use and lack of agricultural lime cause terrestrial acidification and eutrophication. Inadequate wastewater management from Arabica wet processing and N-fertiliser runoff causes freshwater acidification. Global Warming Potential (GWP) is driven by land use change, mineral fertiliser use, and untreated coffee pulp effluent. Water impact is linked to productivity and irrigation/wet processing efficiency.

The analysis consistently shows that coffee yield is the most influential determinant of environmental impact. High-input systems, while productive, can increase human health impacts and fossil fuel depletion if inefficient. Low-input systems, with very low yields, suffer from poor land-use efficiency and negative ecosystem quality impacts. Robusta smallholders in Kagera are low-input, while Arabica smallholders in Mbinga are medium-input with low yields. Arabica estates are high-input with high yields.

Coffee Yield and its Determinants

Arabica yields in Ruvuma (303 ± 65 kg/ha) are significantly higher than Robusta yields in Kagera (104 ± 35 kg/ha). Arabica estates are 2–6 times more productive than smallholders, showing better land use efficiency. Farmers consistently identify adverse weather (37.2%), lack of capital for agro-inputs (36.3%), and pests/diseases (28.7%) as major yield-limiting factors.

Energy Demand and Fossil Resource Depletion

Precise quantification is challenging due to harmonisation issues. Primary processing (if mechanical) and coffee cultivation (via fertiliser production and irrigation fuel) are the main contributors. Robusta sun-drying and minimal mineral fertiliser use in Kagera result in low energy demand. Arabica Central Processing Units (CPUs) often use old pulpers, suggesting room for efficiency improvements.

Fertiliser Use Efficiency and Environmental Impact

In Mbinga, 71% of Arabica farmers use both mineral and organic fertilisers, while 28% use only mineral fertilisers, indicating an opportunity to improve efficiency. In Kagera, 82% of Robusta farmers use only organic inputs, with very low yields, prompting a reassessment of economic benefits. Less than 1% of smallholder farmers apply lime, a critical input for nutrient uptake and fertiliser effectiveness. In

Mbinga, N-focused fertilisers are common, but limited use of P and K fertilisers suggests these are yield-limiting. Integrated Soil Fertility Management (ISFM) is recommended.

Acidification, Eutrophication, Human Health, Ecotoxicity

Terrestrial acidification is primarily caused by N-based fertilisers. Freshwater acidification results from coffee pulp effluent (Arabica wet processing) and N-fertiliser runoff. Eutrophication is linked to N- and P-based fertilisers and untreated pulp effluent, though industrial and sewage wastewater are primary sources in Sub-Saharan Africa. Pesticides are the main contributors to ecotoxicity. In Kagera, pesticide use is minimal. In Ruvuma, all Arabica farmers use some form of pesticide, posing potential human health and ecotoxicity risks, with over 40% of farmers reportedly overexposed. Integrated Pest Management (IPM) and safer alternatives are needed.

Water Use (Irrigation & Wet Processing)

Water impact indicators are challenging to quantify. Most estates irrigate, with some using precise calculations, but sprinkler irrigation consumes 10 times more water than drip irrigation. Only a small percentage of smallholders use irrigation.1 Water use is minimal for Robusta (natural processing). All Arabica uses wet processing, which is water-intensive, and improving efficiency at CPUs is crucial.

Land Use Change, Deforestation, and Biodiversity

Prior land use for coffee varied: over half in Kagera was grassland, while in Mbinga, 44% was natural forest. Only 8.37% of coffee plots in the study were established after December 31, 2020. Post-2020 coffee-driven deforestation in Kagera is insignificant (<1%), and in Mbinga, only 1.23% of recently established plots were converted from 'forest' under EUDR criteria. Despite minimal recent deforestation linked to coffee, the EUDR is already having unintended and disproportionate negative effects on smallholder farmers in Kagera. Significant deforestation from natural forest to coffee occurred in Mbinga, but primarily before 2021. Land Use Change is often the primary driver of GWP. Promoting coffee agroforestry, increasing yields, and improving fertiliser use efficiency are key to improving GWP impact. Estates likely have a lower GWP impact due to higher land use efficiency. Tree diversity in coffee systems varies; Mbinga's Arabica farms have very low diversity, dominated by *Grevillea robusta*, while Kagera's Robusta systems show greater species richness, overall diversity remains limited.

INTRODUCTION

The Value Chain Analysis for Development (VCA4D) initiative, funded by the European Commission, conducts in-depth studies on agricultural value chains to support evidence-based dialogue and policy design. At the request of the EU Delegation to Tanzania, in collaboration with the Government of Tanzania, this study provides a comprehensive assessment of the Tanzanian coffee sector. It follows an earlier VCA4D study on Arabica coffee in the Southern Highlands (2018) but should not be viewed as a direct update or as an impact assessment of EU interventions. Instead, it broadens the scope to a national perspective, covering both the Arabica and Robusta sub-chains and reflecting the sector's evolving policy and market environment.

The 2018 study concentrated on Arabica production in the Songwe and Mbeya regions. Its findings contributed to the design of subsequent EU programmes such as AGRI-CONNECT and MARKUP II, while also coinciding with a moment of significant policy changes. At that time, reforms compelled most coffee to move through AMCOS and Tanzania Coffee Board auctions, initially banning private farm-gate sales. These measures disrupted established buyer relationships, raised transaction costs, and created uncertainty for investors. Although later pro-farmer reforms, such as the reinstatement of direct export contracts in 2021 (now covering around 80% of Arabica exports), the reduction of export levies in 2022, and increased focus on rehabilitating existing farms, have helped to stabilise the sector, the legacy of abrupt policy shifts has left many stakeholders with a perception of instability. Output has remained largely static, with 2023/24 production estimated at 1.35 million 60-kg bags, well below the Government's stated ambition of reaching 300,000 tonnes.

The scope of the 2025 VCA4D study was deliberately broader. The team extended the analysis to include Robusta production in Kagera, now contributing nearly half of the national output but absent from the earlier study, as well as Arabica production in Ruvuma, the largest contributor among the Southern Highlands. The intent was not to replicate the detailed focus of 2018 but rather to provide a wider national overview, incorporating key sub-chains that are now critical to Tanzania's coffee economy.

As part of this study, the team also considered lessons emerging from EU programmes such as AGRI-CONNECT and MARKUP II, both of which have targeted Arabica production zones in Ruvuma and Mbeya. While the evaluation of these programmes lay outside the remit of the VCA4D study, field visits and stakeholder interviews in these regions offered valuable insights. Where relevant, reflections from these programmes have been incorporated into the analysis to help situate current dynamics within the broader context of EU engagement in Tanzania's coffee sector.

Coffee is one of Tanzania's most strategic agricultural exports, underpinning rural livelihoods, generating foreign exchange, and contributing to government revenues. The crop is cultivated across an estimated 265,000 hectares by around 450,000 smallholder households, with over 90% of production exported, primarily to Europe and Asia. Despite this significance, the sector faces persistent challenges, including ageing tree stocks, low productivity, climate-related risks, volatile prices, high input costs, and limited access to credit. Recognising these challenges and opportunities, the EU and the Government of Tanzania commissioned this study to generate updated, evidence-based knowledge to inform future policies, programmes, and investment priorities, including support for compliance with new global regulations such as the EU Regulation on Deforestation-free Products (EUDR).

The study follows the established VCA4D methodology, which integrates primary and secondary data sources to address four framing questions:

1. What is the contribution of the value chain to economic growth?
2. Is this economic growth inclusive?
3. Is the value chain socially sustainable?
4. Is the value chain environmentally sustainable?

Evidence is drawn from government statistics, academic and grey literature, stakeholder consultations, and targeted fieldwork. The analysis was conducted by an interdisciplinary team of four experts: an economist, a social development specialist, an environmental specialist, and a national expert, ensuring a balanced and holistic approach.

Implementation was carried out in three phases (The details of the implementation of the study are presented in Table A0 in the Appendix). The first mission (16 November – 3 December 2024) launched the study through formal meetings with the EUD and the Government of Tanzania, followed by a national stakeholder workshop in Moshi. Field visits in Kilimanjaro and Kagera provided opportunities to engage directly with producers, traders, processors, private companies, NGOs, and government actors. This mission established the scope of the study and developed the functional analysis of the value chain. The second mission (January 2025) extended fieldwork to the Southern Highlands, focusing on Ruvuma and Mbeya/Songwe, to capture the dynamics of Arabica production in rapidly expanding production areas. Together, the two missions ensured representation of Tanzania's main coffee-growing regions.

To complement these activities, additional primary data were collected between May and June 2025 through a survey, focus group discussions, and one-to-one interviews with smallholder farming households in Kagera and Ruvuma. This exercise gathered insights from men, women, and youth, allowing a more in-depth understanding of household livelihood systems, labour dynamics, and the role of coffee within farming strategies. These perspectives enrich the analysis by grounding quantitative results in the lived realities of producers, particularly those most directly affected by structural and institutional constraints.

The findings of the study are structured around the four framing questions that guide the VCA4D approach. Chapter 1 provides a functional analysis of the coffee value chain. Chapter 2 assesses the contribution of the sector to economic growth, with attention to value addition, profitability, GDP, public finances, and trade. Chapter 3 explores whether this growth is inclusive, with emphasis on income distribution, gender, youth, and participation in governance. Chapter 4 examines the social sustainability of the value chain, focusing on labour conditions, equity, food security, and social capital. Chapter 5 evaluates environmental sustainability, addressing resource management, climate risks, and biodiversity. The report concludes with a synthesis of key findings and recommendations for policymakers, donors, and stakeholders.

By combining rigorous quantitative analysis with insights from local stakeholders and households, this study provides an updated and comprehensive picture of the Tanzanian coffee sector. It seeks to inform ongoing policy dialogue and investment planning, strengthen the competitiveness of the sector, and promote inclusive and sustainable growth for one of the country's most important agricultural value chains.

1. FUNCTIONAL ANALYSIS

The functional analysis aims to build an overall description of the value chain system. It identifies and characterises the main actors and stakeholders involved and expands on some of the main strategic development challenges faced. It also allows the VCA4D study team to elaborate a general, common understanding of the coffee value chain (CVC) operations and to confirm the scope of the subsequent analysis.

1.1 Coffee Production

Coffee production is crucial to Tanzania's economy as a primary agricultural export and a key driver of livelihoods in many rural communities. Tanzania is one of Africa's largest coffee producers, ranking as the fourth-largest producer of coffee on the continent, after Ethiopia, Uganda, and Ivory Coast. Ethiopia and Kenya surpass Tanzania in Arabica production, while Uganda and Ivory Coast surpass Tanzania in Robusta production.

1.1.1 National Production

Tanzania's coffee production expanded significantly during the 1970s and 1980s, as in many other African coffee-producing countries, as global prices were favourable (Bates, 1999). In the 1990s, Tanzanian production declined, which can be explained by the sharp decline in global coffee prices linked to the end of the International Coffee Agreement (ICA) in the 1990s. In 1989, the global coffee price collapsed because the ICA quota system broke down, temporarily leading to a global oversupply of coffee (Bates, 1999). In 1993, the ICA effectively ended as the USA withdrew, initiating renewed boom-and-bust cycles. The production decline of the 1990s is also linked to the emergence of certain coffee pests and diseases in epidemic proportions, such as coffee wilt disease (CWD) and coffee berry disease (CBD), made possible in part by the low coffee prices (Bates, 1999).

Tanzania's annual green coffee production has doubled over the last 25 years, increasing from about 37,000 tons in 1997/98 and 45,000 tons in 1998/99 to 82,500 tons in 2022/23 (*Figure 1.1*). However, although the trend is towards increasing production, it should be noted that the inter-annual variability in national production volume over this time is significant. In extreme cases, a two-fold difference could be observed between consecutive years in the period 2000 – 2013. Inter-annual variation seems to have decreased during the past decade, with a gradual stepwise increment in annual production over the past 5 years or so.

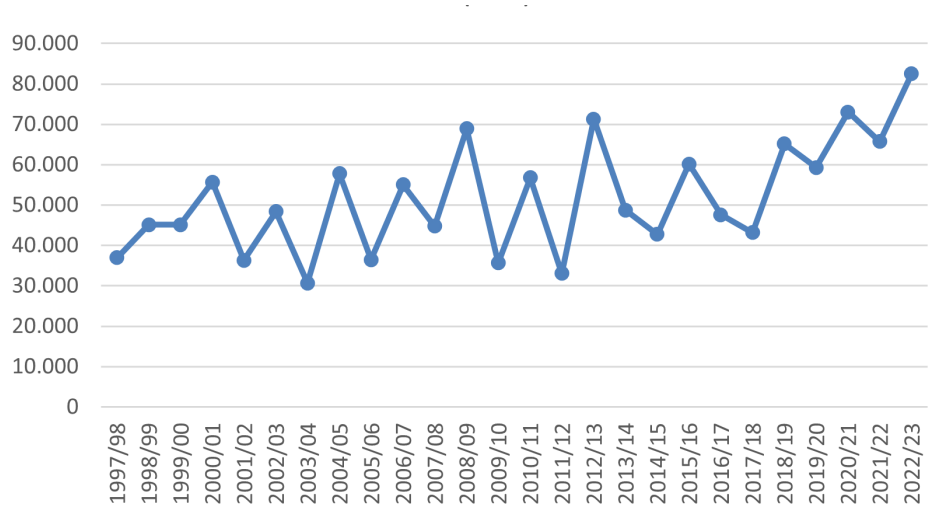


FIGURE 1.1 ANNUAL TANZANIAN COFFEE PRODUCTION (TONS OF GREEN COFFEE/YEAR) (SOURCE: TCB)

Historically, Arabica coffee has been the dominant species cultivated in Tanzania, accounting for around 70 – 75 % of total production. However, over the past two decades, production patterns have shifted toward a more balanced output between Arabica and Robusta. By 2022/23, Arabica accounted for around 47% of total coffee exports, down from 75% in 2000/01 (TCB, 2023), while Robusta rose to approximately 53%, up from just 25% in the same period (*Figure 1.2*). This shift reflects a significant expansion of Robusta cultivation, particularly in the Kagera region, while Arabica production has remained relatively stable.

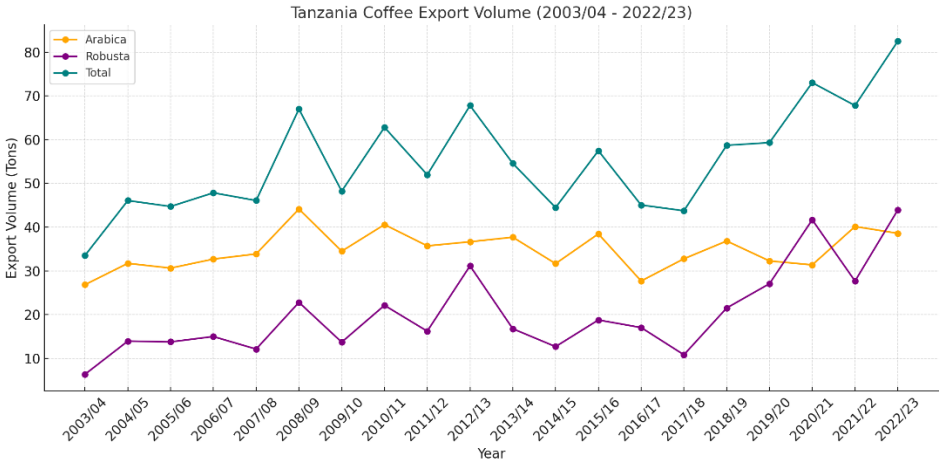


FIGURE 1.2 TANZANIAN COFFEE EXPORT VOLUME (TON GREEN BEANS) FOR THE PAST 20 YEARS-TOTAL, ARABICA AND ROBUSTA (TCB)

1.1.2 Regional Coffee Production

Robusta is predominantly grown in the Kagera region, part of the 'Western Zone' (Silvano et al., 2023; TCA, 2020). Arabica is primarily cultivated in the 'Southern Highlands zone' (Songwe, Ruvuma and

Mbeya) and the 'Northern zone' (Kilimanjaro and Arusha). The three distinct geographic zones in Tanzania are summarised below (*Figure 1.3*):

i. **Northern Zone** – Basically, all coffee grown here is Arabica. The primary production regions in this zone are Kilimanjaro (Moshi) and Arusha, with Manyara's (Tarime) and Tanga's production being of minor importance.

ii. **Western Zone** – The most productive region in this zone and in the country is Kagera (Bukoba), where more than 95 % of all Tanzanian Robusta is produced and about 45 – 60 % of all Tanzanian coffee (TCB, 2023). The Kigoma and Mara regions are of less importance and produce Arabica coffee.

iii. **Southern Highlands Zone** – The Southern Highlands is where most of the countries' Arabica production takes place. Major production regions are Songwe, Ruvuma (Songea) and Mbeya. In addition, there are also emerging coffee production areas, such as Iringa and Rukwa regions (TCB, 2021).

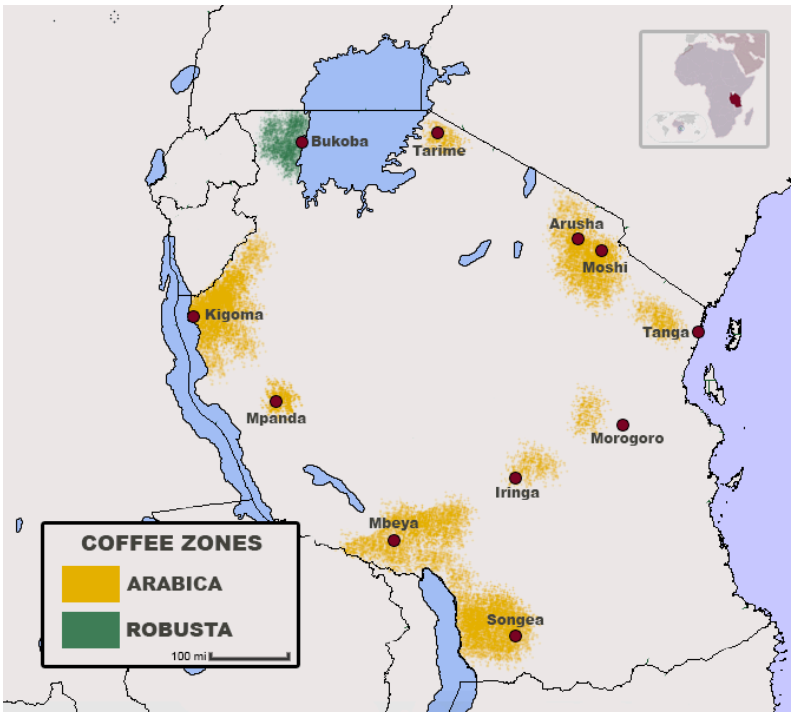


FIGURE 1.3 MAP OF MAJOR COFFEE-GROWING REGIONS IN TANZANIA (WIKIPEDIA)

It is estimated that 90 - 95 % of Tanzanian coffee is produced by smallholder farmers (100% of Robusta, 90-95% of Arabica), on land holdings of less than 1 hectare under a mixed cultivation system. Estates are estimated to account for the remaining 5 - 10 % of the national production, although the exact contribution is not known (TCB, 2012). Most estates can be found in the Northern zone, especially in the Kilimanjaro region, while only a few can be found in the Southern Highlands zone. There is also uncertainty over the number of smallholder farmers engaged with the value chain. The VCA4D study team found different sources quoting numbers ranging from 320,000 to 600,000 smallholder farmers. This is due, in part, to only a proportion of smallholder coffee farmers being registered with TCB (estimated to be 50% of all smallholder farmers - *pers. comm.*). Overall, coffee

provides an important source of income and employment (both directly and indirectly) for an estimated 2.6 million people (TCB, 2021). The coffee sector significantly contributes to Tanzania's foreign exchange earnings (TCB, 2021). We are currently waiting for TCB to share more recent data in order to validate and update this section.

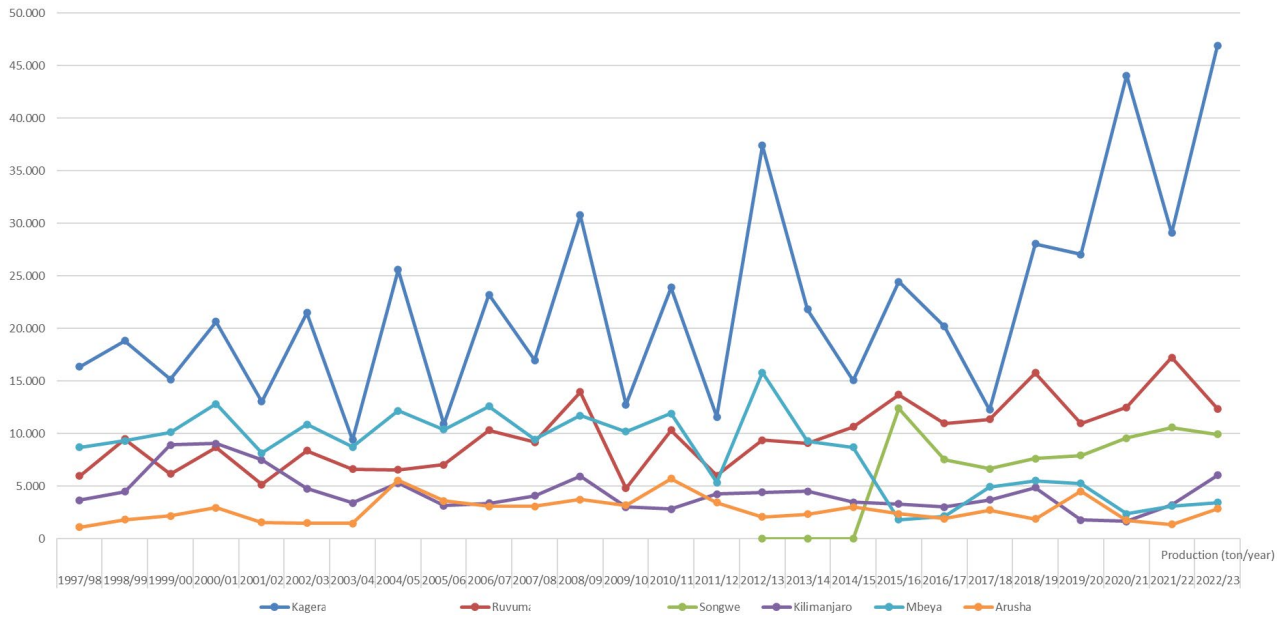


FIGURE 1.4 REGIONAL VOLUME OF TANZANIAN COFFEE PRODUCTION FROM 1997/98 - 2022/23 (TON GREEN COFFEE/YEAR) (TCB)

When comparing coffee production volumes per region from 2000/2001 to 2022/23, significant regional changes can be observed (*Figure 1.4*):

(i) Kagera production increased by almost 150 % from 20,000 to 47,000 tons, explaining the enormous increasing proportion of Robusta produced in Tanzania (*Figure 1.4*).

(ii) Production in the Southern Highlands has also been increasing significantly in the last two decades. Mainly due to increased production in Ruvuma, currently the largest producer of Arabica, where production has more than doubled from 5000 tons to 12,000 tons. While production in Mbeya and Songwe combined increased only slightly with a couple of thousands of tons over the past two decades. For ease of interpretation, we consider here Mbeya and Songwe as one region, though they were administratively divided into 2 regions from 2015 onwards due to political reasons.

(iii) Production in the Northern zone has remained rather stagnant or even decreased somewhat over the past 2 decades:

- In Arusha, Arabica production remained stagnant between 2000 and 5000 tons, now about 3000 tons.
- Production of Arabica in the Kilimanjaro region slightly decreased from 7500 tons to 6000 tons.

Overall, Kagera Region is now the most important coffee growing region, producing practically all Tanzanian Robusta coffee. Ruvuma region is the largest producer of Arabica, and production has been increasing over the past two decades.

1.1.3 Challenges in Coffee Production

Nation-wide Challenges

Challenges persist despite the country's significant increase in annual national coffee production (*Figure 1.1*). As explained in section 1.1.2, several regions, like the Kilimanjaro, are in decline, while other regions are expanding their production volumes and production areas (Kagera and Ruvuma).

Global coffee prices can be considered the main driver behind changes in coffee production. Inherently, the global coffee price is highly variable with boom-and-bust cycles. Currently, Arabica and Robusta prices are reaching record level highs (see section 1.2 on Coffee Economics for more info), partially explaining the rapid expansion in Kagera and the Southern Highlands.

Besides price fluctuations, important challenges to coffee production include aging coffee plants due to poor rejuvenation practices. Linked to this, many farmers still rely on sub-optimal old varieties, while TaCRI has developed new varieties that are less susceptible to coffee leaf rust (CLR) and CBD in the case of Arabica and CWD in the case of Robusta. Climate change is an overarching problem that aggravates the effects of certain pests and diseases and contributes to interannual variations in yield. However, the exact effects are region-specific. We refer to the draft report produced by UNIDO – CGIAR – CIAT on Tanzanian coffee in the context of climate change.

Region-specific Challenges - Kilimanjaro

The major problem in the Kilimanjaro region is land scarcity due to the hereditary land system, which results in extremely small land sizes per person. In addition, there are signs of a potential labour shortage problem, with many young people preferring to work in the cities, as many well-educated people in Tanzania come from this region. Also, there is significant competition with the tourism sector. As a result, farmers focus on more profitable, less labour-intensive and reliable energy-rich crops like bananas rather than coffee.

The Northern zone, including Kilimanjaro, has a bimodal rainfall pattern which is being impacted by climate change. Changes in rainfall pattern result in unsynchronised flowering if no irrigation is applied (at the right time). Given the increasing issue of water scarcity, this reduces coffee yields and increases pests and diseases. It also makes pruning more difficult. Along with erratic rainfall, nighttime temperatures are increasing, rising coffee pests and diseases, phenological shifts, excessive rainfall, and unpredictable rain seasons, all of which disrupt coffee production (Mbwambo et al., 2021; Wagner et al., 2021; Craparo et al., 2015, 2020; Otieno et al., 2019; Temba et al., 2020). A recent study by Wagner et al. (2021) highlights that, despite increased annual precipitation, farmers around Mt. Kilimanjaro face growing challenges from more frequent droughts.

CLR and Coffee White Stem Borer (CWSB) (*Xylotrechus quadripes*) are increasing, and Coffee Berry Borer (CBB) (*Hypothenemus hampei*) has also been reported. Less problematic, though significant, are the Coffee Berry Moth (CBM) (*Prophantis smaragdina*) and the Antestia Bug (*Antestiopsis spp*).

Region-specific Challenges – Kagera

In the Kagera region, the number one problem mentioned by all stakeholders is climate change, which is disturbing rainfall patterns. When there is no consistent rain soon after flowering, the flowers will fall off before being pollinated. Also, after pin formation, 8 – 11 months of good rain are needed for

good berry formation and maturation. In recent years, changing rainfall patterns have been reported to heavy yield losses, and low quality.
The Black Coffee Twig Borer (BCTB) (*Xylosandrus compactus*) is reported to be the second biggest challenge according to TaCRI, leading to severe yield losses. CLR is also on the increase, according to TaCRI, even on Robusta. However, this can be mitigated by the new TaCRI varieties, which are less susceptible. Nonetheless, for the time being, many farmers still rely on old varieties susceptible to CWD in the case of Robusta and CLR and CBD in the case of Arabica. Other pests and diseases, like (root)mealybugs, are of lesser importance in Kagera, according to TaCRI, partially because they can be treated using locally made Neme-based spray.
Farmers and extension officers also reported soil fertility issues, though this varies from district to district. Karagwe was reported to have serious soil fertility issues, while for Kyerwa, it was reported that soil fertility was not an issue.

Region Specific Challenges – Ruvuma & Southern Highlands
In the Southern Highlands, declining rainfall, rising temperatures, increasing vapour pressure deficit and an increase in coffee pests and diseases are significant challenges (Kasongi et al., 2024; Mbwambo et al., 2021; Wagner et al., 2021).
A recent empirical study was conducted in the Mbinga district, Ruvuma region, on the projected effects of climate change on Arabica production. It concludes that "projected rising temperatures and vapour pressure deficit threaten Arabica coffee production in Tanzania's burgeoning coffee region" (Kasongi et al., 2024). The study revealed a troubling rise in minimum temperatures across all elevation zones during critical seasons for coffee over the next 4 decades. The mean annual temperature is expected to exceed the optimal range for Arabica, with nighttime temperature increasing significantly. If rising temperatures and vapour pressure deficit (VPD) continue, even highland coffee production may face greater difficulties than anticipated, highlighting the urgent need for adaptation strategies to sustain coffee farming.

1.1.4 Deforestation and EUDR

Deforestation and its Drivers
From 2001 to 2023, Tanzania is estimated to have lost 3.25 Mha of tree cover, equivalent to a 12% decrease since 2000 (GFW, 2024). Though significant, this is less severe than in most sub-Saharan African countries. Nonetheless, Tanzania is undergoing a period of rapid deforestation. Every year, more than half a million hectares of forest are cleared (Doggart et al., 2020).
As stated in the European Forest Institute (EFI) report on the European Union Deforestation Regulation (EUDR) preparedness of Tanzania: "In 2017 Tanzania submitted its first Forest Reference Emission level. (FREL), declaring an annual deforestation rate of 469 kha/year between 2002 and 2013. Most of this deforestation happened in open wooded land that corresponds, in terms of ecosystems, to miombo and acacia savanna. National Carbon Monitoring Centre (NCMC) is currently developing the FREL 2013 -2021. However, the FREL 2013 – 2021 publication is delayed, and it is unknown when it will be available.
According to Global Forest Watch (GFW), of the 237 kha of tree cover lost in 2023, only 1.02 % was attributed to commodity-driven deforestation, while 91.5% was due to shifting cultivation, including small-scale commercial and subsistence farming. Additionally, 2.5% was caused by forestry and 1.21 % caused by wildfires (*Figure 1.5*).
In line with GFW (2024), a national study revealed that small-scale agriculture is the primary driver of deforestation in Tanzania, recorded in 89 % of deforested areas (Doggart et al., 2020). Most

deforestation events in Tanzania involve multiple drivers, most frequently a combination of crops and livestock (Doggart et al., 2020). As reported by Doggart et al. 2020: "Crop cultivation was the most commonly observed driver occurring in 89% of plots, compared to livestock grazing (69%) and charcoal (35%). Most deforestation events involved multiple drivers, with 83% of plots showing signs of two or more drivers. Stakeholder interviews identified agriculture as the primary deforestation driver in 81% of plots, substantially more than charcoal production (12%), timber harvesting (1%) and livestock (1%)."

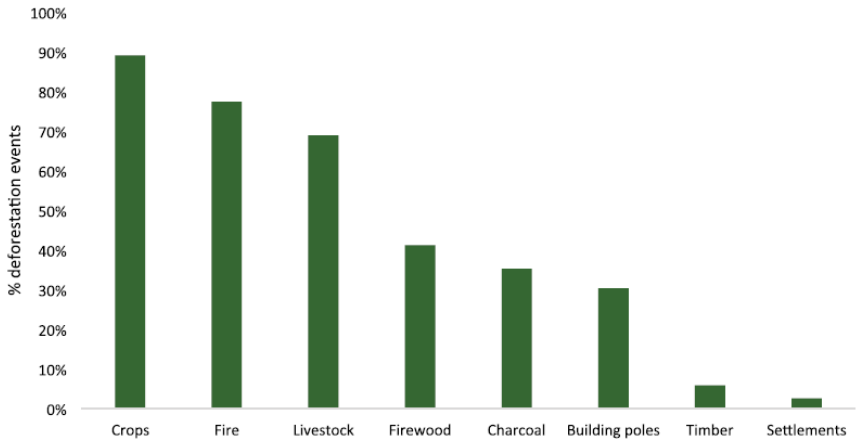


FIGURE 1.5 DRIVERS OF DEFORESTATION AND FOREST DEGRADATION IN TANZANIA (DUGGART ET AL., 2020)

Furthermore, crops like maize, involved in 57 % of all deforestation events, and sesame, involved in 20 % of events, are notably linked to this expansion and deforestation (Doggart et al., 2020). Harvesting wood for firewood, charcoal production, and timber often occurs while deforesting an area for agriculture or livestock grazing. Firewood, charcoal and timber primarily drive forest degradation rather than deforestation (Doggart et al., 2020).

According to GFW (2024), Pwani, Lindi, Morogoro, Tabora and Ruvuma are responsible for 54 % of all tree cover loss between 2001 and 2023 (GFW, 2024). The only coffee-producing region of significance in the top 5 is Ruvuma. In the top 10, only one additional significant coffee-producing region, Mbeya, can be found. During our discussions with stakeholders, it was reported that a significant amount of coffee expansion occurred in Ruvuma and Mbeya in the last decade. Only minor deforestation occurred over the past decades in the Kagera region, where more than half of all Tanzania coffee is produced (GFW, 2024). Deforestation in the Kilimanjaro region was almost absent (GFW, 2024), as the parks in the area are strictly regulated due to the economic benefits and public image it brings to Tanzania, and forests outside parks were already deforested many decades ago.

EU Deforestation Regulation

The preparedness of the Tanzanian coffee sector for EUDR is being assessed in a specific mission by EFI. Nonetheless, here, we will share several qualitative insights obtained during our first mission that might be useful.

In principle, coffee that passes through the auction system should be traceable up to the level of Agricultural Marketing Cooperative Society (AMCOS). However, there are significant weaknesses in traceability within the 'first mile' (from farmers to AMCOS), especially for Robusta coffee. Not all coffee farmers are registered (TCB reports that only 'around 50 % of farmers are registered'). Therefore, the

exact number of coffee farmers is still unknown. Additionally, when stakeholders talk about registered farmers, the question arises of what this entails and whether the relevant information is available for EUDR purposes. Even in the case of registered farmers, it is unknown how large their coffee farms are, how many coffee plants they have, or how much coffee they actually produce. Non-registered farmers can and do sell their coffee to AMCOS.

To add to this complexity, informal coffee trading occurs at the local level in both the Arabica and Robusta VCs, although it is far more prevalent in the Robusta VC. This includes trade between Uganda and Tanzania in the Kagera region, where coffee flows in both directions depending on price fluctuations. Officially, Kagera accounts for 57 % of Tanzania's total coffee production, according to TCB data, but unofficial estimates suggest its output is considerably higher. Given the magnitude of the informal trade within the Robusta VC, it could pose significant challenges for both Tanzania and Uganda regarding EUDR compliance.

1.2 Coffee Economics

1.2.1 General Economics

Coffee remains a critical export commodity and economic driver. In the 2022/2023 season, the country achieved record earnings of $231 million from exporting 81,498 metric tonnes of coffee, reflecting a significant increase from the $206.23 million recorded in the previous season (TCB, 2024). The sector indirectly benefits over 2.5 million people through related employment opportunities (TCB, 2021). Production is experiencing notable growth, as shown in *Figure 1.6*, with current annual revenue exceeding 200 million USD.

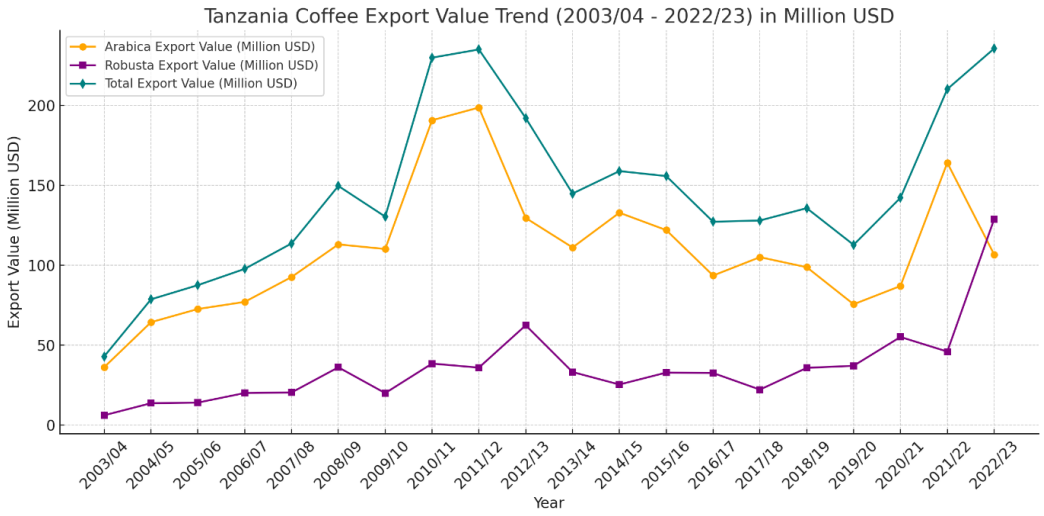


FIGURE 1.6 VALUE OF COFFEE SECTOR IN TANZANIA: TOTAL, ARABICA AND ROBUSTA (TIME PERIOD 2003/04-2022/23)

Despite holding less than 1% of the global coffee market, Tanzania's coffee sector possesses strategic advantages. The country's Arabica coffee is highly regarded for its quality and commands premium prices. Additionally, Tanzania benefits from an early harvest season beginning in May, which allows it to meet global market demand ahead of competitors in Central and South America. Export destinations are diverse, with Japan being the largest buyer at $81.2 million, followed by Italy ($21.3

million), the United States ($18.9 million), Germany ($18.1 million), and South Africa ($14.7 million) (Observatory of Economic Complexity, 2022). Robusta coffee is gaining importance globally and also experiencing rising prices.

More than 90% of Tanzanian coffee is exported, contributing an average of 1.5% to Tanzania's total exports (*Figure 1.7*), though its share has fluctuated in recent years due to competition from other cash crops, global price volatility, and variable production levels. Despite these challenges, the sector's importance remains evident, with coffee accounting for 18% of traditional cash crop earnings, following cashew nuts at 36% and tobacco at 27% (Kiwelu & Mpenda, 2022).

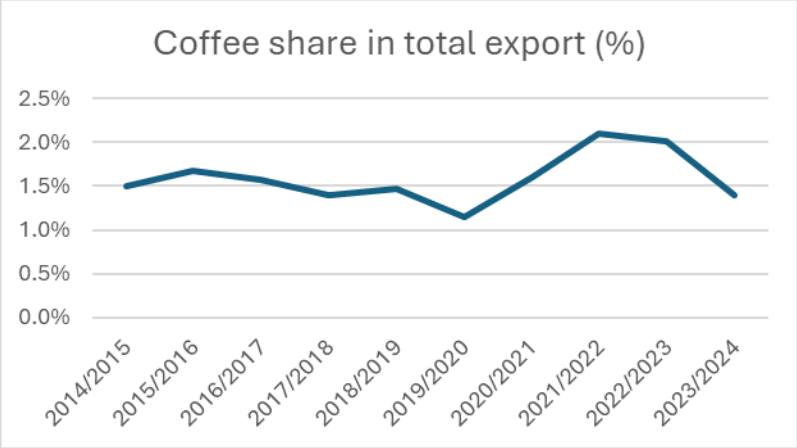


FIGURE 1.7 SHARE OF COFFEE IN TOTAL TANZANIAN EXPORTS (2014-2023) SOURCE: OEC AND TRADING ECONOMICS DATA

Efforts are underway to increase domestic consumption from 7% to 10% (PACSMAC, 2023), reflecting a broader strategy to diversify revenue streams and enhance value addition. Notably, over 70% of coffee exports are now conducted via direct export channels rather than auctions, enabling farmers to access more competitive prices. The coffee sector also plays a critical role in public revenue generation through export taxes, levies, and its contribution to rural economies.

1.2.2 Coffee prices – Global and National

The global coffee market has witnessed substantial price increases due to a combination of adverse weather conditions in key coffee-producing and logistical disruptions. As of October 2024, Arabica coffee prices soared to a historic $3.26 per pound on the New York exchange, a remarkable milestone not seen since 1977, when both Arabica and Robusta last experienced such peaks (*Figure 1.8*). This dramatic increase is primarily attributed to severe droughts in Brazil, the world's largest producer of Arabica coffee, coupled with unfavourable weather conditions in Vietnam, a major producer of Robusta coffee (AP News, 2024; Barron's, 2024). Additionally, the introduction of the European Union Deforestation Regulation (EUDR) has triggered stockpiling and speculation, further constraining supply. Traders hoarding coffee in anticipation of future price hikes have exacerbated market volatility, placing the global coffee trade in a delicate position.

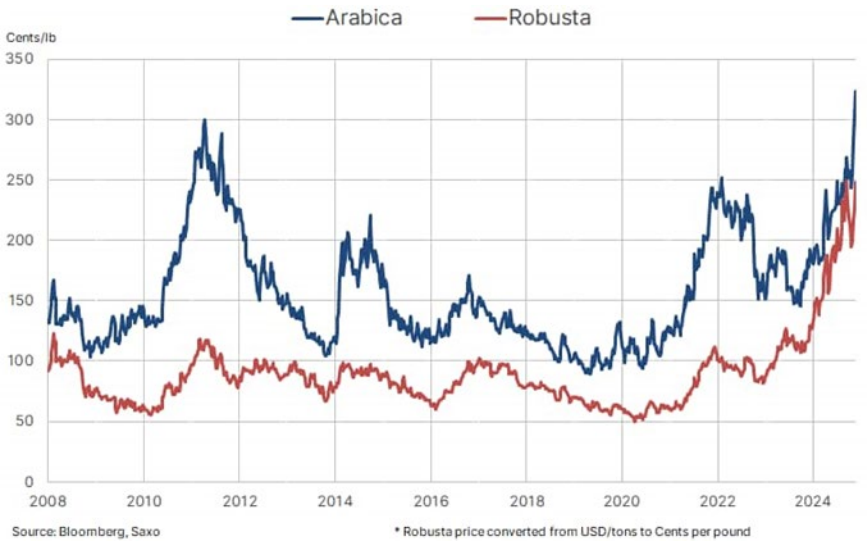


FIGURE 1.8 GLOBAL COFFEE PRICES (2008 – 2024) SOURCE: BLOOMBERG

The narrowing price differential between Arabica and Robusta coffee is reshaping market dynamics. With Arabica supplies under pressure and prices soaring, Robusta has become a more economical alternative, driving its prices higher. To control costs, manufacturers are increasingly blending Robusta into traditionally Arabica-based products. While this approach helps mitigate costs, it also signals a shift in consumer preferences and product formulations, particularly in price-sensitive markets.

Tanzania's national coffee prices have shown considerable fluctuation over the past two decades. Arabica prices reached a peak in 2011/12 at nearly TZS 14,000 per kilogram, reflecting strong global demand and high international market prices. A similar surge was observed in 2021/22, though prices declined again in 2022/23. Robusta prices, while generally lower, have followed a more gradual trend, reaching their highest level of approximately TZS 7,300/kg in 2022/23 (*Figure 1.9*). Notably, the price gap between Arabica and Robusta has narrowed significantly in the last three years, indicating a relative strengthening of Robusta's market position.

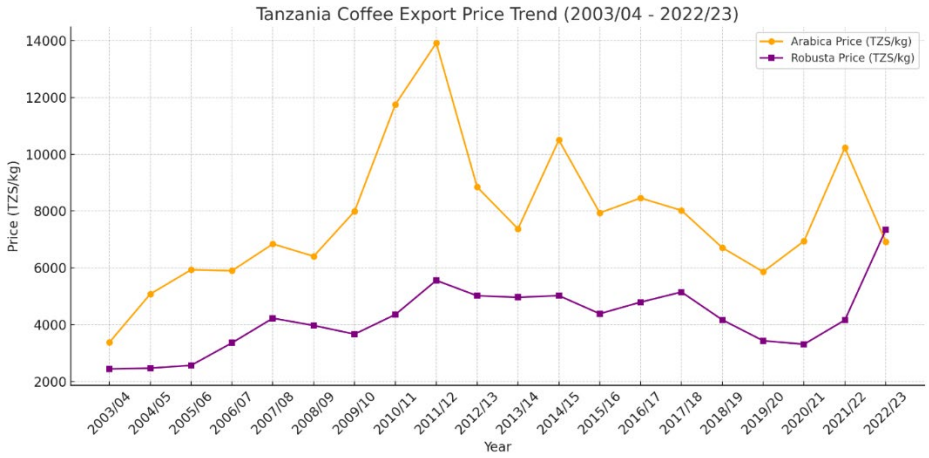


FIGURE 1.9 COFFEE EXPORT PRICE TREND IN TANZANIA

1.2.3 Tanzania Coffee Exports Distribution to the EU and the Rest of the World

Figure 1.10 shows Tanzania's annual coffee exports (2019/20–2023/24), divided between EU markets (Arabica + Robusta) and the Rest of the World. This underscores the EU as a central destination market. The EU consistently absorbed between 40% and 60% of Tanzania's total coffee exports, with volumes ranging from approximately 19,500 to 31,900 tons annually. While Arabica remains important, particularly for blending in Germany, Italy, and Belgium, the EU's demand is strongly weighted towards Robusta, reflecting its role in espresso and instant coffee industries.

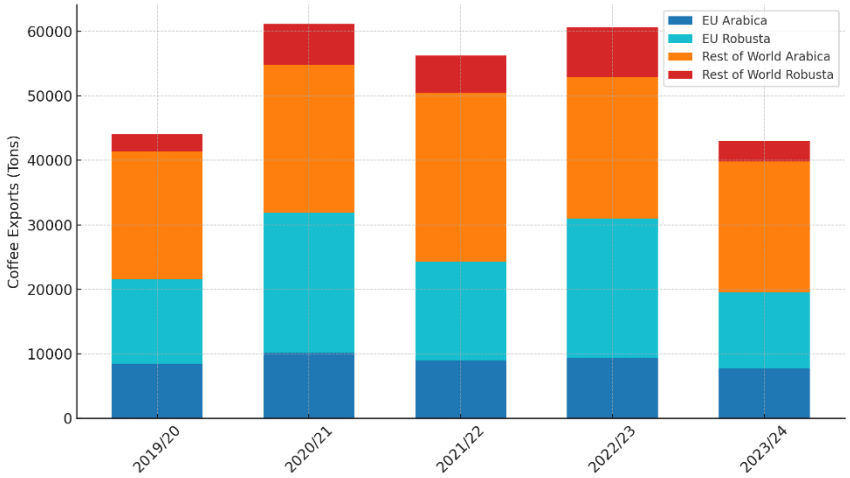


FIGURE 1.10 TANZANIA COFFEE EXPORTS DISTRIBUTION (EU VS REST OF WORLD, ARABICA VS ROBUSTA). SOURCE: TANZANIA COFFEE BOARD

FIGURE TANZANIA COFFEE EXPORTS DISTRIBUTION (EU VS REST OF WORLD, ARABICA VS ROBUSTA) SOURCE: TANZANIA COFFEE BOARD

This pattern highlights the EU's dual economic interest in Tanzania's coffee value chain: securing reliable supplies of both Arabica and Robusta to support Europe's extensive roasting sector, and maintaining cost-effective sourcing that complements imports from Latin America and Asia. For Tanzania, access to the EU market provides not only foreign exchange but also incentives to improve productivity and meet certification standards, which can yield price premiums (COLEAD & VCA4D, 2025). The evidence thus points to a relationship of mutual dependence: Europe benefits from supply diversification and market stability, while Tanzania leverages European demand to strengthen its export earnings and rural livelihoods.

1.2.4 Price setting, market access and power imbalances between stakeholders

Price setting in coffee value chains is largely a top-down process for commodity-grade coffee. Producers and cooperatives remain price takers unless they move into specialty markets. The more they can improve quality, differentiate their product, and secure direct links with international buyers or roasters, the less dependent they are on international market prices. In Tanzania, however, robusta coffee is almost exclusively commodity grade, which means that smallholder producers and AMCOS are firmly in the position of price takers. The price of commodity coffee is determined by international

benchmark prices for robusta and arabica, adjusted by an internationally recognised country premium or discount. A further quality premium may be added for coffee that exceeds commodity standards, based on internationally recognized grading systems. While some Tanzanian arabica coffee receives a price premium due to being of higher quality than typical commodity grade coffee, mainly arabica produced on the estates, a large part of Tanzanian arabica is treated as commodity grade.

Given that virtually all Tanzanian coffee is exported, market access is highly controlled by international players in the coffee value chain. Exporting requires intermediaries with international networks and the financial capacity to manage large shipments—each container holding around 19.2 tons of green coffee. As a result, exporters act as price setters and gatekeepers to international markets, shifting the balance of power decisively in their favour over smallholders and AMCOS.

Beyond formal channels, an informal network of local buyers also operates. These buyers often offer farmers lower prices but provide quick cash, which is crucial when producers face urgent financial needs (Section). In this interaction, farmers are price-takers.

In contrast, arabica estates occupy a much stronger position than smallholder farmers and most AMCOS. They typically produce larger volumes of higher-quality coffee, have better market access, and are often directly linked to multinational coffee conglomerates. Estates can thus be seen as an extension of the vertical integration strategies of these global coffee companies.

The European Union wields considerable power through its influence on market access, even though it does not directly set prices. This is evident in the imposition of the EU Deforestation Regulation (EUDR), which reshapes global value chains, including Tanzanian coffee exports.

The Tanzanian government has attempted to improve farm-gate prices through policy reforms (Section 1.3), but price-setting ultimately rests with multinational coffee companies—just a handful of which control the majority of global coffee trade. Besides, historical experience has shown that government efforts to regulate prices of agricultural commodities have had limited success, sometimes with unintended negative consequences. Nonetheless, the Tanzanian government plays an important role in facilitating market access: promoting quality improvements, enforcing phytosanitary standards, marketing Tanzanian coffee abroad, and working with the EU to ensure continued access to European markets under the new EUDR framework.

1.3 Governmental Policies: Regulations, Licences, Trade and Taxes

The history of coffee policies in Tanzania reflects the nation's evolving political and economic landscape, significantly impacting the coffee industry and its stakeholders. The policies have evolved from colonial to post-independence state control and neoliberal market reforms. Each phase had distinct objectives and varying degrees of success, impacting the coffee industry and its stakeholders. Understanding how it has evolved, and also the impact of more recent policy changes (in the last 10 years) is important as it influences coffee sector actors' behaviour and approach to future investment in the sector.
In the mid-1980s, Tanzania adopted structural adjustment programs under the guidance of international financial institutions, emphasizing market liberalization and reducing state involvement in the economy. These neoliberal reforms transformed the coffee sector by allowing private entities

to participate in coffee marketing and export, challenging the dominance of cooperatives like the KNCU. While intended to increase efficiency, these policies often led to economic crises within the coffee industry, adversely affecting smallholder farmers (World Bank, 2003; TCB, 2020).
Post-independence, the Tanzanian government recognized cooperatives as vital instruments for economic development. By 1965, 1,287 active primary cooperatives were serving more than 20 crops and controlling over 80% of Tanzanian agricultural production and marketing (Maghimbi, 2010). However, during the Ujamaa period (1967–1985), the government dissolved many cooperatives, integrating their functions into state-controlled entities. This centralization led to inefficiencies and a decline in cooperative effectiveness.

1.3.1 Current Government Policies and Regulation

Regulations
The Tanzanian coffee industry is governed by a regulatory framework designed to enhance production, processing, marketing, and quality control. Central to this framework is the Coffee Industry Act of 2001, which re-established the Tanzania Coffee Board (TCB) as the primary regulatory and promotional authority in the sector. This Act outlines the TCB's responsibilities, including the regulation and quality control of coffee products, promotion of domestic and international trade, issuance of licenses, registration of growers and processors, and coordination of research and development initiatives (TCB, 2021).
To strengthen industry financing, the Act introduced the Coffee Development Fund, aimed at supporting programs to improve sustainability and profitability. Key provisions of the Act require the mandatory registration of coffee growers to uphold production standards, the licensing of exporters and dealers, and financial mechanisms to support industry activities. Complementing the Act, the Coffee Industry Regulations Act of 2013 further refines these governance structures, focusing on efficiency and compliance mechanisms (Silvano et al., 2023).
These legislative instruments have established a comprehensive framework for managing the coffee sector, with an emphasis on ensuring sustainability and fostering growth. However, a critical analysis reveals gaps between the stated objectives and actual outcomes, particularly in terms of quality improvement, market access, and profitability. While mechanisms such as mandatory grower registration and quality standards have improved the grading of coffee, smallholder farmers, who dominate the sector, often face challenges in accessing resources like fertilizers and training, leading to inconsistent quality across regions (TCB, 2021). The Tanzania Coffee Board's efforts to promote domestic and international trade have improved centralization and reduced inefficiencies, but small-scale producers still encounter barriers to accessing lucrative export markets due to high costs and inadequate infrastructure[1]. Moreover, the Coffee Development Fund, intended to support profitability, has seen limited accessibility, with insufficient disbursements to smallholders and rural producers struggling to manage high production costs and market volatility (Silvano et al., 2023). These discrepancies indicate that, while the framework provides a solid foundation, systemic challenges such as resource limitations, bureaucratic inefficiencies, and insufficient financial inclusion, have hindered the realization of its goals. Addressing these issues through targeted interventions, such as improved resource distribution, transparency in fund allocation, and streamlined regulatory

[1] Higher-value segments such as specialty and certified coffees, tend to be captured by larger, better-funded companies and exporters who can meet strict quality, traceability, and volume requirements. Smallholders, who struggle to finance improved processing, certification, and who do not have access to reliable transport, often sell to intermediaries at discounted prices and are pushed into lower-margin commodity tiers.

processes, will be essential to align objectives with outcomes and ensure the sector's sustainability and profitability.

Licenses

The licensing system administered by the TCB plays a pivotal role in regulating the coffee value chain, targeting quality, traceability, and adherence to both national and international standards. TCB classifies licenses based on stakeholders' roles to enhance professionalism, market access, and the global reputation of Tanzanian coffee (Tanzania Coffee Board, 2021). However, critical challenges, such as administrative inefficiencies and additional contributions at various levels, continue to impede the system's full effectiveness.

(a) Export Licenses: Roasted and Instant Coffee

Export licenses for roasted and ground coffee, as well as instant coffee, require extensive documentation, including company registration, tax clearance, and office inspection reports. These measures are intended to boost Tanzania's competitiveness by ensuring adherence to quality standards (TCB, 2021). However, the extent to which this has translated into increased market share for processed coffee is debatable. Despite these initiatives, over 90% of Tanzania's coffee exports remain unprocessed green coffee beans, highlighting a gap between policy goals and outcomes (TCB, 2021).

(b) Domestic Licensing and Value Addition

The Local Coffee Roaster's License aims to promote value addition within Tanzania, aligning with the Agricultural Sector Development Program II (ASDP II). By mandating plant inspections and operational compliance, this license encourages local processing (Agri-Connect, 2023). While the intent aligns with national development goals, data from the Tanzania Coffee Association indicates that local processing capacity remains underutilized due to limited infrastructure and market linkages (Silvano et al., 2023). This suggests that while licensing frameworks exist, their impact on fostering significant local value addition is limited.

(c) Processing and Export Licenses

The Coffee Processing License ensures quality control for washed and non-washed coffee, requiring certified facilities to maintain product integrity. Similarly, the Green Coffee Export License mandates compliance with quality and traceability standards, covering over 90% of Tanzania's coffee trade (TCB, 2021). These measures have effectively positioned Tanzania as a reliable supplier of raw coffee. However, reliance on raw coffee exports underscores the country's limited progress in capturing value through processing.

(d) Specialized Licenses: Warehousing and Quality Assessment

Licenses such as the Coffee Warehouse License and the Coffee Liquorer's License address critical value chain components like storage and quality assessment. By preserving coffee quality and certifying professionals for grading, these licenses enhance the governance of the supply chain (Agri-Connect, 2023; Silvano et al., 2023). While effective in their domains, their benefits are constrained by the high costs of compliance and limited access for smallholder farmers.

(e) Direct Export Licenses: Empowering Producers

The Direct Export of Premium Coffee License empowers cooperatives and smallholder producers to bypass auctions, providing direct access to international markets (TCB, 2021). While this initiative

theoretically reduces intermediary costs, its uptake has been limited due to lack of awareness and logistical challenges, as noted by stakeholders during a 2022 industry review (Agri-Connect, 2023).

(f) Achievements and Gaps

The licensing system has successfully established a quality/compliance framework, but it has not delivered the stated inclusive outcomes. As a result, licensing works for baseline control yet fails on inclusion and local value addition, largely because marketing functions are not governed or financed in ways that smallholders and local processors can access (Silvano et al., 2023). Additionally, the reliance on raw coffee exports contradicts the system's aim to promote processed coffee in global markets. To align outcomes with stated objectives, reforms are needed to simplify licensing processes, reduce compliance costs, and improve support for local processors and cooperatives. Furthermore, capacity-building initiatives could enhance stakeholder participation, addressing bottlenecks in the value chain. These issues are explored in more detail in Section 3.

Trade

TCB regulates the trade by ensuring transparency, quality, and fair pricing mechanisms. The coffee trade is categorized into domestic, export, and specialty markets:

(a) **Domestic Trade**: Local coffee consumption remains low, estimated at less than 10% of total production. Local traders primarily sell to small-scale roasters, cafes, or directly to consumers, but data on this segment is sparse (Agri-Connect, 2023).

(b) **Export Trade**: Over 90% of Tanzanian coffee is exported, primarily through auctions or direct relationships with international buyers. Tanzania's Arabica and Robusta coffees are valued for their quality, ensuring a competitive edge in global markets (Tanzania Coffee Board, 2021).

(c) **Specialty Trade**: This niche market focuses on high-quality coffee with specific flavour profiles and certifications such as organic or fair trade. These certifications enhance value and attract premium prices in international markets (Agri-Connect, 2023).

Eligible traders include exporters, cooperatives, processors, and private traders, all of whom must adhere to industry regulations and quality benchmarks. Exporters, for instance, must comply with international trade standards, while cooperatives aggregate coffee to enhance bargaining power. Private traders, who purchase directly from farmers, are governed by the Coffee Industry Regulation (2012) to ensure transparency and fairness (Silvano et al., 2023).

Growth is constrained by high transaction costs , which include licensing and inspection fees, costly transport from remote producing zones, multiple intermediated payments, and expensive short-term finance. Weak infrastructure, including poor feeder roads, limited power and water for washing stations, scarce certified labs and warehousing, and patchy digital connectivity for traceability and payments, combine to raise costs and depress quality. Volatile global prices, amplified by exchange-rate swings, pass through to farm-gate prices, triggering distress sales and deterring investment in processing, certification, and upgrading inadequate infrastructure, and volatile global prices limit the sector's growth. Additionally, restricted financial access for small-scale traders and cooperatives hampers their participation in competitive markets. To address these issues, initiatives such as modernizing the auction system, improving access to trade finance, and refining trade policies have been introduced (Agri-Connect, 2023).

While Tanzania's coffee trade system embodies a strong regulatory framework and mechanisms for market participation, gaps exist between the stated objectives and actual outcomes. Addressing structural challenges, particularly financial and infrastructural barriers, is essential for the system to achieve its full potential. Enhanced domestic trade and greater inclusion of smallholder farmers in high-value markets could significantly bridge the gap between aspirations and reality.

Taxes and subsidies

Taxation in Tanzania's coffee industry encompasses multiple levies, fees, and charges, applied at different points in the coffee value chain. The coffee industry in Tanzania is subject to at least six distinct types of taxes and levies. These taxes are paid by various actors across the value chain:

(a) Farmers: Pay local government cess, withholding tax, and in some cases, fees for cooperative membership.
(b) Processors: Bear VAT on inputs, corporate taxes on profits, and license fees for operations.
(c) Exporters: Are required to pay export levies, license fees, and corporate taxes on their earnings.
(d) Cooperatives and Associations: Often handle the payment of taxes such as VAT and cess on behalf of their members (Agri-Connect, 2023; Silvano et al., 2023).

The cumulative burden of these taxes can significantly impact the profitability of coffee farming and trading. For smallholder farmers, the local government cess and withholding tax reduce their earnings at the farm gate. For processors and exporters, high taxes on operations and exports can deter investment and limit the sector's growth potential.

The National Coffee Development Strategy (NCDS) 2021-2025 highlights the need for streamlined taxation to lower transaction costs and increase competitiveness. Recommendations include reducing the local government cess and introducing tax incentives for value addition to encourage domestic processing and packaging (Tanzania Coffee Board, 2021).

Fertiliser subsidies are a major policy intervention in Tanzania's agricultural sector, directly affecting the coffee value chain. Through the National Agricultural Input Voucher Scheme (NAIVS) and the Digital Fertiliser Subsidy Distribution System (DFSDS) introduced in 2022, farmers access fertilisers such as UREA, DAP, CAN, and NPK at about half the market price. In 2025, over 300,000 metric tonnes were distributed at a public cost of TZS 110 billion (TFRA, 2023). The scheme is coordinated by the Ministry of Agriculture, TFRA, and TADB, with private-sector importers and agro-dealers managing last-mile delivery.

Sales and the Auction System

Coffee is sold either directly to buyers or indirectly through the auction system. Each has unique features and implications for stakeholders. Both are regulated by TCB to ensure transparency, market access, and fair pricing for producers.

(a) Direct Sales

Direct sales bypass traditional auction platforms, allowing producers to sell directly to buyers such as international roasters or processors. These transactions are often based on long-term agreements that emphasize quality, consistency, and traceability. Producers engaged in direct sales typically benefit from higher prices and premium incentives for quality (Baffes, 2006).

Direct sales of coffee (Arabica) emerged as a solution to several limitations of the auction system. High-quality producers sought better prices and recognition for their premium products, addressing the need for quality differentiation. Additionally, direct sales are supposed to provide market stability through long-term contracts, offering an alternative to the price volatility of auctions. Furthermore, the growing demand for traceability and sustainability certifications, especially in speciality markets, was better facilitated through direct sales, meeting the specific requirements of buyers (Mezgebo &

Lemma, 2022). The growth of direct trade is primarily driven by the speciality coffee sector, where producers can earn up to 50% more than auction prices.

(b) Auction Sales

Indirect sales through the auction system are conducted in centralized marketplaces (independently for both Arabica and Robusta), often in designated centers. Farmers or cooperatives deliver their products to licensed agents who aggregate the commodities for sale. While the system emphasizes transparency, it has been criticized for exposing smallholder farmers to price fluctuations caused by market volatility (Temu et al., 2003).

(c) Tanzania Mercantile Exchange (TMX)

Ongoing efforts to integrate the auction these systems with electronic trading platforms like TMX reflect a commitment to modernizing the coffee sector and enhancing its competitiveness in the global market.
The Tanzania Mercantile Exchange (TMX) was established to facilitate electronic trading of agricultural commodities, including coffee. The TMX aims to enhance market efficiency, transparency, and access to both domestic and international markets. By integrating traditional auction systems with modern electronic trading platforms, TMX seeks to provide a more robust marketing framework for Tanzanian coffee.

(d) Comparative Analysis: Tanzania vs. Uganda

Uganda employs a liberalized coffee marketing system, where most coffee is sold directly to exporters. This system allows for greater flexibility and innovation in marketing strategies. Unlike Tanzania's structured auction system, Uganda's liberal approach reduces transaction costs but may compromise transparency (Nyoro et al., 2004).
Although the auction system in Tanzania plays a critical role in facilitating market access and price transparency, especially for smallholder farmers, however, the rise of direct sales reflects changing market dynamics, driven by demands for quality, traceability, and stable prices. Comparing Tanzania's system with Uganda's highlights the trade-offs between structured regulation and market liberalization. Consequently, Tanzania may benefit from balancing these systems while fostering innovations that empower smallholder producers (see Section 3).

1.4 The Coffee Value Chain

1.4.1 Arabica Value Chain Structure

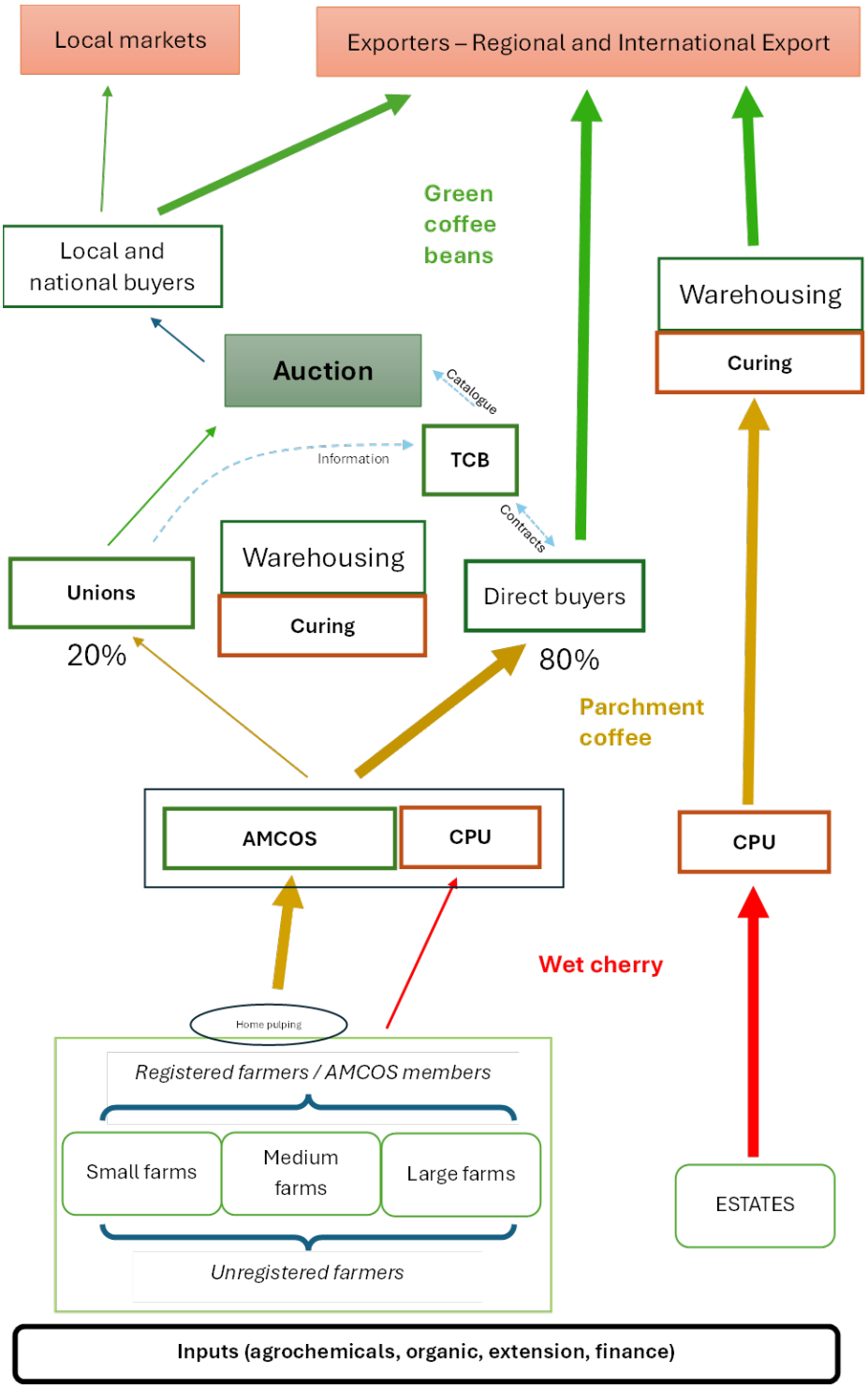


FIGURE 1.11 STRUCTURE OF ARABICA COFFEE VALUE CHAIN (SOURCE: AUTHORS)

1.4.2 Robusta Value Chain Structure

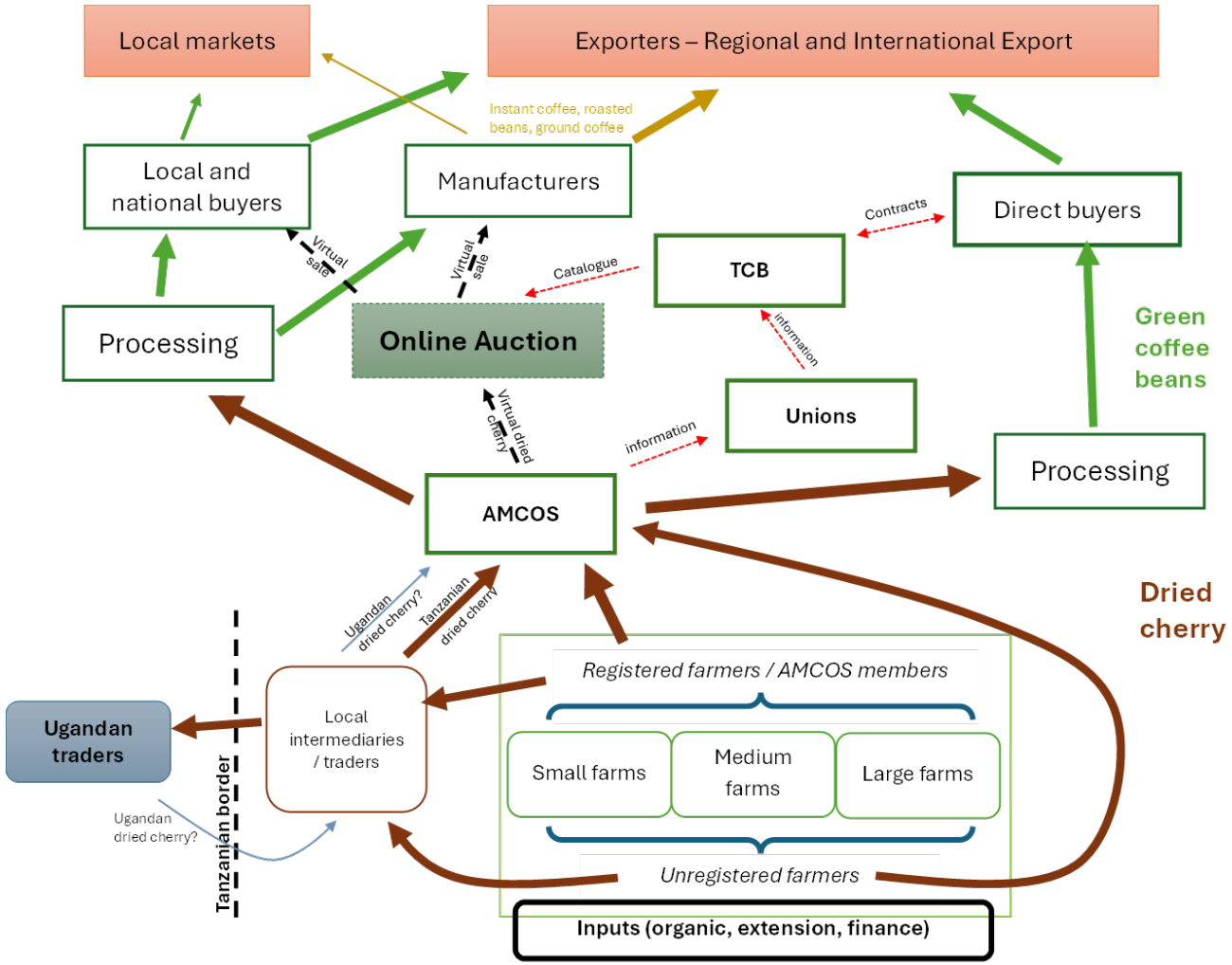


FIGURE 1.12 STRUCTURE OF ROBUSTA COFFEE VALUE CHAIN (SOURCE: AUTHORS)

1.4.3 Input Provision

Road Infrastructure

Road transport underpins Tanzania's coffee sector. It carries over 90 percent of passengers and 75 percent of freight, across a 181,190 km network. There are 36,760 km of trunk/regional and 144,429 km of collector/feeder/urban roads, governed by MoWTC, with TANROADS (trunk/regional), TARURA (district), and the Road Fund Board allocating approximately 90 percent of its fund to maintenance and approximately 10 percent to development and administration. For coffee, reliable roads are needed to link smallholders to AMCOS and Unions, processors, auctions, and export nodes (Tanzania Coffee Industry Development Strategy 2020–2025). High transport costs will impact negatively on farm-gate prices, and constrain extension access, and raise input costs.

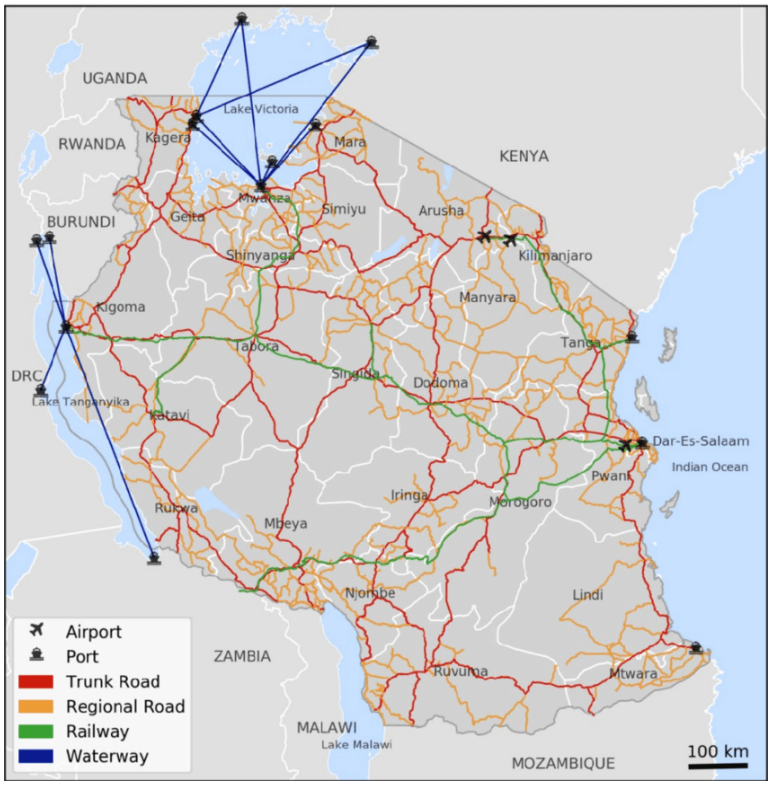


FIGURE 1.13 MAP OF THE MAIN TRANSPORTATION INFRASTRUCTURE IN TANZANI (PANT ET AL., 2018)

Despite major investments in upgrades to the road and rail networks, as well as the seaport at Dar es Salaam, the condition of many rural roads remain poor and they become impassable during the rains (as observed by the VCA4D team, Ileje District, Songwe, 2018). Connectivity is uneven (Figure 1.12; Pant et al., 2018), with Kilimanjaro better linked than Ruvuma, leading to coffee quality losses, missed market windows, and reliance on intermediaries. The new online coffee auctions in Kagera cut trips to physical auctions and have improved price/quality, but last-mile road upgrades remain essential. Broad evidence shows that better connectivity lowers prices of essentials, boosts input use and production, supports specialization/market orientation, and raises incomes, while the potential downsides also require attention (Dumas et al., 2024).

Electricity Infrastructure

Reliable transport and power are complementary for Tanzania's coffee sector, but electricity remains a binding constraint for processing and value addition. Although the Tanzania Coffee Industry Development Strategy 2020–2025 does not single out electricity, it recognises infrastructure (including power) as essential for investment. In practice, reliable supply most benefits secondary processing (husking, grading) and value addition (roasting, instant coffee), yet the VCA4D Study observed that most CPUs and mills were running on diesel generators, with some union factories using diesel or biomass (coffee husks). Access to electricity has improved but remains uneven. In 2016, only 16.9 percent of rural households were grid-connected versus 65.3 percent in urban areas (Khan, 2018), rising to 24.5 percent of rural households by 2019/20 (REA, 2020) – Table 1-1. Regionally, connections moved from 42.6 to 47.6 percent (Kilimanjaro), 24.6 to 32.4 percent (Kagera), 31.8 to 41.1 percent (Ruvuma), 15.9 to 24.7 percent (Songwe), and 34.1 to 46.9 percent (Mbeya) (REA, 2020; Khan, 2018). Because electricity is used mainly for lighting (76.6 percent), many rural households still depend on solar systems (30.4 percent), rechargeable lamps or torches (30.4 percent), and kerosene lamps (6.4 percent), limiting mechanised pulping, consistent drying, and quality control; consequently, power gaps raise processing costs, depress quality premiums, and slow the shift toward higher-value processed exports.

TABLE 1-1 PROPORTION OF HOUSEHOLDS CONNECTED TO THE NATIONAL GRID BY REGION COMPARING CONNECTION RATES IN 2016/17 WITH 2019/20 (SOURCES: REA, 2020 AND KHAN, 2018)

Region	2016/17	2019/20
Kilimanjaro	42.6%	47.6%
Kagera	24.6%	32.4%
Ruvuma	31.8%	41.1%
Songwe	15.9%	24.7%
Mbeya	34.1%	46.9%

Lighting is reported to be the most common use of an electricity connection (76.6%), leaving the majority of rural households reliant on other sources of energy to provide lighting in their house, including solar systems (30.4%), rechargeable lamps or torches (30.4%) and kerosene lamps (6.4%).

Financing

The Tanzania Coffee Industry Development Strategy 2020–2025 budgets TZS 142 billion and calls for innovative financing beyond public funds, aligned with Government industrialisation and the plans of Local Government, TaCRI, TCB, and development partners (Strategy 2020–2025). In practice, the value chain is funded by donors, government, and growing private participation, yet credit for inputs, field management, processing, and market access remains scarce and targets are often missed. TADB has supported youth agribusiness lending, and CRDB/NMB have expanded agriculture portfolios, but high interest, collateral demands, and limited rural financial infrastructure limit uptake. The Strategy proposes special input-credit schemes and greater use of cooperative/AMCOS credit. Donor initiatives have helped (e.g., BMZ's Coffee Innovation Fund ran 53 pilots across seven countries (2019–2023), including Tanzania, to test production,

processing, and marketing solutions) but TCB estimates only 30 percent of smallholders have access formal financial services (SASI; TCB).

Digital finance can help narrow these gaps. The Financial Inclusion Report shows adult usage of financial services rose to 76 percent in June 2023 from 65 percent in 2017 (NCFI, 2023), with 47.2 million mobile money subscribers and 99 percent phone ownership. Yet inclusion remains uneven. Women, youth, MSMEs, persons with disabilities, and smallholders are underserved. In 2018 less than 45 percent of Tanzania's land area had any mobile reception, even if this covers 83 percent of the population. This leaves 17 percent (about 9.2 million people) unserved, across the remaining area. For the coffee sector, closing these financing and connectivity gaps, through blended finance, de-risked input credit, gender-responsive digital services, and rural coverage, will determine whether the Strategy's investment translates into timely input use, upgraded processing, and reliable market access.

Research

Research on *C. arabica* has focused on disease resistance, yield improvement, and quality. Varieties such as "N39" and "SL28" show strong resistance to Coffee Leaf Rust and Coffee Berry Disease (Mwangi et al., 2021).

Quality improvements are also a priority, with research on processing techniques and the development of cultivars with enhanced flavor profiles to expand robusta's role in premium markets (Kisaka et al., 2022; TaCRI, 2022).

Future research priorities include advancing climate-smart practices and water-use efficiency, further developing improved varieties, strengthening extension services to improve adoption, and promoting sustainable production to safeguard long-term competitiveness.

Seedling Production and Distribution

Over the past two decades, coffee seedling production and distribution in Tanzania have expanded considerably to address low yields, ageing trees, and disease pressures. TaCRI and the Tanzania Coffee Board (TCB) play central roles: TaCRI leads research and farmer training, while TCB regulates and promotes the sector, including seedling distribution (TaCRI, 2021; USDA, 2024).

Between 2020 and 2022, TaCRI produced over 31 million improved seedlings, while TCB distributed 13 million by late 2023, with a target of 25 million by 2025 (TaCRI, 2021; USDA, 2024). These include arabica varieties resistant to CLR and CBD, and robusta varieties resistant to Coffee Wilt Disease (CWD). The improved lines reduce fungicide reliance, increase yields, and provide larger, higher-quality beans for international markets. Distribution targets key producing regions such as Kilimanjaro, Mbeya, Ruvuma, and Kagera, supported by local governments and AMCOS. However, the extent of adoption by farmers remains underexplored.

Fertilisers and Agro-chemicals

Agro-input use in Tanzanian coffee production differs sharply between estates and smallholder farmers and is generally higher in arabica than in robusta, reflecting price differences between the two. Large estates follow detailed fertilization and crop protection plans, applying both mineral

and organic inputs. These include agricultural and dolomitic lime; compound NPK fertilizers; single-nutrient fertilizers (N, P, K, S, Mg, B, Zn); and organic matter from coffee pulp, husks, and pruning residues. Estates also apply copper-based fungicides to manage fungal diseases such as CLR, in contrast to the limited input use by smallholders. Currently, through the National Agricultural Input Voucher Scheme (NAIVS), farmers can access fertilisers at about half the market price, while no comparable subsidy is available for pesticides in Tanzania.

Water

Water use in Tanzanian coffee production varies strongly by region, species, processing method, and farmer type. In Kilimanjaro, smallholders irrigate coffee–banana fields using traditional furrows, while estates employ channels, drip, and sprinkler systems—the latter consuming up to ten times more water per unit area than drip irrigation. In Kagera, smallholders rarely irrigate coffee, relying instead on mulching to conserve soil moisture; this practice has proven insufficient during recent droughts, leading to severe yield declines. Although the Kagera River provides abundant water, it is mainly used for maize, rice, and sugarcane in valley bottoms rather than for coffee. In Ruvuma, streams exist but are often diverted for brickmaking rather than agriculture.

Water use in coffee processing depends primarily on the method applied. Arabica estates and central processing units (CPUs) generally use the fully washed method, which is water-intensive, though estates are typically more efficient and treat their wastewater. Smallholders in Kilimanjaro also process arabica at home using the washed method but without wastewater treatment. By contrast, smallholders in Kagera process robusta using the natural (dry) method, in which cherries are sun-dried without water, making it the least water-intensive approach.

Farmer Training and Extension services

District Councils are the main source of extension services. These are described as inadequate in quality and quantity, often lacking specific expertise on coffee. Some civil society and private sector organisations complement government effort by supporting farmers with project-based extension services. These services are limited in quantity and short lived. Overall, extension services do not meet demand (SIDA,2022[2])

1.4.4 Primary Processing

Arabica processing

In Tanzania, Arabica coffee goes through a 'wet' or 'washed' process after it is harvested. This involves separating unripe cherries (which float in water), then removing the outer fruit covering (or pulp) and mucous membrane to expose the coffee beans, still covered in a protective layer. At this stage it is called 'parchment coffee'. The cherries should be pulped within 24 hours of harvesting, but ideally within 12 hours. The longer the cherries sit, the more difficult it becomes to separate the pulp from the seeds. The beans are then fermented in water for up to 72 hours to allow microorganisms in the beans to break down the mucus membrane before being dried in the sun. Drying can also be speeded up mechanically – a process the VCA4D study team saw at the Kilimanjaro Estate and at the AMCOS and Union level – but they will still be finished off in the sun. It can take 1-2 weeks to fully dry parchment coffee. During the visit to Kilimanjaro region, the VCA4D study team were told that the vast majority of parchment coffee held by AMCOS was being processed at home by smallholder farmers. In this way, smallholder farmers avoid the higher cost of transporting bulky, heavy wet cherries (as opposed to less costly parchment) to their nearest central processing unit (CPU), owned/operated by AMCOS, and the cost of processing them there. So, from the smallholder farmer perspective, home processing is more cost effective

[2] https://cdn.sida.se/app/uploads/2022/02/14134317/DE2022_9_62492en.pdf

but does require access to a hand cranked pulping machine. However, pulping and sun drying has a direct impact on the quality of the coffee. The output of CPU processing is a uniform, higher quality parchment compared to multiple batches of home processed parchment of varying quality.

Robusta processing

Unlike Arabica, Robusta coffee undergoes minimal primary processing. It involves drying the harvested cherries in the sun on drying racks or more often, simply spreading them out on the floor in the sun (using a tarpaulin or similar material to keep the cherries off the ground). Depending on the harvesting method, twigs, leaves, immature and damaged cherries can often be found among the drying cherries at this stage, which need to be removed before secondary processing. During Mission 1, the VCA4D study team were told that the drying process typically takes up to 4 weeks to achieve an acceptable moisture content level. Dried cherries are brittle with a hard outer shell and, ideally, should have a maximum moisture content of 12.5%. Drying is primarily done at the producer/AMCOS level but does not always dry the cherry sufficiently. Therefore, some machine drying is often done at the Union factory before it goes through the secondary process of hulling.

In Kagera region, the VCA4D study team were told that there was a potentially considerable trade in dried cherry across the border to Uganda. In addition to the attractions of selling to this market (higher prices, instant payment, cash in hand), the coffee cherries sold to Uganda are often 'wetter' than those sold to the Tanzanian auction. Smallholders would spend less time/effort drying the cherries fully and could realise a greater profit since the Ugandan buyers were paying by weight (wetter cherries = fewer coffee beans/kg).

1.4.5 Secondary Processing

This stage encompasses hulling, polishing, grading, roasting, and grinding. The methods employed can vary between Arabica and Robusta beans due to their distinct characteristics.

Arabica processing

Arabica coffee beans undergo several important processing steps that significantly affect their quality and flavour profile. After drying, the beans are hulled to remove the parchment layer, and polishing may be done to eliminate any remaining silver skin, improving their appearance. The beans are then graded and sorted based on factors such as size, weight, and defects, with Tanzania using a grading system similar to Kenya's, where "AA" represents the highest quality. Roasting is a carefully controlled process that brings out the delicate fruity and floral notes characteristic of Arabica beans, and the profile of roasting has a considerable impact on the final taste and aroma of the coffee. Finally, the roasted beans are ground to the appropriate consistency for the desired brewing method, ensuring the best possible extraction of flavours.

Robusta processing

Robusta coffee beans are known for their distinctive characteristics, offering a robust flavour profile that appeals to many coffee drinkers. After harvesting, Robusta beans undergo hulling to remove the outer layers, though polishing is not commonly done since the market typically accepts beans with the silver skin still intact. The beans are graded based on size and quality, with grading criteria varying across different regions. When roasted, Robusta beans are typically darkened to bring out their strong, full-bodied flavor, complemented by earthy and nutty undertones. The grinding process is tailored to suit the brewing method, ensuring the desired strength and body in the cup.

Secondary processing of Arabica and Robusta coffee beans differs significantly to highlight their unique characteristics. Arabica beans often undergo polishing to enhance their appearance, a step usually omitted for Robusta due to different market demands. During roasting, Arabica beans are

roasted to emphasize their delicate and complex flavours, while Robusta beans are roasted darker to enhance their bold and bitter profile. These tailored roasting and grinding processes further develop the inherent qualities of each bean, ensuring their distinct flavours profiles are maximized to suit consumer preferences.

1.4.6 Export, Quality, Marketing and Consumption

Tanzania's coffee industry is characterised by its diverse production of both Arabica and Robusta species, each with distinct qualities, marketing strategies, and export patterns.

Arabica Coffee
Arabica coffee from Tanzania is renowned for its distinct flavor profiles, shaped by its region of origin. Coffee from the Northern Zone, notably Mount Kilimanjaro and Mount Meru, is prized for its pleasant aroma, vibrant acidity, rich mouthfeel, and sweet, balanced taste. These qualities are attributed to the mineral-rich volcanic soils and the high-altitude climate of the region. In contrast, Arabica coffee from the Southern Highlands, such as Mbeya and Ruvuma, is characterized by medium body, fine acidity, and fruity or floral aromas and flavours. The terroir, the interaction of soil, climate, and cultivation practices, plays a crucial role in these quality distinctions. Arabica coffee undergoes meticulous processing to ensure its premium quality. It is processed from parchment to clean green beans before being marketed. Approximately 70% of Tanzania’s Arabica coffee is exported directly, bypassing traditional auctions. This shift enables farmers and cooperatives to achieve more competitive prices by eliminating intermediaries, thereby enhancing their profitability and financial sustainability.

Robusta Coffee
Robusta coffee is valued for its strong body, high caffeine, and use in blends. It is sold largely through cherry auctions, as most AMCOS lack processing facilities. The crop is graded before export, Grade 18 (8%), 16 (30%), 14 (50%), and 12 (12%), with the top three considered premium (KDCU, 2024). Exports are managed by cooperatives such as KCU and KDCU, as well as private exporters. Rising global demand has strengthened Tanzania’s competitive position, particularly in blending markets.

Figure 1.13 depicts the Coffee Taster's Flavour Wheel, a tool widely used in the coffee industry to identify and describe the complex flavours and aromas of coffee. At the centre are broad sensory categories such as Tastes (e.g., sour, sweet, salty) and Aromas. The second layer adds slightly more detail, breaking down general categories into subcategories like Fruity, Floral, Nutty, or Spicy. The outermost layer provides specific descriptors, such as Blueberry, Citrus, Honey, or Cinnamon. These allow for precise articulation of coffee flavours.

FIGURE 1.14 COFFEE TASTER'S FLAVOUR WHEEL (SOURCE: SPECIALTY COFFEE ASSOCIATION)

Marketing Strategies

Tanzania's coffee marketing combines auctions with a growing reliance on direct sales. While auctions remain important, particularly for Robusta, over 80% of exports now bypass this channel through direct contracts with international buyers. Arabica's direct export share has risen from below 10% in the early 2000s to more than 75% in 2022/23, while Robusta exports have consistently exceeded 90% since 2011/12 (Figure 1.15). Direct sales provide farmers with more stable incomes and reduce dependence on intermediary-driven auctions, strengthening Tanzania's position in premium markets. However, the system is not without challenges: direct export contracts require compliance with complex administrative and tax procedures under the Tanzania Revenue Authority (TRA), including documentation, customs clearance, and payment delays. Key actors include major exporters such as Ibero (T) Ltd, Taylor Winch (T) Ltd, Dorman (T) Ltd, and Cotacof Ltd, as well as cooperatives like KDCU and KCU, which collectively play a central role in linking producers to global buyers (StiR, 2022)..

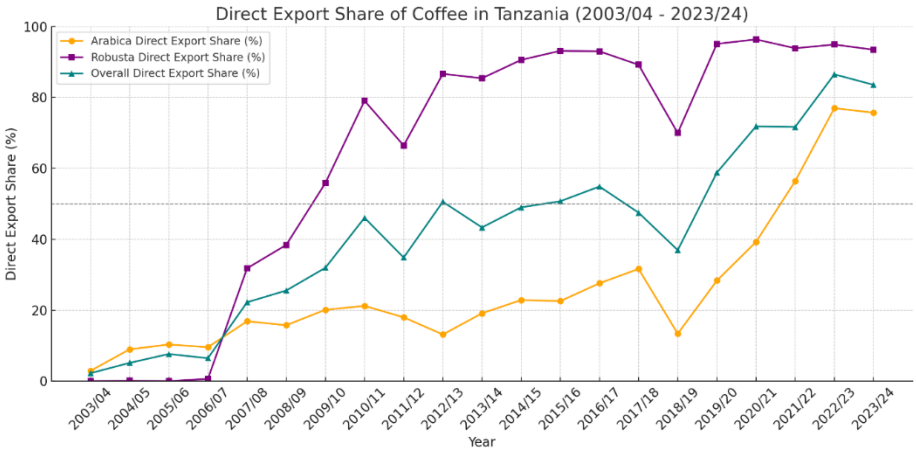


FIGURE 1.15 DIRECT EXPORT SHARE OF COFFEE IN TANZANIA (2003/04 - 2023/24)

Domestic Coffee Consumption

While Tanzania is predominantly an export-oriented coffee producer, efforts to boost domestic consumption have gained momentum. Current estimates suggest that domestic consumption accounts for 7% to 10% of total production, although these figures are subject to debate due to limited data. Domestic coffee consumption is influenced by factors such as production cycles, market prices, and evolving consumer preferences. Coffee is increasingly becoming a staple beverage in urban centres, supported by a growing café culture and the availability of locally roasted premium coffee. However, rural populations tend to favour tea or traditional beverages. Initiatives such as the PACSMAC (2023) programme aim to elevate domestic consumption by promoting the quality of Tanzanian coffee and supporting local roasting businesses. Events like coffee festivals and campaigns to raise awareness are also part of a broader strategy to reduce dependence on volatile export markets and diversify revenue streams.

1.5 VCA4D farmer typology

The 2018 VCA4D Coffee Study in the Southern Highlands divided smallholder producers into small, medium and large smallholder farms, plus estates. This was based on land holding size. Additional characterization was discussed as part of the social analysis. The environmental analysis also compared certified and non-certified production plus a sensitivity analysis for irrigation. While the three smallholder categories still have relevance for the 2024 VCA4D study, land holding size itself is highly context specific. The Functional Analysis clearly shows there are significant differences in farm characteristics between the Regions that will be covered in this study (e.g. in Kilimanjaro, average land holdings are far smaller than those encountered in Songwe in 2018) and there are also significant differences emerging at District level also. Therefore, no single, common 'land holding size' categorization will be possible for the 2024 VCA4D study across all Regions. Instead, large, medium and small farms will be defined at the regional and district level based on locally appropriate characteristics.

Another factor that the 2024 VCA4D study will take into consideration is that, during discussion with the Tanzania Coffee Board (Mission 1, November 2024), they expressed their interest in developing a clearer definition of a 'profitable' coffee farmer. Reportedly based on research carried out by TaCRI, the figure of '500 coffee plants' was being considered as a benchmark for the point at which a farmer could cover their costs and start to make a surplus from coffee cultivation. This 'break even' point could potentially be used to identify 'viable' farms, and would look something like Figure 1.15, below.

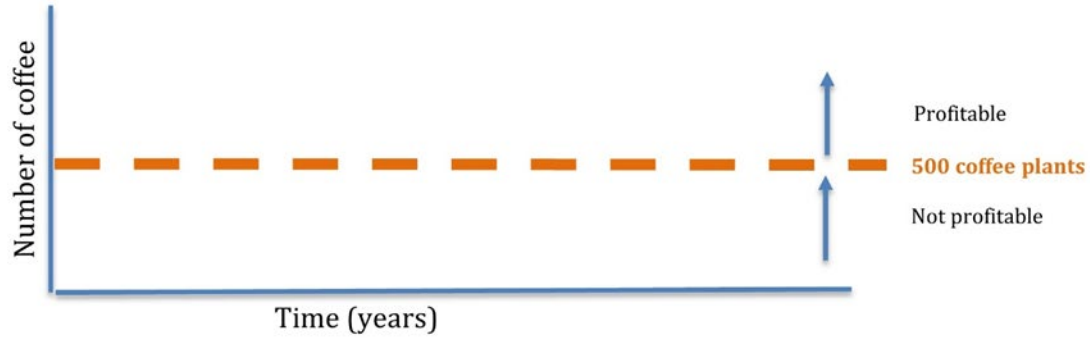


FIGURE 1.16 SIMPLIFIED REPRESENTATION OF THE THEORY THAT '500 COFFEE PLANTS' MARKS THE POINT AT WHICH A SMALLHOLDER FARMER CAN COVER COSTS AND MAKE A SURPLUS

Using the information collected by VCA4D Team during Mission 1 on farm size (see previous table) and comparing this against the '500 plants' benchmark suggested by TCB, a very generalised assessment of farm 'viability' was carried. It was based on the following assumptions about plant density in a pure stand and mixed farming system (Note: these are *estimates* for the purpose of assessing the useability of the '500 trees' benchmark as part of the VCA4D producer typology):

- Robusta pure stand at 3mx3m or 3mx2.5m spacing would give approximately 450 – 540 plants per acre
- Robusta mixed farming system (at 4mx4m or 5mx5m spacing) would give approximately 152 – 253 plants per acre
- Arabica pure stand (at 2mx1.5m spacing) would give approx. 1350 plants per acre
- Arabica mixed farming system (5mx5m spacing) would give approximately 162 plants per acre

Applying this logic to the two Regions visited during Mission 1, the following conclusions were drawn (*Table 1-2*):

TABLE 1-2 TESTING THE '500 COFFEE PLANTS' MODEL AGAINST KNOWN PARAMETERS IDENTIFIED BY THE VCA4D STUDY TEAM DURING MISSION 1

Model: **Robusta MONOCULTURE stand = requires between 1.1 and 0.9 acres to be 'viable' based on TaCRIs research criteria of 500 plants.** **Robusta MIXED farming system = requires between 2 and 3.3 acres to be 'viable'**		
Ave. farm size in Kagera (Robusta)		**Discussion**
Large farmer	5 -15 acres	Based on the TaCRI model, most 'medium' and 'large' farms could be 'viable', even with a mixed farming system. During Mission 1, stakeholders confirmed that many farmers in Kagera were expanding their coffee farms, and that some new farms were being established by youth and others who were being drawn into coffee production on the back of the current high prices for Robusta coffee on the market. Of farms visited by the VCA4D Study Team, all of whom could be considered among the higher socioeconomic group within their respective communities, it was clear that coffee management practices were not always optimal. The team observed coffee plants that
Medium farmer	2 – 4 acres	
Small farmer	0.5 – 2 acres	

		would yield very few berries in the coming season. Irrigation was not an option for coffee farmers in Kagera.
Model: **Arabica MONOCULTURE stand = requires between 0.4 acres to be 'viable' based on TaCRIs research criteria of 500 plants.** **Arabica MIXED farming system = requires 3.1 acres to be 'viable'**		
Ave. farm size in Kilimanjaro (Arabica)		**Discussion**
Large farmer	3 - 5 acres	All smallholder farms observed during the VCA4D visit to Kilimanjaro were using the 'Kiamba' (mixed farming) system, apart from the estates. Many no longer had coffee trees present on the farm, and coffee production by farmers (not estates) in the region is observed to be in decline. Based on the TaCRI model, only farms of 3 acres or more would be viable if coffee was included in a mixed farming system (i.e. only the 'large' farmers and estates). All three of the smallholder farms visited during VCA4D Mission 1 were observed to be among the higher socioeconomic group within their respective communities. The farms were 2.5 acres, 1 acre and 1.25 acres respectively, and included farms with access to irrigation. Based on the TaCRI model, there were clearly other livelihood activities, such as banana, which were now the mainstay of the household, rather than coffee.
Medium farmer	1.5 – 3 acres	
Small farmer	0.5-1.5 acres	

However, this is a very simplistic analysis of coffee farm productivity or viability. The number of plants alone is clearly insufficient to understand the viability of coffee production at smallholder level. Yield per coffee tree can be affected by many factors. Also, coffee is only one of many strategies that smallholder households depend on as part of their portfolio of livelihood activities, all of which will affect coffee's 'viability' in the eyes of smallholder farmers and their ability to manage price fluctuations. Factors to consider include (*Table 1-3*):

TABLE 1-3 FACTORS INFLUENCING SMALLHOLDER FARM VIABILITY

Coffee Profitability	Livelihoods Portfolio
Rainfall pattern Coffee species Coffee variety Planting densities (Banana and coffee) Cropping system Pests and diseases Management practices (pruning/stumping) Age of coffee plants Input use (fertilizer/OM/lime/irrigation) Soil fertility Shading Altitude Harvesting practice (picking/stripping) Ability to pay for labour Access to credit Access to extension	Relative importance of coffee in the smallholder household livelihood portfolio, among the other activities: • Other crops (food and cash) • Tree crops / timber • Livestock • Off-farm activities (e.g. petty trading, labouring) • Other, non-farm business activities • Remittance Labour capacity

Primary processing method	

Coffee prices are highly volatile over time (both between, and within seasons). It would be reasonable to assume that, based on yield per plant against cost of inputs and/or the ability of the household to absorb some of this variability in return, some farms might remain 'viable' even in years where the price is low. While others might only do so when prices are very high (*Figure 1.16*):

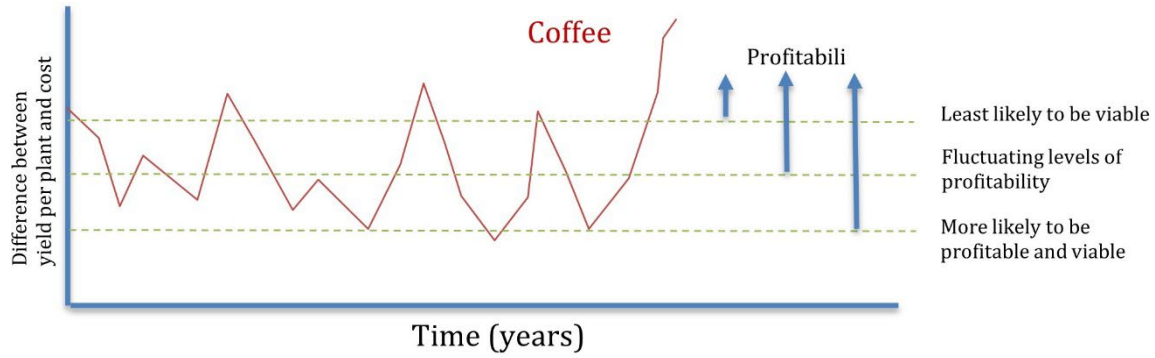


FIGURE 1.17 SHOWING HOW VARIATION IN COFFEE PRICES CAN IMPACT SMALLHOLDER FARM PROFITABILITY AND VIABILITY

Based on all the above, it would be reasonable to group farms based on their 'viability' and 'vulnerability' – i.e. to identify the point at which coffee no longer fulfils its expected role as part of the household's livelihoods portfolio and instead becomes a financial burden. It is at this point that farmers begin to abandon coffee cultivation. This cannot be based on farm size alone, since it is equally possible to have 10 high-yielding coffee plants with minimal input costs, as it is to have 500 lower-yielding plants, and for both to provide an important contribution to household income.

TABLE 1-4 PROPOSED FARM TYPOLOGY BASED ON CHARACTERISTICS IDENTIFIED BY THE VCA4D STUDY TEAM DURING MISSION 1

Typology	Suggested Characteristics – to be tested through the course of the VCA4D study
Viable	Farms who are managing their coffee plants well Farms who are producing sufficient yield per plant to balance any costs (or have no input costs altogether) Farms who can afford inputs (labour, agro-inputs, etc) Farm in areas that are favourable for coffee Farms who have access to irrigation Farms where coffee income is considered an important part of the household livelihood portfolio Farms that can absorb risks (i.e. years during which coffee prices are low) because they have other means by which they can insure themselves against losses
Vulnerable	Farms who may no longer be producing sufficient yield per plant to balance costs (or are being caught in a cycle of needing more inputs to maintain yield) Farms who are finding input costs less affordable (labour, agro-inputs, etc) Farm in areas that are becoming less favourable for coffee

	Farms where coffee is losing its place as an important income source because other options are proving more reliable / profitable Farms that are unable to absorb risks, or that have lost the capacity to do so, which is exposing them to losses over time and eroding their livelihoods
Disengaged	Farms where other, more attractive and profitable activities have taken the place of coffee – coffee no longer seen as a 'viable' option and farmers are actively removing it from their livelihood portfolio (or have already done so).

While it is beyond the scope of the VCA4D study to unpack 'viability' in detail, it will be possible to identify and confirm many of these characteristics and contribute this knowledge to further the development of a realistic understanding of coffee farm viability (*Table 1-4*).

2. WHAT IS THE CONTRIBUTION OF THE VALUE CHAIN TO ECONOMIC GROWTH?

2.1 Introduction

This chapter assesses the contribution of the Tanzanian coffee value chain to national economic growth, drawing on a comprehensive economic analysis that integrates findings from both the Robusta and Arabica sub-sectors. The analysis follows the Value Chain Analysis for Development (VCA4D) framework, with the primary aim of assessing the sector's overall role in driving economic growth. This includes profitability, value added, contributions to Gross Domestic Product (GDP), public finances, and the balance of trade. Profitability and sustainability across all value chain actors were assessed using detailed operating account data, enabling a bottom-up estimation of the coffee sector's economic footprint. In line with the VCA4D approach, the analysis is conducted at market prices and provides insights into both the generation and distribution of value added and income within the national economy. Furthermore, it considers the sector's competitiveness and long-term viability within the global market. The scope of analysis is based on the functional boundaries defined in Chapter 1, focusing on the key actors and operations across the entire coffee value chain.

2.2 Methodology and Data Sources

Data Collection and Sources

This analysis follows the VCA4D methodological framework to construct detailed operating accounts for each actor in the coffee value chain. We combined primary data (surveys and interviews with farmers, cooperatives, processors, exporters, etc.) and secondary data (official statistics, reports, and literature) to estimate costs, revenues, and margins for representative actors at each node of the chain. National accounts and trade data informed the macroeconomic indicators (GDP contribution, trade balances), while field surveys provided microeconomic details on production costs and incomes. All monetary values are in million Tanzanian shillings (MTZS), and the analysis is for an annual production cycle.

Actor Typologies in relation to economic analysis

A robust actor typology is central to the VCA4D analysis, providing a structured lens through which economic performance, inclusion, and sustainability can be assessed across the coffee value chain. For the production segment, we adopt a classification system originally developed in the 2018 VCA4D Coffee Study of the Southern Highlands, which distinguishes between small, medium, and large smallholder farms, alongside a distinct "estate" category for Arabica plantations. This typology has been retained for the present 2025 national study, but is adapted to reflect localised definitions of scale and the national heterogeneity in coffee farming systems.

Crucially, landholding size, a key determinant of farm category, is highly context-specific and was validated through field consultations with AMCOS leaders and Ward extension officers in both Robusta and Arabica producing regions. In Kagera (Robusta), small farms are defined as those

with 0.5–1 acre, medium farms as 1.1–4.9 acres, and large farms as ≥5 acres. According to local sources, the population distribution is approximately 45% small, 45% medium, and 10% large farms. In Ruvuma (Arabica), the thresholds differ: small farms are defined as 0.2–1.9 acres, medium farms as 2–4.9 acres, and large farms as ≥5 acres, with an estimated distribution of 10% small, 80% medium, and 10% large. These regionally calibrated thresholds reflect the diversity of agrarian structures across the country and strengthen the empirical rigour of our actor classification.

Small producers are typically subsistence-oriented households with limited land and capital, relying heavily on family labour and often engaged in diversified cropping systems. Medium producers operate semi-commercial farms with more structured management and some hired labour input. Large producers, commercial-scale farms with expanded acreage, mechanisation, and a clearer market orientation, sit at the upper end of the smallholder spectrum. In the Arabica chain, "Estate Producers" represent a separate category of large, capital-intensive plantation farms that often operate with formal business structures, permanent labour, and centralised processing facilities.

Beyond production, the value chain comprises multiple actor categories. Primary Societies (e.g., AMCOS) play an intermediary role by aggregating coffee from members, offering initial processing, and sometimes negotiating sales. Processors represent a key transformation node; in Robusta, they are further segmented into small and large processors depending on throughput and capitalisation. Exporters, whether private firms or cooperative unions, manage the consolidation and marketing of green coffee for the international market. Local Traders are active in the domestic market, trading coffee locally. Alongside this formal system, an informal trade network also exists, particularly in border regions. These actors, referred to here as Border Collectors or Intermediaries, operate outside the regulated marketing channels and are present in Robusta-producing areas near Uganda. A distinct Soluble Manufacturer operates in the Robusta chain, processing green beans into instant coffee for international, domestic and regional markets, adding a unique layer of downstream value addition.

This actor typology enables a nuanced and comparative understanding of structure and function across the Robusta and Arabica chains. It also allows for alignment with prior VCA4D studies, supporting broader cross-country learning and benchmarking. Most importantly, the typology underpins a disaggregated assessment of value creation and capture, informing policy options for enhancing inclusiveness and resilience across the Tanzanian coffee economy.

Building Operating Accounts

For each actor category, an operating account was constructed detailing: total Production (the gross value of output/coffee sold), Intermediate Goods and Services (IGS) consumed (inputs like fertilizers, agro-chemicals, hired services, transport, packaging, etc.), Wages paid (hired labor costs), Taxes and fees paid, and capital costs like Depreciation. Where applicable, Subsidies (e.g. fertilizer subsidies) and interest on loans or land rents were included. From these, we computed the actor's Net Operating Profit (NOP) and Value Added (VA). By definition, VA = Production – IGS (the value added by the actor's own inputs of labor, land, and capital) and Net Operating Profit = Production + Subsidy – (IGS + Wages + Taxes + Interest + Land Fees + Depreciation). In other words, VA represents the returns to all factor inputs (labor, land, capital), including profits, while NOP is the residual profit after paying all cash outflows. Family labor (common for smallholders) is not explicitly paid wages in these accounts – its contribution is reflected in a higher operating profit margin for small farms (since family labor cost is implicit).

Consolidation and Comparability

We aggregated individual actors' accounts to a chain-level account for each sub-sector (Robusta and Arabica) by multiplying representative per-actor values by the number of such actors and summing across all roles. This provides the total output value of each chain and the distribution

of value added and profit among actors. The results are then used to address key "Framing Questions": (FQ1) profitability and sustainability of activities for actors, (FQ2) social inclusiveness (distribution of income and employment), and the value chain's contributions to (and integration with) the national economy. We compute economic performance indicators such as return on turnover, benefit/cost ratios, and compare results between Robusta and Arabica. To assess broader economic impact, we estimated indirect effects by examining the value chain's purchases of goods/services produced outside the chain, using national input-output coefficients. This yields Direct Value Added (VA generated within the chain) and Indirect Value Added (VA generated in the wider economy via the chain's demand on other sectors). Their sum is Total Value Added attributable to the value chain. We also calculated the Integration Rate (how much of the chain's output value is retained as domestic VA, versus imported inputs) and the Driving Effect Ratio (the proportion of additional indirect VA relative to direct VA, indicating multiplier effects). Finally, we assessed international competitiveness via the Nominal Protection Coefficient (NPC) and Domestic Resource Cost (DRC) indicators. The NPC compares domestic prices to world (parity) prices for outputs and inputs – values below 1 indicate actors face prices below world levels (e.g. due to export taxes or input subsidies), while above 1 indicates protection. The DRC measures the ratio of domestic factor cost to value added in world prices; a DRC < 1 signifies a comparative advantage (the chain can produce efficiently at social prices), whereas DRC > 1 signals inefficiency in international terms. These metrics help evaluate if Tanzania's coffee sector is globally competitive or reliant on policy distortions.

2.3 Actor-Level Profitability and Sustainability in Robusta and Arabica Chains

Both Robusta and Arabica coffee value chains in Tanzania are profitable at each stage, but the magnitude of profit and sustainability of margins vary widely by actor and between the two sub-chains. We use Net Operating Profit (NOP) (absolute profit) and Return on Turnover (percentage of profit on revenue, i.e. profit margins) as key measures of financial performance. A higher NOP indicates greater absolute gains captured by that actor, while a higher return on turnover (profit/revenue) indicates efficiency or low-cost relative to output. Below, we analyse these indicators for each major actor category in the Robusta and Arabica chains, then compare the patterns across the two coffee sub-sectors.

2.3.1 Value Added and Return in the Robusta Coffee Chain

In the Robusta value chain, value added is distributed across both upstream and downstream actors, with primary producers capturing the largest share. As presented in Figure 2.1, large producers account for 24% of total VA, followed by medium producers with 21% and small producers with 17%. Together, producers generate 62% of total value, underscoring their central role in primary production and initial post-harvest handling. Downstream actors also capture notable shares, with exporters retaining 10% and soluble manufacturers 11%, reflecting the gains from trade and processing activities. By contrast, midstream actors such as processors and primary societies capture more modest shares, typically between 4% and 7%, pointing to limited transformation capacity in this segment. Overall, the distribution of value added in the Robusta chain reflects a relatively broad spread of economic benefits, with producers maintaining a strong position in value capture.

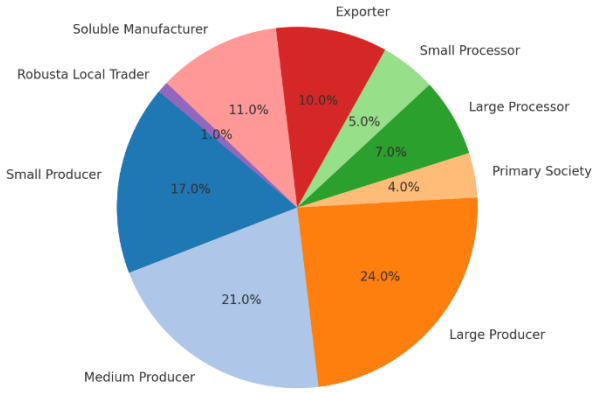


FIGURE 2.1 DISTRIBUTION OF DIRECT VALUE ADDED (%) AMONG ACTORS IN THE TANZANIA ROBUSTA COFFEE VALUE CHAINS

In terms of return on turnover, as presented in Figure 2.2, large Robusta producers enjoy very high profit margins, with an average return on turnover of nearly 78%. This reflects low unit costs (in part due to economies of scale and possibly favorable pricing). Medium Robusta farms also see strong margins (around 68% profit on turnover), while smallholders have lower value added but still retain 55% of their gross revenue as net profit. Notably, the smallest producers maintain positive margins despite lacking scale efficiencies. This is largely because many costs (especially family labour) are not paid out in cash; unpaid family labour keeps cash expenses low, allowing even a subsistence farmer to show a monetary "profit". However, this does not necessarily equate to high household income; once the value of that labour is considered, it means smallholders' profits are, in effect, the return to their labour and management.

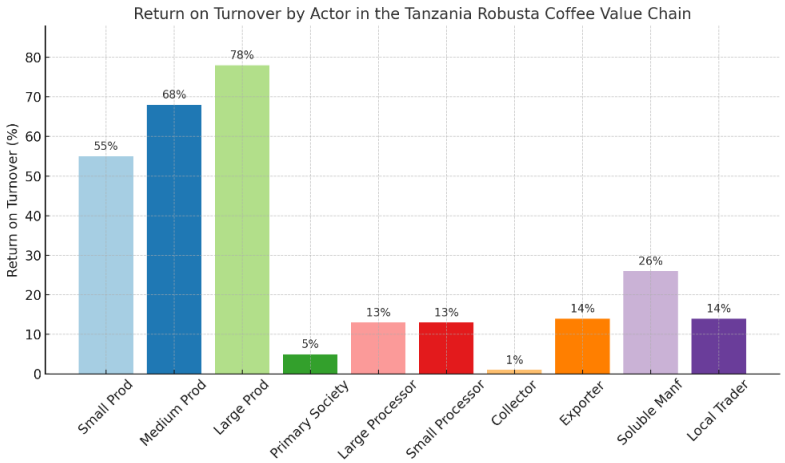


FIGURE 2.2 RETURN ON TURNOVER BY ACTOR IN THE TANZANIA ROBUSTA COFFEE VALUE CHAIN

Midstream actors in Robusta, cooperatives and processors, operate on much thinner margins. Both large and small processors have returns on turnover around 13–15%, indicating capital-intensive operations with significant input costs (buying coffee parchment/cherry and processing it to green bean). Primary societies (cooperative aggregators) barely break even in margin terms (5% return on turnover). These low margins suggest that at the prices paid and costs incurred, cooperatives and small processors are only marginally profitable, hinting at operational

inefficiencies or limited value addition at this stage. Still, they do usually cover costs and contribute to the positive value added. The exporters and the soluble coffee manufacturer in the Robusta chain add substantial value. An exporter's return on turnover is about 14%, but because of the large volumes handled, exporters as a group capture 10% of the chain's value added. The soluble coffee manufacturer (which processes Robusta into instant coffee) enjoys a particularly lucrative position; it registers roughly a 26% margin on sales and accounts for about 11% of total chain value added. These downstream actors benefit from accessing higher-value markets (export price differentials, processing markups) and from market power that allows them to keep a significant share of the final value. Indeed, the data suggest exporters and the instant coffee processor are able to retain gains from high world prices as rents rather than passing them fully to suppliers. Finally, petty traders (local traders and cross-border collectors) in Robusta play a minor role financially; local traders' margins can be around 14%, but the volumes they handle are small, yielding only 1% of total chain value added. In summary, the Robusta value chain is characterised by high profitability at the farm level, with large and medium producers achieving particularly strong margins, while midstream actors struggle to generate substantial returns. Downstream exporters and instant coffee manufacturers capture significant value, highlighting their strategic market position.

VA breakdown by functions

To understand economic dynamics in the Robusta coffee value chain, Figure 2.3 presents a functional breakdown of Value Added (VA) across the three key stages: Primary Production, Transformation, and Trade. Primary producers retain the largest share of value, accounting for 62% of total VA, underscoring the foundational role of farm-level activities. However, trade and export functions capture a substantial 26%, despite adding relatively limited functional value. Transformation actors, processors account for the remaining 12%. This skewed distribution highlights a structural imbalance in the value chain: actors closer to end markets wield greater market power and extract higher margins. This may pose long-term sustainability concerns by undermining the incentives and viability of those engaged in primary production, particularly smallholder farmers. Addressing this imbalance will be essential for promoting more equitable and inclusive value chain development.

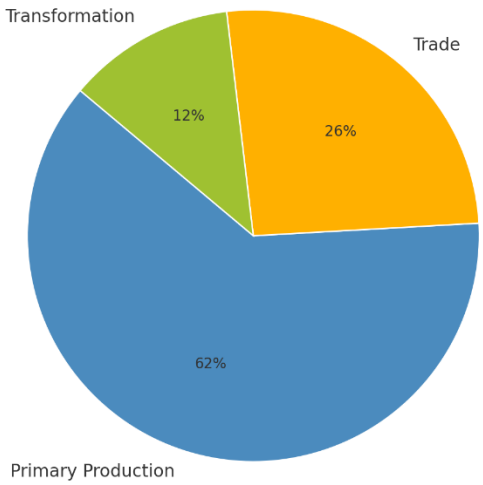


FIGURE 2.3 VALUE ADDED BREAKDOWN BY FUNCTIONS IN ROBUSTA VALUE CHAIN

Cost structure and efficiency implications

Figure 2.4 presents the distribution of cost components across the Robusta coffee value chain, offering insight into the structure of production and operational expenditures. The most striking feature is the dominance of organic inputs, which account for 66.0% of total costs, underscoring

the input-intensive nature of Robusta cultivation, particularly among smallholders who rely heavily on non-chemical agronomic practices. Labour is the second largest cost item, constituting 10.7%, reflecting the manual intensity of production, harvesting, and handling.
Other notable costs include taxes related to coffee seed development (6.3%), transport services (4.4%), and chemical use (5.1%), highlighting the logistical and regulatory burdens within the chain. Depreciation costs remain low (e.g., equipment at 2.6%), suggesting limited capital investment or mechanisation.
This cost structure reveals both vulnerabilities and opportunities: while input dependency may constrain profit margins, particularly when input prices rise, the relatively low mechanisation and service costs suggest scope for targeted investment in transport efficiency and equipment to enhance productivity and reduce overall cost pressures.

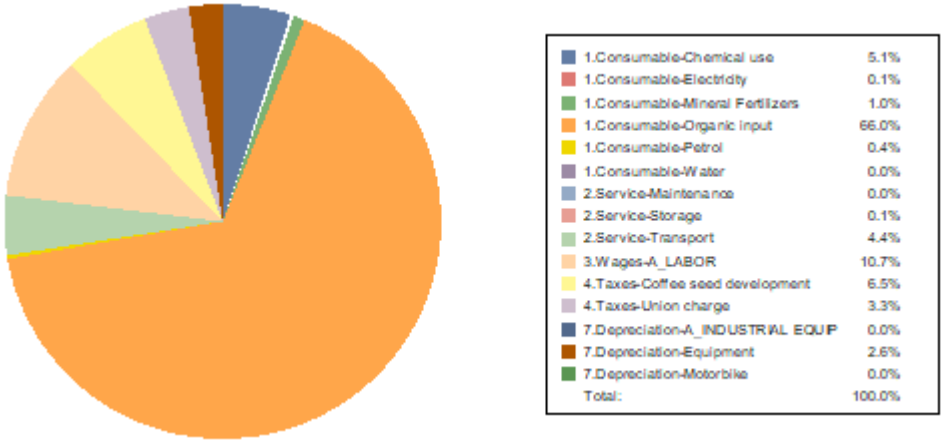


FIGURE 2.4 COST DISTRIBUTION SHARE IN TOTAL COST IN THE ROBUSTA VALUE CHAIN

2.3.2 Value Added and Return in the Arabica Coffee Chain

The Arabica value chain exhibits a concentrated distribution of value added, overwhelmingly dominated by medium producers, who retain 54% of total VA, as presented in Figure 2.5. Exporters (18%) and estate producers (10%) follow, while large producers account for only 6%. Small producers, processors, and primary societies each capture merely 4% of the total value, suggesting their marginal position in the chain. Although both Arabica and Robusta are producer-driven in terms of value capture, Robusta displays a more balanced distribution across its producer categories, whereas Arabica is heavily skewed towards medium farms. This concentration underscores the need for targeted interventions to support smallholders and midstream actors, for instance, by improving access to processing facilities and promoting quality upgrading, so that they can capture a greater share of value. It's worth noting that most value added comes from profit, in both chains (wages and depreciation are smaller components of VA). Thus, value distribution aligns closely with profit distribution discussed earlier, reinforcing the idea that empowering a group to add value is tantamount to improving their profit share.

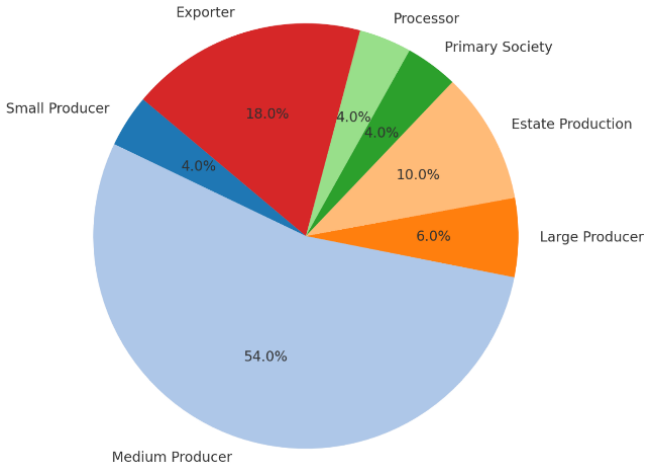


FIGURE 2.5 DISTRIBUTION OF DIRECT VALUE ADDED (%) AMONG ACTORS IN THE TANZANIA ARABICA COFFEE VALUE CHAINS

Figure 2.6 presents the return on turnover by actors in the Arabica coffee value chain. Medium-scale farms stand out with exceptionally high profitability, achieving returns on turnover of around 67%, comparable to, or even exceeding, those of large Robusta farms. This performance suggests that medium producers operate with a high degree of efficiency, combining favourable yields, quality premiums, and moderate cost structures. They seem to hit a "sweet spot" of economies of scale without the heavy wage costs that very large estates bear, enabling exceptional profitability. By contrast, smallholder Arabica producers occupy a marginal position: their valued added are very low and account for only 4% of total chain value added. Large Arabica producers and Estate plantations together take around 15–16% of total value added (with estates 10% and large producers 6%). Arabica estates record returns on turnover of only 26%, reflecting their heavy reliance on hired labour and higher operating costs. Estates remain important employers and contributors to the local economy, but structurally they are less profitable than medium farms.

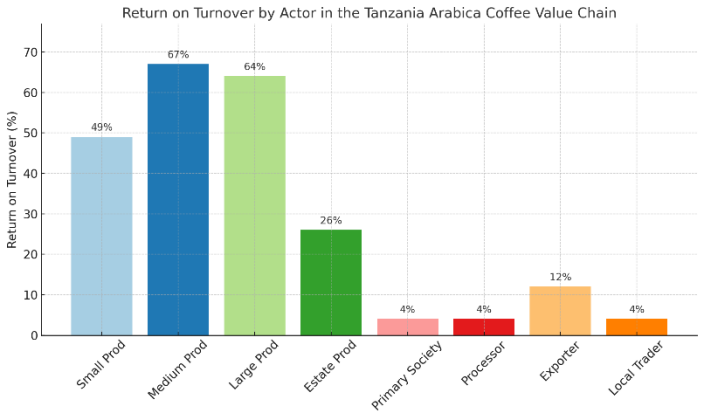


FIGURE 2.6 RETURN ON TURNOVER BY ACTOR IN THE TANZANIA ARABICA COFFEE VALUE CHAIN

Midstream in the Arabica chain, primary societies and processors similarly have very limited profitability. Each of these categories contributes only about 4% of total chain value added and has low returns on turnover (on the order of a few percent). Much like in Robusta, this suggests that the prices and costs at the cooperative and processing stage leave little surplus; they function more as service providers than profit centers. Exporters in the Arabica chain, however, capture a

significant value added share (about 16%). Tanzanian Arabica exporters leverage the high premiums on specialty or high-grade Arabica in international markets. Even with an export levy in place, they retain a strong margin. Their return on turnover is not directly given, but their profit share indicates robust value added, second only to the medium producers. Local traders are virtually absent or insignificant in the Arabica chain (most Arabica is channelled through organised groups or direct to exporters, with only 1% of value going through local trading).
Overall, the Arabica chain's value added are highly concentrated: medium-scale growers and exporters collectively take roughly 72% of all value added. Smallholders, cooperatives, and even large estates see relatively modest rewards. This concentration underscores structural differences; medium producers in Arabica are reaping the rewards of quality differentiation and market linkages, whereas smaller players are largely left behind in profit terms.

Value Added breakdown by functions

Figure 2.7 presents the functional breakdown of Value Added (VA) in the Arabica coffee value chain. Primary producers retain the largest share at 74%, reflecting their central role in the chain's value creation. In contrast, transformation actors capture only 4%, while the trade segment secures 22%, revealing the continuing structural advantage of intermediaries in accessing markets and setting prices. This distribution mirrors the Robusta value chain and highlights a common pattern where market access and control, rather than productive activity, drive profitability, raising concerns over equity, power imbalances, and long-term value chain sustainability.

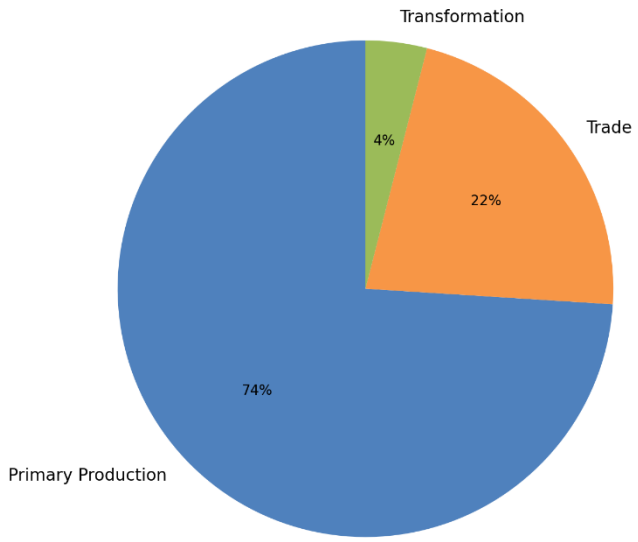


FIGURE 2.7 NET OPERATING PROFIT BREAKDOWN BY FUNCTIONS IN ARABICA VALUE CHAIN

Cost structure and efficiency implications:

Figure 2.8 illustrates the distribution of cost components within the Arabica coffee value chain, highlighting the relative weight of key inputs in total operational expenditure. The most significant cost driver is fertiliser, which accounts for 57.7% of total costs, substantially higher than in the Robusta chain, reflecting the agronomic intensity and input-dependence of Arabica cultivation, especially at estate and medium-scale levels.
Labour costs represent the second largest share, at 18.8%, underscoring the labour-intensive nature of Arabica coffee farming, particularly during harvesting and post-harvest handling. Chemical inputs also comprise a considerable portion, at 9.5%, followed by organic inputs (6.2%) and transport services (4.0%). Depreciation costs remain relatively low overall but indicate the presence of capital assets such as pulpers, milling machines, and other equipment.

Comparatively, Robusta's lower reliance on chemical/fertilizer inputs and its emphasis on organic inputs suggest a potentially more resilient and less import-dependent production system. Arabica's higher input intensity, particularly its reliance on subsidized imported fertilizers, makes it more susceptible to external shocks and cost pressures, and creates a significant fiscal burden.

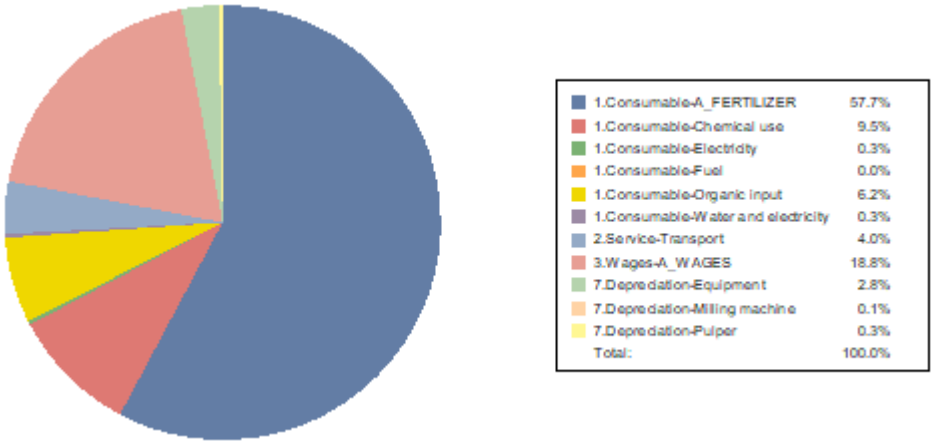


FIGURE 2.8 COST DISTRIBUTION SHARE IN TOTAL COST IN THE ROBUSTA VALUE CHAIN

2.3.3 Comparing Profitability and Financial Viability Across Chains

The analysis of total value added (VA) in the national coffee value chain underscores the sector's strong financial viability, but also highlights structural imbalances in how value is distributed. As shown in Figure 2.9, operating profits dominate overwhelmingly, representing 91% of total VA. In contrast, wages and salaries account for only 3.4%, taxes on operations for 4.7%, and depreciation for just 1.0%. This distribution illustrates the highly profit-driven character of the sector, where the vast majority of value accrues as private operating surpluses rather than being channelled into labour income or public revenues.

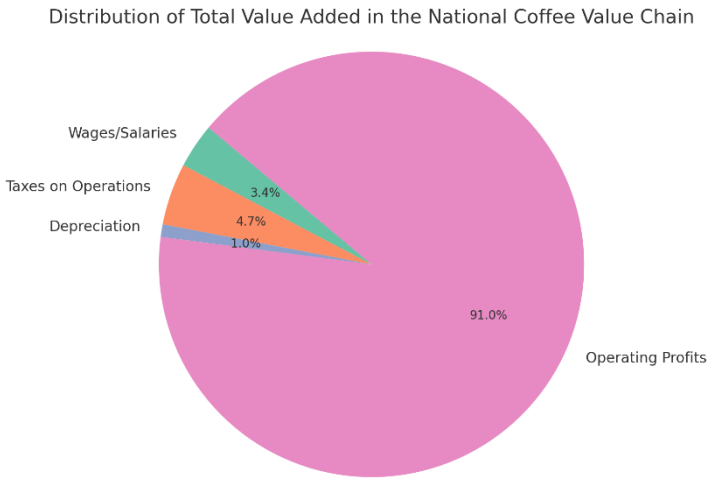


FIGURE 2.9 DISTRIBUTION OF TOTAL VALUE ADDED IN THE NATIONAL COFFEE VALUE CHAIN

When comparing Robusta and Arabica chains, differences in profitability structures become evident. The Robusta chain demonstrates a relatively broader distribution of profits across actors, reflecting the diversity of production systems and value chain functions. In contrast, Arabica's

profitability is heavily skewed towards a single actor group, namely medium-sized farms, which capture a disproportionately high share of the returns.

From a sustainability standpoint, both chains generate strong returns, yet the robustness of these profits differs. Robusta smallholders, for example, achieve positive margins largely by relying on unpaid family labour and low-cost inputs. These returns are vulnerable to erosion if labour costs are formalised or if input prices increase significantly. Medium-sized Arabica farms and large Robusta farms, by contrast, benefit from larger margins, giving them greater capacity to absorb economic shocks and adapt to price fluctuations or policy changes.
The profitability analysis suggests that while aggregate financial viability is not in doubt, no actor category records losses on average, the distribution of benefits is uneven and raises important policy considerations. Overall, the findings confirm that Tanzania's coffee sector is profitable at the aggregate level and contributes positively to economic growth. However, the concentration of operating profits alongside low shares for wages and taxes indicates a governance challenge: ensuring that the gains from coffee production are more equitably shared among producers, workers, and the wider national economy. The subsequent sections examine in greater detail how these profitability dynamics translate into contributions to GDP, employment, and inclusiveness.

2.4 Total Effects within the National Economy

In addition to actor-level performance, it is critical to understand how the coffee sector (Robusta and Arabica) contributes to broader economic objectives: GDP growth, export earnings, and government revenues. We assess each sub-chain's contribution to Tanzania's economy and then consider the combined national coffee value chain. The analysis computes the direct contributions (from the value chain itself) and the indirect contributions (spillovers to other sectors) to national GDP, as well as the sector's role in trade and fiscal balances.

2.4.1 Value Added Generation

The total economic contribution of the coffee value chain to the national economy is measured by its total value added, which comprises both direct and indirect components. Direct Value Added (VA) is the sum of VA generated by all actors operating within the value chain, while Indirect VA is the sum of VA generated by suppliers external to the value chain, providing intermediate goods and services.

For the Robusta value chain, the Direct VA is estimated at 478,897 MTZS. The indirect value added generated is 77,948 MTZS, leading to a Total VA of approximately 556,000 MTZS (*Table 2-1*). This positive indirect VA indicates a healthy driving effect within the domestic economy, where the Robusta value chain's activities stimulate economic activity among local suppliers.

In contrast, the Arabica value chain presents a different picture. Its Direct VA stands at 409,287 MTZS. However, the indirect value added for Arabica is explicitly stated as negative, at -52,083 MTZS (*Table 2-1*). This negative figure is attributed to the value chain being heavily subsidised, particularly through fertiliser subsidies. A negative indirect VA suggests that the value chain's reliance on external, likely imported and subsidised, intermediate goods and services reduces the overall value added generated domestically, rather than stimulating it. This highlights a trade-off

between directly supporting production through subsidies and promoting broader domestic linkages. The Total VA for the Arabica chain is consequently lower, at 357,203 MTZS.

When consolidated, the National Coffee Value Chain generates a total VA of 913,203 MTZS (556,000 MTZS from Robusta and 357,203 MTZS from Arabica). This combined figure represents the overall generation of value entailed by the coffee sector's operations within Tanzania. This figure represents the net output (after input costs) of all coffee actors and can be viewed as the sector's contribution to agricultural GDP.

2.4.2 Contribution to Gross Domestic Product (GDP)

The contribution of the coffee value chain to the national Gross Domestic Product (GDP) provides a macroeconomic perspective on its significance. Individually, the Robusta and Arabica value chains contribute 0.3% and 0.2%, respectively, to the total GDP (*Table 2-1*). When combined, the National Coffee Value Chain's total value added of 913,203 MTZS, against Tanzania's overall GDP (approximately 188,788,000 MTZS in 2023, at market prices), translates to an approximate contribution of 0.5% to the national GDP. While this percentage may appear modest in isolation, it is notable when compared to other key sectors; for instance, coastal fisheries contributed 0.46% to Tanzania's GDP (Le Gouvello et al., 2022). This comparison indicates that the combined coffee sector represents a significant, albeit niche, contributor to Tanzania's overall GDP, particularly within the agricultural sector. Its collective impact, therefore, warrants strategic attention in national economic planning.

The contribution of the coffee value chain to agricultural GDP is a critical indicator of its economic significance. The total value added generated by the chain accounts for approximately 8.3% of Tanzania's agricultural GDP, underscoring its role as a key driver of growth within the sector (*Table 2-1*). Given the substantial direct value added from primary production across both Robusta and Arabica coffee systems, the coffee sector represents a considerable share of the broader agricultural economy and remains central to its performance and structural transformation.

2.4.3 Economic Integration and Driving Effects

The Rate of Integration indicates the portion of the value chain's production that eventually remains within the national economy, estimating the extent to which value chain actors draw on domestic productive capacities of intermediate goods and services. The Driving Effect Ratio (Indirect VA/Direct VA) further quantifies this by revealing the level of integration within the domestic economy.

As presented in *Table 2-1*, the Robusta value chain demonstrates a high rate of integration into the economy, at 95%. It can be described as a very inward-looking value chain, meaning it primarily utilises local resources and is not heavily dependent on external inputs for its operations. In monetary terms, Robusta actors import only around 10,135 MTZS worth of inputs (such as some fertilisers and chemicals) while generating over 585,630 MTZS total VC production, meaning the vast majority of inputs are domestic, and the chain creates a large net positive foreign exchange flow. Its Driving Effect Ratio, calculated from the provided data, is approximately 0.16. This indicates a positive and substantial multiplier effect within the domestic economy.

In contrast, the Arabica value chain exhibits a lower rate of integration, at 67%. This lower level of integration is directly linked to the value chain's significant dependency on imported intermediate goods and services, amounting to 163,776 MTZS. A substantial share of these imports is attributable to fertilisers, which are partially subsidised by the state at a rate of 50%. The negative indirect value added for Arabica further reinforces this, as imported inputs reduce the domestic multiplier effect rather than stimulating it. This suggests that while both chains contribute to the economy, Robusta promotes stronger domestic linkages. Policies for Arabica should therefore explore opportunities to localise input supply chains to reduce import dependency and strengthen domestic integration, thereby enhancing its driving effect within the national economy. The robusta sub-sector's efficiency and net foreign earnings help offset the costs of Arabica's support. Overall, the national coffee value chain remains strongly inward-oriented, with about 81% of the final value of coffee added domestically on average. However, this average conceals the significant disparity between Robusta's very high integration and Arabica's much lower integration.

2.4.4 Contribution to Public Finances

The contribution of the coffee value chain to public finances is assessed by comparing the tax receipts generated by its activities against any subsidies received. For the Robusta value chain, taxes collected amount to 22,939 MTZS, with subsidies calculated to only 73 MTZS (*Table 2-1*). The public funds balance for Robusta is positive at 22,866 MTZS, indicating it is a net contributor to the state budget.

Conversely, the Arabica value chain presents a different fiscal picture. While it contributes 18,768 MTZS in taxes, it receives substantial subsidies, primarily through input subsidies for fertiliser, amounting to 69,789 MTZS (*Table 2-1*). This results in a significant deficit for the state, with a net negative transfer of 51,021 MTZS from public funds to the Arabica value chain. The data explicitly shows that the subsidy is much higher than the taxes the state collects for Arabica.

When considering the national coffee sector, the combined taxes amount to 41,707 MTZS (22,939 MTZS from Robusta and 18,768 MTZS from Arabica). Total subsidies amount to 69,862 MTZS. This results in a national coffee value chain that, in aggregate, is a net recipient of public funds, with a deficit of 28,155 MTZS. This fiscal dynamic reveals a significant policy choice where the state actively supports the Arabica value chain, potentially through implicit cross-subsidisation from other sectors or even from the Robusta chain, as the data suggests. This raises questions about the efficiency and equity of public finance allocation within the coffee sector. Whether the high subsidy to Arabica is justified by its overall economic or social benefits, or if it disproportionately benefits certain actors (e.g., medium producers, exporters) without sufficient spillover, warrants further consideration. Policy discussions should explore options for reducing Arabica subsidies or increasing export levies on Arabica to achieve a more balanced fiscal contribution across the coffee sector.

TABLE 2-1 COMPARATIVE MACROECONOMIC CONTRIBUTIONS (VA, GDP SHARE, INTEGRATION, PUBLIC FUNDS) FOR ROBUSTA, ARABICA, AND NATIONAL VC

Indicator	Robusta VC	Arabica VC	National Coffee VC
Total VC Production (MTZS)	585,630	529,997	1,115,627

Total Direct VA (MTZS)	478,897	409,287	888,184
Total Indirect VA (MTZS)	77,948	-52,083	25,865
Total VA (MTZS)	556,000	357,203	913,203
Total VA in percentage of National GDP (%)	0.3%	0.2%	0.50%
Total VA in percentage of Agriculture GDP (%)	5.10%	3.20%	8.30%
Driving Effect Ratio (Indirect VA/Direct VA)	0.16	-0.13	0.04
Rate of Integration (Total VA/VC Production) (%)	95%	67%	81%
Total Taxes (MTZS)	22,939	18,768	41,707
Total Subsidies (MTZS)	73	69,789	69,862
Public Funds Balance (MTZS)	22,866	-51,021	-28,155

2.4.5 Contribution to the Balance of Trade

Coffee is a traditional export crop for Tanzania, and both chains are heavily export-oriented. The coffee value chain's contribution to Tanzania's balance of trade is assessed by comparing its export earnings with the costs of imported intermediate goods and services required for its operations. Both Robusta and Arabica value chains demonstrate a positive contribution to the balance of trade, indicating their significance as net foreign currency earners for the national economy.

For the Robusta value chain, total exports are reported at 546,629 MTZS, while imports of intermediate goods and services amount to a relatively low 10,135 MTZS. This results in a substantial positive trade balance of 536,494 MTZS, making Robusta a highly efficient generator of foreign exchange with minimal foreign currency outflow for inputs.

The Arabica value chain also records significant exports of 529,305 MTZS. However, its imports of intermediate goods and services are considerably higher, at 163,776 MTZS. This higher import dependency, primarily due to imported fertilisers and other inputs, results in a positive trade balance of 365,529 MTZS, which is still substantial but lower than Robusta's (*Table 2-2*).

When consolidated, the National Coffee Value Chain generates total exports of 1,075,934 MTZS and incurs total imports of 173,911 MTZS. This yields a combined national trade balance of 901,745 MTZS, reinforcing the coffee sector's overall positive impact on Tanzania's foreign exchange reserves. The differing levels of import dependency between the two coffee types are a key observation. Arabica's higher reliance on imported inputs makes it more susceptible to global supply chain disruptions and currency fluctuations for these essential inputs. Diversifying input sources domestically or promoting more organic and less input-intensive farming methods for Arabica could enhance its long-term resilience and net foreign exchange contribution.

The import intensity of each value chain is presented in *Table 2-2*. Only 1.7% of Robusta's total production value relies on imports, reflecting strong domestic integration. In contrast, Arabica's production depends heavily on imported inputs, primarily fertiliser, accounting for 30.9% of its

total value. At the national level, imports represent 15.6% of the coffee value chain's production, revealing a moderate overall reliance on external inputs, driven largely by the Arabica segment.

TABLE 2-2 COMPARATIVE BALANCE OF TRADE (EXPORTS VS. IMPORTS) FOR ROBUSTA, ARABICA, AND NATIONAL VC

Indicator	Robusta VC	Arabica VC	National Coffee VC
Total VC Production (MTZS)	585,630	529,997	1,115,627
Total VC Exports (MTZS)	546,629	529,305	1,075,934
Total VC Imports of IGS (MTZS)	10,135	163,776	173,911
Balance of Trade (Exports - Imports, MTZS)	536,494	365,529	901,745
Total Imports/VC Production (%)	1.7%	30.9%	15.6%

In sum, Tanzania's coffee value chains contribute modestly to GDP (about half a percent) and are important export earners. The Robusta chain is far more macroeconomically efficient; it has a high integration rate, strong net exports, and a net positive fiscal contribution. The Arabica chain, while still bringing in export revenue, currently relies on significant government support and imported inputs, making its net economic contribution smaller and raising concerns about sustainability without subsidies. Next, we examine indicators of international competitiveness (NPC, DRC) to further assess each sub-sector's viability, and then turn to how incomes and employment are distributed across the chains (social inclusiveness).

2.4.6 Competitiveness and Viability within the International Economy

The international competitiveness and viability of the coffee value chain are assessed using the Nominal Protection Coefficient (NPC) and the Domestic Resource Cost (DRC) ratio, presented in *Table 2-3*. These indicators compare domestic market outcomes to international benchmarks, providing insight into the value chains' alignment with global prices and the efficiency of domestic resource use. NCP is calculated as the ratio between the domestic price received by farmers and the corresponding world price. An NPC less than 1.0 suggests that domestic prices are lower than world prices, indicating an implicit tax on domestic producers. Conversely, an NPC greater than 1.0 indicates that domestic producers are receiving a higher price than the world market price, implying an implicit subsidy or protection.

In the Robusta chain, the NPC is 0.93, indicating that domestic market prices are slightly below international parity levels. This suggests a slight net tax on domestic producers and points to a modestly competitive position in the global market. Conversely, the Arabica chain shows an NPC of 1.16, implying that domestic prices exceed parity prices by 16%. This divergence suggests some level of implicit protection or price distortion, mostly due to policy transfer in the form of a 50% subsidy on fertiliser. At the national level, when combining both chains, the NPC is approximately 1.02, suggesting overall price alignment with world markets.

The DRC, however, provides a deeper insight into the economic efficiency of producing a good domestically compared to importing it, indicating whether the value chain is viable in the global economy. A DRC value less than 1 suggests that the domestic cost of producing a good is lower

than the foreign exchange it earns, implying international competitiveness. A DRC greater than 1 suggests the opposite, indicating that domestic production is not competitive without policy support. For the Robusta value chain, the DRC is 0.04. This value, significantly less than 1, indicates that Robusta coffee production in Tanzania is inherently viable and competitive in the global economy. It efficiently utilises domestic resources to generate foreign exchange. For the Arabica value chain, the DRC of 0.06 remains well below unity, indicating that Arabica production is still economically viable and globally competitive, though less efficient than Robusta. The DRC analysis confirms that both the value chains exhibit a strong comparative advantage, meaning that even without any subsidies, the value chains use resources efficiently and profitably at social prices.
The divergence figures reinforce this view: while Arabica earns a positive divergence (52,086 MTZS) due to policy transfer through fertilizer subsidy, Robusta shows a negative divergence (-32,458 MTZS), offsetting part of this gain. Net divergence at the national level is modest (19,626 MTZS), reflecting limited market distortion and overall economic gains from trade.

TABLE 2-3 INTERNATIONAL VIABILITY INDICATORS (NPC, DRC) FOR ROBUSTA, ARABICA, AND NATIONAL VC

Indicator	Robusta VC	Arabica VC	National Coffee VC
Profit at market price	438802	368607	807409
Profit at parity price	471261	316522	787783
Divergence	-32458	52086	19626
Nominal Protection Coefficient (NPC)	0.93	1.16	1.02
Domestic Resource Cost Ratio (DRC)	0.04	0.06	0.05

The slight difference in DRC values (Robusta at 0.04 versus Arabica at 0.06) combined with the NPC insights reveals that Robusta's competitiveness is inherent and robust, even under slight taxation. Arabica is also competitive globally and relies heavily on policy support (subsidies) to maintain its private profitability and competitive edge. This suggests that while both chains have a comparative advantage (DRC < 1), the nature of that advantage differs significantly. Overall, Tanzania is generally suited to produce coffee, as indicated by DRC values below 1 for both chains. Opportunities exist to gradually reduce Arabica subsidies during periods of high world coffee prices and instead capture more value through moderate taxation when profits spike. This approach could improve the sector's net contribution to public finances without undermining competitiveness, provided productivity continues to rise.

2.5 Summary of economic indicators for framing question 1

The summary table of indicators for framing question 1 (See definitions of economic terms before the Executive Summary) is presented in *Table 2-4*.

TABLE 2-4 SUMMARY TABLE OF INDICATORS FOR FRAMING QUESTION 1

	INDICATORS	**RESULTS**
Framing Question 1: What is the contribution of the VC to economic growth?		

CQ1.1	How profitable and sustainable are the VC activities for the entities involved?	**Operating Accounts of every type of actor**	(Synthetic table of Operating accounts in Section 2.3, details in Annex 3 and 4)
		Net operating profit by type of actor (MTZS)	Robusta: Small Prod: 73,703; Medium Prod: 90,459; Large Prod: 104,439; Primary Society: 17,929; Large Processor: 33,128; Small Processor: 22,093; Collec Border: 825; Exporter: 43,106; Soluble Manf: 46,574; Local Trader: 5,643
		Net operating profit by type of actor (MTZS)	Arabica: Small Prod: 15,354; Medium Prod: 203,288; Large Prod: 24,164; Estate Prod: 33,750; Primary Society: 14,613; Processor: 14,954; Exporter: 63,137; Local Trader: 691
		Return on turnover (operating profit/production)	Robusta: Small Prod: 55%; Medium Prod: 68%; Large Prod: 78%; Primary Society: 5%; Large Processor: 13%; Small Processor: 13%; Collec Border: 1%; Exporter: 14%; Soluble Manf: 26%; Local Trader: 14%
		Return on turnover (operating profit/production)	Arabica: Small Prod: 49%; Medium Prod: 67%; Large Prod: 64%; Estate Prod: 26%; Primary Society: 4%; Processor: 4%; Exporter: 12%; Local Trader: 4%
		Benchmarks for farmers' net income (minimum wage, livelihood needs, job opportunities…)	Robusta Small Prod: TZS 6,388/day; Medium Prod: TZS 15,981/day; Large Prod: TZS 111,402/day. Arabica Small Prod: TZS 4,436/day; Medium Prod: TZS 14,631/day; Large Prod: TZS 27,826/day. Smallholders' returns are very low compared to larger producers.

Framing Question 1: What is the contribution of the VC to economic growth?		**INDICATORS**	**RESULTS**
CQ1.2	What is the contribution of the VC to the GDP?	**Value of final VC production (MTZS)**	1,115,627
		Direct VA (MTZS)	888,184
		Total VA (MTZS)	913,203
		Total VA creation per stage	Farmers: (Primary Production) Robusta 21.6%, Arabica 21.6%. Processors:

			(Transformation) Robusta 34.5%, Arabica 33.6%. Traders: (Trade) Robusta 43.9%, Arabica 44.8%.
		Total VA and components (MTZS):	Wages/salaries: 30,146; Taxes on operations: 41,707; Depreciation: 8,480; Operating profits: 807,851
		Total VA in percentage of the GDP	0.50%
		Rate of integration into the Economy (total VA/VC production)	81%
CQ1.3	What is the contribution of the VC to the agriculture sector GDP?	**VC agricultural actors' Value Added in percentage of the agriculture sector GDP**	8.30%
CQ1.4	What is the contribution of the VC to the public finances?	**Receipts of the government (taxes, etc.) (MTZS)**	41,707
		Outlays of the government (subsidies, etc.) (MTZS)	69,862
		Public Funds Balance (MTZS)	-28,155
CQ1.5	What is the contribution of the VC to the balance of trade?	**VC exports (MTZS)**	1,075,934
		VC total imports (goods and services) (MTZS)	173,911
		Balance of trade of the VC (MTZS)	901,745

Framing Question 1: What is the contribution of the VC to economic growth?		**INDICATORS**	**RESULTS**
CQ1.6	Is the VC viable in the international economy?	**Nominal Protection Coefficient (NPC)**	1.02
		Domestic Resource Cost Ratio (DRC)	0.05

3. IS THIS ECONOMIC GROWTH INCLUSIVE?

A critical aspect of the value chain analysis is inclusiveness – who benefits from the coffee value chain in terms of income and employment? We address this by examining the distribution of value added and profits (incomes) across different types of actors and by analysing the distribution of wages (paid employment) along the chain. This corresponds to VCA4D Framing Question 2 (FQ2), assessing whether the VC's growth is inclusive of smallholders and workers.

3.1 Income Distribution Across Actors

3.1.1 Net Operating Profit Distribution

As shown in Figure 3.1, the distribution of Net Operating Profit (NOP) across actors differs markedly between the two coffee value chains. In the Robusta chain, profitability is spread across a relatively broad set of actors, with upstream farmers collectively capturing the majority share. Large producers account for 24% of total NOP, medium producers 21%, and small producers 17%, so that producers as a group retain over 60% of total profits. Downstream actors such as exporters (10%), processors (12%), and traders capture smaller but still notable portions. This apparent spread suggests that no single category entirely dominates value capture, pointing to a nominal inclusivity at the aggregate level.

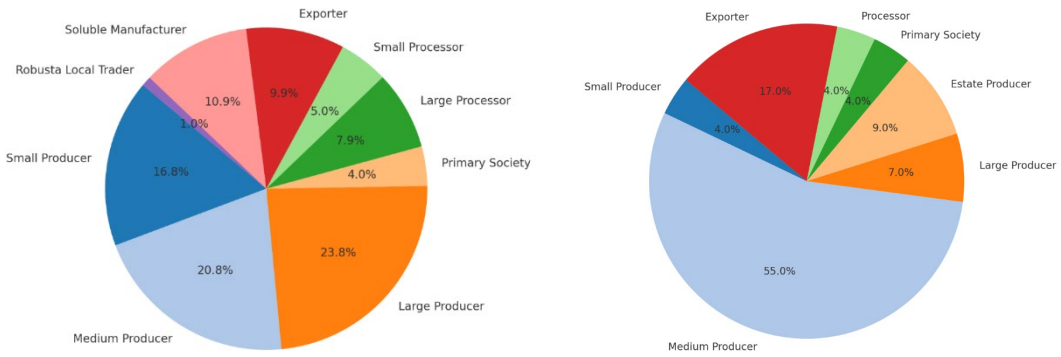


FIGURE 3.1 DISTRIBUTION OF NET OPERATING PROFIT BY ACTOR IN THE ROBUSTA (LEFT) AND ARABIC (RIGHT) COFFEE VALUE CHAIN

The Arabica chain displays a different, more polarised pattern. Medium-scale producers dominate decisively, capturing 55% of total NOP. Exporters account for 17%, while estates (9%), large producers (7%), and small producers (4%) capture relatively marginal shares. Cooperatives and processors together hold only 8%, reflecting their weak role in value retention.
Overall, while the Robusta chain appears more inclusive in aggregate, with profit shared across a range of actors, there is disparities between small and larger entities. By contrast, the Arabica chain is structurally dominated by medium producers, leaving both small producers and other actors with only marginal shares.

3.1.2 Wage Employment Distribution

Coffee value chains not only generate profits for owners but also wages for labourers. Inclusiveness requires looking at who gets employment and wage income in these chains. As presented in *Figure 3.2* and *Table 3-1*, in the Robusta chain, large producers are the dominant contributors to wage payments, accounting for 53.5% of the total, followed by medium producers at 29.7%. Small producers contribute minimally, only 2%. This indicates that while Robusta offers wider employment distribution across different producer scales, it is still skewed towards larger farming operations.

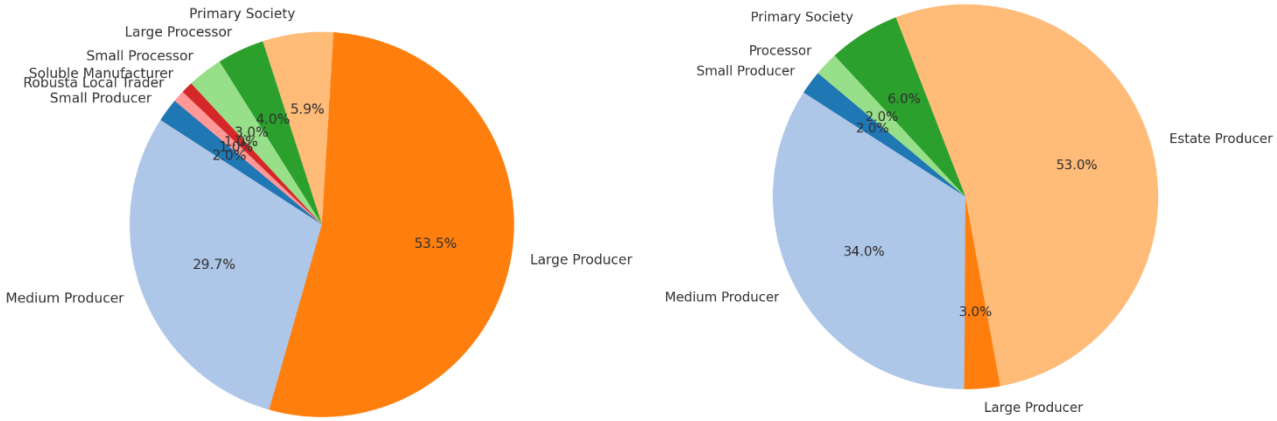


FIGURE 3.2 DISTRIBUTION OF TOTAL WAGES PAID (%) BY EACH ACTOR CATEGORY IN THE ROBUSTA (LEFT) AND ARABICA (RIGHT) CHAINS

For the Arabica chain, estate production is by far the largest contributor to wage payments, accounting for over 53% of total wages. Medium producers contribute just under 34%, indicating they also employ significant hired labour (though less per unit output than estates). A clear difference emerges: Robusta's wage payments are dominated by large and medium producers (who hire seasonal and permanent farmworkers), whereas Arabica's wage profile is dominated by estate plantations. These estates (often large coffee plantations in Northern Tanzania and Southern Highlands) are labor-intensive operations that hire a large workforce for field work and processing.

This signifies a more polarised structure in Arabica, where employment is concentrated in a few large or commercial farms. While Arabica estates provide significant formal wage employment, the benefits are concentrated, whereas Robusta's employment generation is more dispersed across various producer scales. Policies aiming for broad-based rural employment should therefore consider supporting the diverse producer base in Robusta. For Arabica, while estate production is a major employer, efforts are needed to expand labour absorption among smallholders and cooperatives to enhance inclusiveness.

This indicates that formal employment in Arabica is highly concentrated in a few large enterprises (estates and bigger medium farms), whereas in Robusta, while large farms lead, there is a somewhat broader base (medium farms and some processing contributing more significantly). From a development perspective, Robusta appears slightly more inclusive in job creation, it spreads wage employment across more mid-sized farms, while Arabica's jobs are mostly on big estates, meaning regions with estates benefit from jobs but smallholder regions see little wage employment. Also, much of Robusta's labour is self-employment (family labour on small farms), which doesn't show up as "wages" but is still work being done. Indeed, one observation is that the coffee sector (especially Robusta) is labour-intensive but not wage-intensive; a large portion of labour is self-employed family labour, so the sector's contribution to *formal* employment is limited. Policymakers aiming for job creation might consider strategies to increase labour-intensive processing (e.g. encourage more domestic roasting, which could create jobs) or to support smallholders in scaling up (transitioning family labour into more formal, higher-income employment opportunities).

TABLE 3-1 COMPARATIVE DISTRIBUTION OF NOP AND WAGES BY ACTOR TYPE (ROBUSTA VS. ARABICA)

Actor Type	Robusta VC (% NOP)	Arabica VC (% of NOP)	Robusta VC (% of Total Wages)	Arabica VC (% of Total Wages)
Small Producer	17%	4%	2%	2%
Medium Producer	21%	55%	30%	34%
Large Producer	24%	7%	54%	3%
Estate Producer		9%		53%
Primary Society	4%	4%	6%	6%
Processor	12.8%	4%	7%	2%
Collector at Border	0.2%		0%	
Exporter	10%	17%	0%	0%
Soluble Manufacturer	11%		1%	
Local Trader	1%	0	0.2%	0%

3.1.3 Distribution of Employment Creation

Table 3-2 presents the distribution of employment across different labour categories within the Robusta and Arabica coffee value chains, expressed in terms of wage value, time equivalent in days, and estimated full-time equivalent (FTE) employment.

TABLE 3-2 DISTRIBUTION OF WAGES AMONG EMPLOYMENT CATEGORIES

	Value of wages (MTZS)	Time equivalent (days)	Full Time Equivalent
	Robusta Value Chain		
Total Temporary	12,474	2806578	23388
Total Permanent Unskilled	1,614	322817	1291
Total Permanent Skilled	271	9019	36
Total wage labour	14,358	3,138,414	24,715
	Arabica Value Chain		
Total Temporary	11,569	2,442,285	16282
Total Permanent Unskilled	3,022	604,430	2418
Total Permanent Skilled	1,017	33,916	136
Total wage labour	15,608	3,080,630	18,835

The total estimated FTE wage employment is 24,715 for the Robusta value chain and 18,835 for the Arabica value chain. These workers collectively receive net wage payments of MZTS 14,358 and MZTS 15,608, respectively. These figures exclude income tax and social security contributions made by either employees or employers. Temporary labour represents the largest share of wage employment in both value chains, accounting for 94.6% of all labour days in Robusta and 79.3% in Arabica, indicating a high reliance on short-term or seasonal work, particularly during harvesting and post-harvest periods. Permanent unskilled workers account for a notable share of labour in Arabica (2,418 FTE), compared to only 1,291 in Robusta. Skilled permanent employment remains relatively low in both chains, with only 36 FTEs in Robusta and 136 in Arabica. Gender-disaggregated analysis indicates that women constitute approximately 55% of the FTE workforce, with men accounting for the remaining 45%. This highlights the critical, though often under-

recognised, role of women in the coffee labour economy. The high concentration of women in temporary and unskilled roles may also reflect gender segmentation in labour allocation and access to formal employment opportunities.

3.1.4 Individual-level Distribution of NOP and Inclusiveness of the Coffee Value Chain

The analysis of individual Net Operating Profit (NOP) relative to the value chain (VC) average, alongside return to family labour per day, reveals stark disparities in income distribution and inclusiveness across both Robusta and Arabica coffee value chains in Tanzania (Tables A1 and A2). Return to family labour per day is calculated by dividing the individual NOP by the average annual full-time equivalent (FTE) labour days per household. Based on FAO estimates (Adong et al. 2024), we use 120 days for Robusta and 150 days for Arabica producers.

In the Robusta chain, smallholders capture only 27% of the average NOP, medium producers attain 67%, while large producers earn 4.6 times the average. When expressed in labour terms, the estimated return to family labour is TZS 6,388, TZS 15,981, and TZS 111,402 per day for small, medium, and large producers, respectively. This sharp gradient illustrates the significant advantages conferred by scale, with large producers earning more than 17 times the daily return of smallholders. Disparities extend further downstream, where large processors and soluble coffee manufacturers earn NOPs over 10,000 times the chain average, further amplifying inequality in value capture.

In the Arabica chain, although overall profitability is lower, the inequality remains pronounced. Small producers earn just 22% of the average NOP, medium producers 72%, and large producers 1.37 times the average. The daily return to family labour is estimated at TZS 4,436 for smallholders, TZS 14,631 for medium producers, and TZS 27,826 for large producers, again highlighting steep returns to scale. Estate producers, operating at an entirely different order of magnitude, earn more than 1,100 times the average NOP. Similar to the Robusta chain, downstream actors such as exporters and processors dominate value capture, while primary societies and local traders generate negligible returns.

Taken together, the data point to a structural imbalance in both value chains, where profitability is heavily concentrated among large-scale and capital-intensive actors. Small and medium producers capture only a fraction of the total value generated, raising serious concerns about the inclusiveness and long-term viability of the sector. With such low and unequal returns, particularly for smallholders, there is a real risk of disengagement from coffee farming in favour of alternative livelihood options unless targeted interventions improve equity and raise producer-level margins. The employment structure within the Tanzanian coffee value chain is characterised by a significant reliance on family labour, particularly for smallholder farms. For Arabica coffee cultivation, smallholder households typically invest between 150 and 170 family labour days per year. This includes a wide range of tasks such as land preparation, weeding, pruning, harvesting, and basic processing, almost exclusively performed by family members, often involving women and children. For Robusta coffee, the figure is slightly lower, averaging 120 to 140 family labour days per year, reflecting different agronomic practices and less labour-intensive management. Hired labour is generally minimal or absent, especially for typical smallholdings, indicating that coffee farming primarily serves as a source of self-employment and household livelihood rather than a major generator of formal wage jobs for the broader labour market.

This heavy reliance on family labour, while providing resilience for farming households, also implies potential vulnerability to income fluctuations and limited access to social security benefits typically associated with formal employment. The higher labour intensity of Arabica cultivation suggests a greater human capital investment and a higher opportunity cost for family labour in this segment. Interventions for Arabica smallholders might therefore focus on labour-saving technologies or improving labour productivity to maximise returns from this higher labour investment. For Robusta, the lower labour intensity might allow for diversification into other activities, enhancing household resilience.

In contrast to the prevalence of family labour among smallholders, larger-scale operations contribute significantly to wage employment. In the Robusta chain, large producers account for over half (53.5%) of total wage payments, followed by medium producers (29.7%). In the Arabica chain, estate production is the largest contributor to wage payments, accounting for over 53% of total wages, with medium producers contributing just under 34%. This indicates that while the coffee sector provides substantial employment, the nature of this employment varies significantly by actor type and coffee variety. Estate production in Arabica stands out as a significant source of formal wage labour, suggesting a more formalised employment model in that segment.

Kangile et al. (2021) concluded that some income sources widen inequality between wealthier and poorer households. The fairest and most equal sources (in order) were found to be coffee production, other crop farming and livestock. A 1 percent increase in coffee income was associated with a −0.043 percent reduction in inequality, while a 1 percent increase in remittances reduced inequality by −0.006. Coffee farming is thus especially important for improving outcomes across all farmers, particularly the poorer ones, while off-farm income is strongly linked to higher inequality, tending to benefit better-off farmers more.

3.2 Income Inequality among Actors

The unequal shares of VA and profit are reflected in high inequality metrics. We calculated a Gini coefficient for the distribution of net income across all actors in each chain (*Table 3-2*, *Figure 3.2* and *Figure 3.4*). The Gini coefficient, a measure of statistical dispersion intended to represent the income or wealth distribution within a nation or any other group, provides a quantitative assessment of income inequality. A coefficient of 0 represents perfect equality, while 1 represents perfect inequality. The FAO considers a Gini coefficient of 0.35 and over as indicative of a high degree of inequality.

TABLE 3-3 GINI COEFFICIENTS FOR NET OPERATING PROFIT DISTRIBUTION (ROBUSTA VS. ARABICA)

Coffee Type	Gini Coefficient (NOP Distribution)	Interpretation
Robusta	0.8253	Very skewed, highly unequitable
Arabica	0.4566	Less skewed than Robusta, but still indicating significant inequality

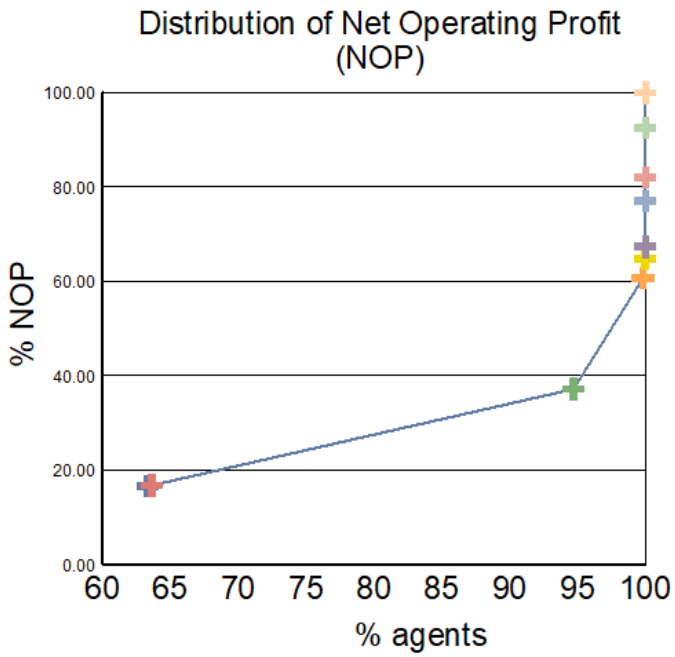


FIGURE 3.3 GINI COEFFICIENT (0.82) FOR THE ROBUSTA COFFEE VALUE CHAIN

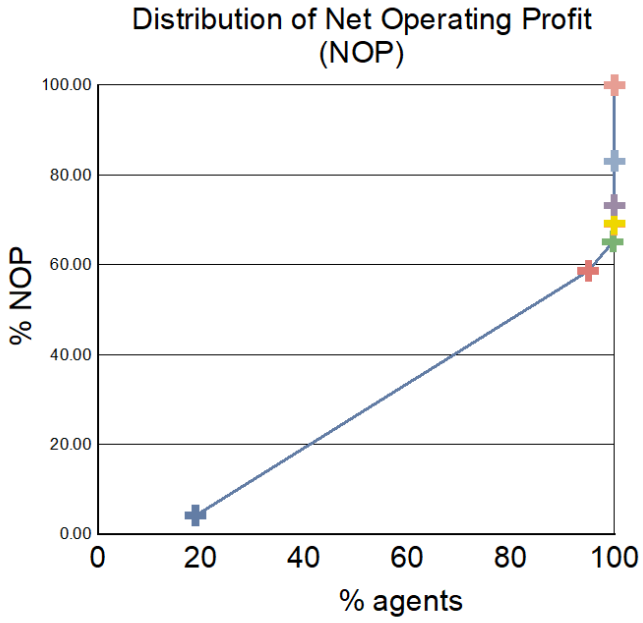


FIGURE 3.4 GINI COEFFICIENT (0.45) FOR THE ARABICA COFFEE VALUE CHAIN

For the Robusta coffee value chain, the Gini coefficient for Net Operating Profit (NOP) distribution is 0.8253. This figure indicates an extremely skewed and highly unequal distribution of profit. The data explicitly states that 96% of number of the actors in the system earn 40% of the total income, further illustrating this severe concentration of profit among a very small percentage of actors. This is explained by the presence of a few very large actors (like a handful of exporters, two instant coffee factories, and some large producers) capturing a large income, while tens of thousands of

small farmers each receive a tiny income. This is a critical nuance: while value creation might be spread across various producer scales, the ultimate profit capture is highly concentrated.

In contrast, the Arabica value chain exhibits a Gini coefficient of 0.4566 for NOP distribution. While still indicating significant inequality by international standards (as it is above 0.35), this is considerably lower than Robusta's coefficient, suggesting a relatively more equitable profit distribution within the Arabica chain. This somewhat counter-intuitive result (Arabica VA/profit was more concentrated in share terms, yet Gini is lower) is likely because the number of medium producers who are winning in Arabica is fairly large (on the order of 90,000 medium farms), so income is concentrated but among many mid-sized actors rather than a few individuals.
From an inclusiveness standpoint, policies should aim to reduce these gaps, for example, helping smallholders improve yields and quality to raise their incomes, and strengthening producer organisations, improving transparency in pricing, and potentially regulating market intermediaries, to promote more equitable profit sharing.

3.3 Participation in Value Chain Governance and Inclusion

Institutional arrangements, market structures, and social capital shape participation and influence inclusion in the Tanzanian coffee value chain. Governance plays a pivotal role in determining who benefits and to what extent, its effectiveness remains mixed. Agricultural Marketing Cooperative Societies (AMCOS) are intended to serve as critical intermediaries that aggregate produce, negotiate on behalf of smallholders, and facilitate access to markets. However, many AMCOS remain under-resourced and poorly managed, with limited capacity to provide timely payments, pre-financing, or input support. This weak institutional capacity has affected trust among farmers, leading to disengagement. While AMCOS have the potential to empower producers, particularly those with limited market access, their inability to meet farmer expectations has, in many cases, undermined their role as vehicles for inclusion. Collective action remains fragmented, and although some well-functioning cooperatives exist, many operate at a basic level, offering little more than logistical support.

The auction system, coordinated by the Tanzania Coffee Board and supported by the Tanzania Mercantile Exchange (TMX), aims to improve transparency in price formation and create a level playing field for producers. In principle, such mechanisms should reduce asymmetries in price information and enhance producer bargaining power. In practice, however, the effectiveness of these systems in promoting inclusion is limited. While auction prices are publicly available, the ability of smallholders to act on this information is constrained by structural issues, such as liquidity shortages, limited storage options, and weak negotiation capacity. For many farmers, especially those in more remote areas, auction systems remain distant and abstract, with little bearing on the actual prices they receive. Moreover, the complexity and delayed payment cycles associated with auction sales often incentivise producers to engage in informal, immediate transactions, even if prices are lower. The expansion of direct sales and alternative marketing channels reflects growing dissatisfaction with the formal auction system and a desire for greater control over pricing and trade relationships. Yet these new arrangements may also introduce new exclusions, favouring better-resourced actors.

The licensing system has established a credible compliance baseline, but it has not delivered inclusive efficiency. Market-access rules and costs disproportionately favour large exporters, while smallholders and local processors face high transaction costs and weak bargaining power. Core marketing functions such as price discovery, origin branding, certification/traceability, market intelligence, and buyer linkage, are under-provided to producer groups, which limits their entry

into specialty and processed-coffee segments and keeps most farmers in low-margin green-bean channels. To realign outcomes with inclusion, governance reforms would need to: (i) simplify/waive selected fees for cooperatives and small processors and enable cooperative direct exports; (ii) ring-fence a portion of licensing revenues for shared marketing services (district cupping labs, quality-grader training, certification readiness, digital traceability, and Tanzania-origin promotion); (iii) guarantee farmer representation, including women and youth, on TCB and auction marketing committees; (iv) mandate transparent auction data and enforce timely-payment standards; and (v) expand warehouse-receipt/blended-finance facilities so producer groups can aggregate, hold, and market higher-quality lots. These steps would complement process simplification and capacity-building to turn compliance success into inclusive market participation.

Despite national commitments to gender equity, the coffee sector remains marked by deeply entrenched gendered roles and unequal access to decision-making. Women contribute significantly to labour, particularly in harvesting and post-harvest processing, yet they often lack control over production decisions, sales income, and access to formal credit and training. This imbalance fuels intra-household tensions. However, signs of progress are emerging. Some women report increased ownership of land and participation in marketing decisions, and informal support systems, particularly Village Savings and Loan Associations (VSLAs), have provided alternative channels for financial inclusion and collective action. Nevertheless, time poverty caused by women's dual burden of domestic and productive labour continues to limit their full participation in value chain governance.

Overall, while governance reforms have aimed to increase transparency and participation, their impact on inclusion remains uneven. AMCOS have not yet delivered on their potential as drivers of collective empowerment, and auction systems have struggled to bridge the gap between market structures and the lived realities of smallholder farmers. Without targeted investment in institutional capacity, accountability, and farmer capabilities, these governance structures risk reinforcing rather than reducing inequality in the coffee value chain. Addressing these challenges requires a dual approach: investing in the technical and financial capacity of AMCOS and promoting accountability mechanisms that rebuild farmer confidence. The increased digitisation of platforms like TMX has the potential to improve transparency, but only if paired with financial literacy, capacity building, and supportive infrastructure.

Governance in Tanzania's coffee AMCOS and Unions is highly uneven. Where strong and business-oriented leadership can enforce clear production rules and negotiate buyer terms, cooperatives function reliably. However, many lack core managerial systems, with 60 percent without business plans, 75 percent with limited financial management skills, and 80 percent struggling to access and use market information (TCB, 2023). Service-delivery failures, especially delayed payment of coffee income, scarce seasonal pre-finance, and late or inconsistent input and training support, has eroded trust and helps drive side-selling, as was repeatedly reported in the VCA4D FGDs in Ruvuma and Kagera (May 2025). Limited membership subscriptions and bank credit are constraining pre-financing, while rules allowing single membership but multi-channel selling weaken loyalty and cooperative balance sheets. By contrast, business-oriented Unions such as KDC and KDCU in Kagera dominate the Robusta sub-chain, whereas Arabica Unions are less active. Although programmes like CFAT are professionalising some groups, policy changes have generally reduced cooperatives' ability to compete with private traders on equal terms, curbing farmer benefits (Sumelius et al., 2024).

To create a more inclusive governance framework, practical upgrades will be needed in technology, finance, organisation, and market design. These might include greater. promotion of

digital traceability and mobile payments, e-auctions and direct-to-farm market-info services, micro-wet mills and solar dryers, producer-owned export consortia, and tools like warehouse-receipt finance, forward contracts, and micro-insurance. These would enable smallholders to meet quality and traceability standards, aggregate and process higher-quality coffee, cut costs associated with intermediaries and logistics, and receive faster, more transparent payments. With better access to prices and improved risk management, farmers would be in a better position to negotiate directly with higher-value buyers and capture quality premiums instead of resorting to lower value and distress sales to intermediaries. To ensure these gains are inclusive, governance structures would need to promote open standards, fund shared services (e.g. district cupping labs, and training for quality graders), provide matching grants to purchase small equipment, and guarantee farmer representation, including women and youth, on auction and marketing oversight bodies. Complementary rules on data portability, timely payments, and accessible dispute resolution would further prevent capture by large actors and embed greater accountability in the system.

3.4 Summary of economic indicators for framing question 2

The summary table of indicators for framing question 2 (See definitions of economic terms before the Executive Summary) is presented in Table 3-4.

TABLE 3-4 SUMMARY TABLE OF INDICATORS FOR FRAMING QUESTION 2

Framing Question 2: Is this economic growth inclusive? *(To be completed with Social Analysis results)*		**INDICATORS**	**RESULTS**
CQ2.1	How is income distributed across actors of the VC?	**Disaggregated Value Added**	Robusta: Producers: 62% (Large 24%, Medium 21%, Small 17%). Exporters: 10%, Soluble Manuf: 11%. Processors/Primary Societies: 4-7%.
		Disaggregated Value Added	Arabica: Medium Producers: 54%. Exporters: 18%, Estate Producers: 10%. Small Producers/Processors/Primary Societies: 4% each.
		Total farm income	Robusta: Smallholders capture 27% of average NOP, Medium 67%, Large 4.6 times average.
		Total farm income	Arabica: Small producers 22% of average NOP, Medium 72%, Large 1.37 times average.
		Wages and salaries (at every stage, all activities)	Total wages paid: Robusta 14,508 MTZS; Arabica 15,638 MTZS.
		Total income accruing to marginalized and vulnerable groups	Smallholders in both chains receive very low returns to family labour (Robusta Small Prod: TZS 6,388/day; Arabica Small Prod: TZS 4,436/day). This

			raises concerns about their long-term engagement and livelihood sustainability.
CQ2.2	What is the impact of the governance systems on income distribution?	**Income distribution among actors**	Robusta: Gini coefficient of 0.8253 (extremely skewed, highly unequitable). 96% of actors earn 40% of total income.
		Income distribution among actors	Arabica: Gini coefficient of 0.4566 (significant inequality, but less skewed than Robusta).
		Share of farm gate price in the final price (%)	62%
CQ2.3	How is employment distributed across the VC?	**Number of jobs (family, self- and formal employment) at different VC stages (permanent/ temporary, skilled/unskilled…)**	Number of actors: Robusta: 151,941; Arabica: 121,839. Full-time equivalent (FTE) for Robusta: Temporary = 11,226; Permanent skilled = 1,291; Permanent unskilled = 36. Full-time equivalent (FTE) for Arabica: Temporary = 9,769; Permanent skilled = 2,418; Permanent unskilled = 136.
		Employment of women	The estimated female employment rates in the Robusta and Arabica coffee value chains are approximately 51.1% and 54.3%, respectively, based on total labour days. This highlights the critical role women play in coffee production and related activities.

3.5 Overall Conclusion and Major Findings

The analysis of Tanzania's national coffee sector reveals two distinct value chains, Robusta and Arabica, with markedly different economic characteristics, degrees of inclusivity, and structural vulnerabilities.

The Robusta chain demonstrates strong financial viability and macroeconomic efficiency. With a domestic integration rate of around 95%, it operates with minimal dependence on imported inputs and makes a net positive contribution to public finances and foreign exchange. Value added is relatively broadly distributed across actors, with producers collectively retaining over 60% of profits. However, inclusivity at the aggregate level conceals severe inequalities at the individual level: a small number of larger producers and processors capture disproportionate gains, while the vast majority of smallholders remain marginalised. This is reflected in the chain's exceptionally high Gini coefficient (0.83), which underscores persistent challenges in achieving equitable income distribution despite strong overall performance.

By contrast, the Arabica chain, though associated with a higher-value product, displays weaker financial viability and macroeconomic efficiency. It is heavily reliant on fertiliser subsidies, with imported inputs accounting for a large share of production costs, leading to economic leakages and a net fiscal drain. Profits are highly concentrated among medium-scale producers, who

capture more than half of total net operating profit, while both smallholders and larger estates receive relatively modest returns. This structure produces a lower but still significant Gini coefficient (0.46), highlighting a pattern of concentration rather than broad-based inclusion.

Across both chains, structural asymmetries in market power are evident. Trading and export functions consistently capture sizeable shares of value added, often exceeding the margins realised by producers and cooperatives. This dynamic undervalues on-farm production and limits incentives for investment and upgrading at the farm level. Furthermore, low returns to family labour, particularly for small Arabica producers, raise concerns about the long-term viability of smallholder engagement in coffee farming, especially among younger generations.

In summary, Tanzania's coffee sector is crucial for agricultural growth and generating foreign exchange, but its economic benefits are distributed unevenly. Robusta provides a relatively stable and integrated model but is marked by acute inequality, while Arabica is financially fragile, dependent on subsidies, and dominated by medium-scale farms. Addressing these issues will require a focus on making the sector more inclusive, equitable, and sustainable to ensure it can continue to be a driver of economic growth and provide stable livelihoods.

4. IS THE VALUE CHAIN SOCIALLY SUSTAINABLE?

The analysis of social sustainability and inclusiveness contained in this section of the report reflects individually on the Arabica and Robusta sub-chains. While there are many similarities between the two and they are governed, in most instances, by the same policies and systems, there are also significant differences both at the geographic, functional and social levels. These represent unique challenges and vulnerabilities that contribute to preventing them from achieving their full potential in terms of social benefits. These issues are explored through the VCA4D social analysis methodology which attempts to answer the framing question: "Is the value chain socially sustainable?". It defines 'sustainability' through the lens of six broad topics, not all of which are relevant to every value chain: (i) working conditions, (ii) land and water rights, (iii) gender equality, (iv) food and nutrition security, (v) social capital, and (vi) living conditions. Where appropriate, the social analysis also builds on and updates the findings of the 2018 VCA4D study, which focused on the Arabica VC and production in the Southern Highlands (Reben et al, 2018).

The analysis is based on evidence gathered through direct feedback from key informants within the coffee sector ranging from smallholder producers to national level stakeholders, plus secondary data provided to the VCA4D Team during the study. The VCA4D study also collected additional primary data from men, women and youth smallholder coffee farmers in Ruvuma and Kagera Regions using a survey, focus group discussions and 1:1 interviews between May – June 2025. This additional information provides a more in-depth understanding of SHF and their livelihood systems in relation to coffee production. The analysis is further augmented by evidence from secondary sources.

Understanding social sustainability is complicated by the potential disconnect between political and consumer-driven priorities and the lived experience of smallholder producers who are primarily concerned with livelihood security, income stability and resilience to climate and market shocks. Section 4.7 of the social analysis briefly reflects on some of these issues in the Tanzanian context.

4.1 Working conditions

Tanzania's coffee sector relies on unpaid household labour and a highly seasonal, largely informal workforce that peaks at harvest and processing. The VCA4D study cannot provide accurate workforce figures[3]. The majority of workers are employed in production and primary processing. The VCA4D Study confirms that informal employment in the coffee sector is based on verbal agreements, locally accepted rates of remuneration (Table 4.1) and the ability of both parties to negotiate acceptable terms. Verbal agreements may be legally unenforceable, but they still carry social costs, like damaged trust, reputational harm and loss of future opportunities.

It can be difficult to measure household labour inputs accurately because it lacks the visible markers of 'employment' (e.g. the exchange of time for money and in-kind payments) and is often underreported by key informants. The VCA4D Study also shows reciprocal labour as another important draw on household labour capacity particularly in Ruvuma, Mbeya and Songwe Regions (not present in Kagera). Reciprocal labour crosses household boundaries and is based on social obligation rather than cash – where the 'payment' is future help, trust and maintenance of social status. Reciprocal labour obligations can be distorted by power and gender norms, particularly where some people's time is perceived as less valuable (see previous comment).

Nationally, agriculture's share of total employment fell from around 83 percent in 2000 to 65 percent in 2021 (NBS, 2022), potentially reflecting mechanization and structural shifts. In rural areas, informal employment dominates and is becoming increasingly important: only 4.8 percent of the rural workforce is formally employed, 95.2 percent is informally employed, with agriculture accounting for 76.4 percent of this (NBS 2022).

Labour on smallholder coffee farms

Most work on production and primary processing is carried out by household members, estimated to be between 73 to 90 percent of labour input (True Price, 2017 and COSA, 2011). Any shortfall is made up with 'outside' labour (labour from outside the household - either informally hired or reciprocal labour). Results from the VCA4D Survey revealed that smallholder coffee farmers in Ruvuma are more dependent on 'outside' labour (89 percent of those surveyed hired outside labour in the preceding year), of which 96 percent came from unpaid reciprocal labour. In Kagera, there appeared to be no reciprocal labour arrangements and only 63 percent of households drew on outside labour, all of which was paid for in cash. Figure 4.1 shows the relationship between peak hiring times and coffee agronomy tasks. Regional differences are clear. While harvest is a common time for SHF to hire labour in both regions, more farmers in Kagera hire labour for weeding than harvest[4]. Women were less likely to be hired. Of those HH in Kagera who employed someone from outside the household to help with weeding, 77 percent only hired men. Some tasks are predisposed towards male workers because of the effort level, but a task such as weeding is well within women's capabilities.

In Ruvuma, harvesting and pruning are the activities most likely to require additional labour. A common labour hierarchy is: household members → close relatives → neighbours through reciprocal arrangements → paid day-labourers from within the community → (and then only if needed) labourers from outside the community. This reflects cost and trust dynamics, where family/reciprocal arrangements reduce cash outlays and the need to monitor the work.

[3] As an example, based on the survey and extrapolated to the estimated 120,000 coffee farmers in Kagera – If 63% employ labour, of which 82% hire at harvest. That would equate to 61,992 if each HH hired one person for one day. This demonstrates the impact that informal labour in the coffee sector can have on the local economy.

[4] The FGD feedback hints at attitudes towards Robusta harvest being too important (and valuable) to trust non-HH members.

monitoring, and farmers typically hire local '*vibarua*' before considering migrants or outsiders. Exact choices shift with season, cash flow, and task, but the general rule is local-and-known first, paid-and-external last.

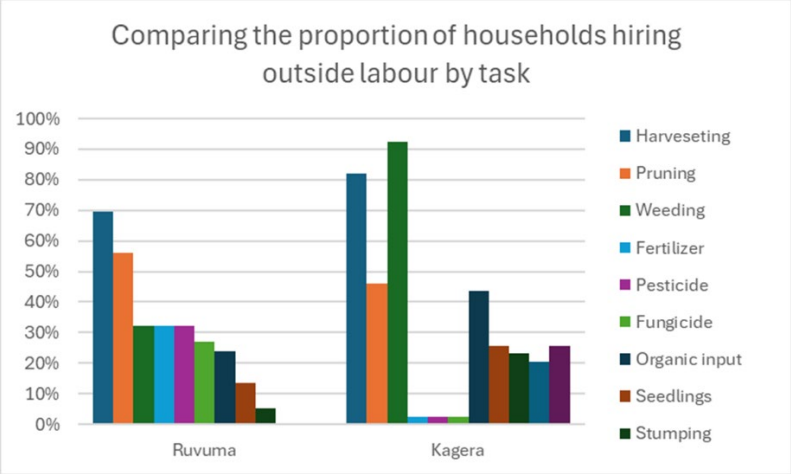


FIGURE 4.1 PROPORTION OF SMALLHOLDER FARMING HOUSEHOLDS WHO HIRED ADDITIONAL LABOUR FOR COMMON TASKS THROUGHOUT COFFEE PRODUCTION. THIS INCLUDED RECIPROCAL LABOUR, AND THOSE HIRED THROUGH WAGE AND IN-KIND PAYMENT. SOURCE: VCA4D SURVEY, 2025

The VCA4D Survey shows the range of payment terms negotiated between coffee farmers and labourers (Table 4-1). Women were reportedly receiving lower wages than men (feedback from focus groups) but this did not show in the survey results. However, women were much less likely to be hired than men for many tasks (harvesting being the main exception).

TABLE 4-1 EXAMPLES OF LABOURER PAYMENT TERMS FOR KEY COFFEE PRODUCTION TASKS BY REGION. SOURCE: VCA4D SURVEY, 2025

Task	Kagera (TSh)	Ruvuma (TSh)
Weeding	Per day = 1500 – 8000 Per garden = price varies by size Per tree = 500	Per day = 3000 – 5000 Per garden (varies)
Harvesting	Per day = 2000 - 8000 Per tin or *debe* = 1000 – 2000 Per kg = 500 Per tree = 1000 – 2000 Per garden = price varies by size	Per bucket or *debe* = 1000 – 2000
Pruning	Per day = 3000 – 5000 Also per tree and per garden (varies)	Per day = 4000 -5000 Per tree = 1000 Per garden (varies)
Organic inputs	Per day = 2000 – 5000 Per tree = 1000 Also per garden (varies)	
Fertilizer & pesticide application	Paid per garden (varies)	Per day = 5000

Labour on estates

Of the two estates visited by the VCA4D Social Expert, the Aviv Estate (owned by Olam) in Ruvuma region, had a base workforce of between 1000 – 1150 staff. At harvest time, they employed an additional 4000 – 5000 workers on seasonal, temporary contracts. Workers were reported to be

coming from as Mbinga, Njombe and Dodoma during harvest time. The Kilimanjaro Estate in Kilimanjaro region, was a much smaller operation. It had a base workforce of 600, of whom only 150 were permanent staff. During harvest, they employed an additional 1000 – 3000 people. Seasonal contracts lasted only 3-6 months. Both estates (particularly Kilimanjaro, who sourced 90 percent of their workforce from the neighbouring communities) experienced recruitment challenges during peak times. Women were more commonly hired during harvesting and for rearing seedlings, while men were recruited to prune, weed and for more physically demanding tasks.

4.1.1 Respect of labour rights

Formal labour rights

Tanzania's employment and labour rights framework is comparatively robust and has been strengthened over the past decade. It is grounded in 8/10 key ILO conventions (including Conventions 87 and 98) and the United Nations Convention on the Rights of Persons with Disabilities (CRPD). Since the 2018 VCA4D study, reforms have culminated in the Labour Laws (Amendments) Act, No. 4 of 2025, which introduces key updates to the Employment and Labour Relations Act, the Labour Institutions Act, and the Non-Citizens (Employment Regulation) Act. These are summarized in Table 4-2, below. Lessons from the COVID 19 pandemic have also been incorporated into these changes.

TABLE 4-2 SUMMARY OF LEGAL CHANGES TO TANZANIAN LABOUR POLICIES RELEVANT TO THE COFFEE SECTOR

Area	Policy Shift	What has changed and how this impacts the coffee sector
Legal clarity on contracts	Seasonal and fixed term workers gain formal recognition	Commercial coffee farms and estates, which rely on seasonal workers, can now legally engage casual labour under formal contracts that offer greater protection for rights and obligations.
Welfare of workers	Workers gain greater leave rights and protections in the event of disputes	Workers can now take up to 30 days unpaid leave without fear of dismissal, which can help them manage emergencies and competing personal commitments. Elements of maternity and paternity leave have also increased. Workers have better legal support during disputes. Employers cannot initiate or continue disciplinary actions once a grievance is referred to the Commission for Mediation and Arbitration (CMA) or a labour court. Arbitrators must work within a timeline and notify of delays.
Reduction in employer risk	Improved compensation (tiered) plus remedies for breach of contract	There are stricter disputes and termination rules for employers. Compensation rates are now tiered. If an employer is found to be in breach of a fixed-term contract, coffee estate, processing factory or warehousing staff are entitled to compensation equal to the remaining contract duration.
Non-citizen labour	Easier permit renewals and multi-entity employment	Many coffee estates rely on the technical expertise of expatriate staff, including agronomists and farm managers. Hiring and retention of non-citizen workers is now more streamlined. Also, Class A permit holders (investors and shareholders) can now work in multiple entities providing they have the approval of the Labour Commissioner plus a valid tax clearance.
Negotiation of emergency agreements	Section 16A allows temporary workplace arrangements during emergencies.	Lessons learned from Covid-19 have led to a more structured process for the negotiation of agreements during emergencies, along with built-in safeguards (mediation by the CMA). Agreements must be mutual, collaborative and fair.

Tanzania scores above the Sub-Saharan average on the 2024 Labour Rights Index (74/100 vs ~66) but resource constraints for courts and inspectorates have created a backlog in cases. Trade union density is under 2 percent, contributing to an ITUC Global Rights Index rating of '4', indicating potentially serious violations could occur. The Tanzania Plantation and Agricultural Workers Union (TPAWU) is relevant for formal coffee estate workers, who represent a small proportion of those employed in the sector. Official government records show only three CBAs had been registered in the agricultural sector between July 2021 and June 2022 (ILO, 2023), and the VCA4D Study could only find one that referred to a sector-wide agreement for tea and coffee in 2021 under the National Employment Council for the Agricultural Industry.

Informal labour rights

Informal agricultural workers receive limited legal protection. In principle, farmers and informal workers have access to voluntary social insurance schemes such as the National Social Security Fund's (NSSF) "Wakulima" scheme and the broader National Informal Sector Scheme (NISS) but uptake is very low (under 14 percent) due to limited awareness, cost and seasonal income volatility (Lambin & Nyyssölä 2024).

Family members working on their own coffee farms do not benefit from employment rights except, in principle, they could benefit from basic safety protections as these might be considered to extend to family labour on farms. Child labour prohibitions and restrictions on hazardous agricultural work apply regardless of pay status, so children engaged in family farm work remain protected by law.

The National Coffee Sustainability Curriculum (NSC) discusses family and hired labor on coffee farms (e.g., "Outside school hours it is OK for children to help their families on the farm with supervised light work…" and "Decent working conditions and good treatment of workers").

Third-party and private sector certification

In addition to Tanzania's legal framework, a proportion of coffee production falls under voluntary third-party sustainability standards (VSS) such as Fairtrade, Rainforest Alliance, 4C and Organic. These VSS are aligned with many of the ILO core rights (e.g. no forced/child labour, safe conditions, freedom of association, gender equality, PPE, training). They require annual independent audits, but these are unlikely to be sufficient to ensure full compliance. Recent studies suggest that meaningful improvements for farmers and workers depend more on sustained local engagement and institutional support than on certification alone (Neilson et al., 2018). Other standards such as Global GAP, with its social add-on GRASP, are also present in Tanzania's coffee sector and include assessment of working conditions, occupational safety, and basic labour rights on certified farms.

Some companies are also applying their own private standards such as Starbucks CAFÉ Practice and Sucafina's IMPACT Verified, which include worker welfare, environmental stewardship, and traceability. Private sector standards are usually audited internally and so potentially lack the safeguards of full, independent, third-party verification. While they offer smallholder farmers better market access there is evidence that livelihood outcomes are variable unless they are also associated with strong local institutional support (Nelson & Phillips, 2018).

The VCA4D Study cannot accurately quantify certified output. Coverage appears relatively low and concentrated in a few estates (e.g. Olam's Aviv Estate in Ruvuma - Arabica) and selected cooperatives supported by export buyers and NGO programmes (e.g. Solidaridad/Markup). Sucafina/Cotacof aims to source up to 44 percent of their coffee from certified producers. It reports working with AMCOS to certify several thousand farmers in Tanzania but does this through

a range of standards including Rainforest Alliance, CAFÉ Practices and IMPACT. In 2024, all 4C farmers in Tanzania were registered through the Karagwe District Cooperative Union (KDCU Ltd) in Kagera - Robusta. A study from 2021 shows that coffee certification among Tanzanian farmers is generally low - 70.5 percent of farmers were not participating in any schemes (Kangail et al, 2021). Of those who did participate, older and more specialised farmers were seen to be more engaged.

4.1.2 Child labour

The 2018-2022 National Strategy on Elimination of Child Labour reportedly reduced child labour (rom 35 percent in 2014 to 21 percent in 2021, through better coordination, plus stronger social protection initiatives and increasing public awareness. More intensive inspections may also have contributed to this. Otherwise, there have been no changes to the core child labour laws in Tanzania since the 2018 VCA4D Study.

Children frequently help on family farms with the Integrated Labour Force Survey 2020/2021 reporting that 88.9 percent of all children in rural contribute to family labour (NBS, 2023). Such work is unpaid and is not considered "child labour" unless it is depriving them of an education or is harmful to their development or health (as defined by the ILO). The 2018 VCA4D Study concluded that some children may drop out of school to help during periods of high labour-demand (e.g. harvesting). However, during VCA4D Focus Group Discussions and other, smallholders (both men and women) consistently reported that education was a priority for them.

"Education is a big priority for us, but without a reliable source of income, it would be difficult to keep them enrolled, especially when school fees or supplies are due." Women FGD, Ruvuma June, 2025

The Integrated Labour Force Survey for 2020/21 also shows that the largest proportion of economically active rural children have already received primary education (73.5 percent), while only 18.7 percent had not attended school at all. The VCA4D Survey found no paid child labour and only X households where children were helping during peak times[5]. The VCA4D study could find no evidence for child labour on coffee estates.

4.1.3 Job safety

Key hazards associated with coffee production are shown in Table 4-3, below. Additional analysis of health risks are given in Chapter 5 (environmental section).

TABLE 4-3 MAIN HAZARDS ASSOCIATED WITH COFFEE PRODUCTION

Production	Exposure to agrochemicals – primarily Arabica	Smallholders and estates
	Sharp tools for pruning – Arabica and Robusta	
	Living heavy weights, particularly during harvesting – Arabica and Robusta	
	Long working hours and repetitive tasks, particularly during harvesting and primary processing – Arabica and Robusta	
	Working with agricultural machinery –Arabica	Estates and larger farms
	Water contamination (irrigation) - Arabica	

[5] The 2018 Study could not find any specific evidence for it either, but came to the conclusion that for those households who were most dependent on the income earned from employment during the coffee harvest period, it could make economic sense to include children in the activity so that more buckets could be filled (or at least, a minimum daily target could be reached).

Transport	Poor mechanical condition of vehicles – Arabica and Robusta	All levels
	Road accidents – Arabica and Robusta	
Processing	Water contamination – wet processing of cherries (Arabica)	Home processing and CPU
	Working with machinery Wet hand mills (Arabica) CPUs (Arabica) Mechanical driers, de-huskers, graders, roasters (Arabica and Robusta)	Home processing, factories and warehouses
	Exposure to dust and endotoxins (Arabica and Robusta)	Factories and warehouses
	Lifting heavy weights (Arabica and Robusta)	CPU, factories and warehouses

The occupational safety and health (OSH) framework comprises the Occupational Health and Safety Act No. 5 (2003) and the Occupational Safety and Health Authority (established under the Executive Agencies Act, 1997). They mainly cover formal employment. Estates fall under OSH/Employment Acts while smallholders typically do not. Safety on smallholder farms will depend on what people have learned through engagement with NGOs, extension staff and through certification schemes) and access to affordable PPE.

4.1.4 Conclusion of Working Conditions

Coffee labour is predominantly informal, seasonal and concentrated in production/primary processing. There is a heavy reliance on unpaid household work and informal hiring. Tanzania's legal framework, including the 2025 amendments, primarily protects formal workers. Therefore most coffee workers remain outside effective coverage. Social insurance options exist but are rarely used (Lambin & Nyyssölä, 2024). Certification and private standards promote better practices but are not widespread enough for sector-wide impact (Neilson et al., 2018; Nelson & Phillips, 2018). Child labour indicators have improved nationally, though children still assist on family farms (NBS, 2023). Job-safety risks persist in informal settings due to limited oversight, awareness, and PPE.

4.2 Land and water rights

"Out of every 100 people in the community, maybe only 3 or so don't have coffee farms at all. These individuals are usually left out either due to lack of land, resources, or inheritance. While they may still support coffee-related activities or work as casual labourers during harvest seasons, they don't enjoy the same benefits as those with established farms.". Women's Focus Group (FG), Ruvuma, May 2025

Tanzania's coffee sector is smallholder-led with typical holdings. The VCA4D Survey found 83 percent of those sampled were farming coffee farms of up to 2 ha or less, 20 percent farming 2 – 5ha, and 4 percent farming more than 5ha of coffee. Most of these farms are 'owned' through long-standing customary arrangements. The 2022/2023 Annual Agriculture Sample Survey (NBS, 2024) found that 52.3 percent were held under customary arrangements, with formal ownership (in the legal sense) accounting for only 25.9 percent. Under the 1999 Land Act and Village Land Act, all land is state owned, but village land is allocated to households under legally recognized, transferable customary rights (granted verbally or in writing by village councils). Certificates of Customary Right of Occupancy (CCRO) are actively being promoted. The 1999 land laws grants equal tenure rights to women and men. However, the process of registering CCROs is very slow. Exact figures were not available at the time of writing this report, but some sources estimate that

as little as 10 percent of farm plots may have formal certificates, and in a recent programme review for the World Bank (Stein et al, 2024) has suggested that gender inequalities are becoming institutionalized and formalized within the process. A recent study has also questioned the extent to which farmers are able to use CCROs to access loans (Masingi et al, 2022).

"Parents here really go out of their way to encourage young people to get involved in coffee farming…… For example, if you're just starting out, they might give you a portion of land to plant coffee…. They want us to succeed." Youth FGD, Kagera Region

Access to land for SHF is shaping expansion of coffee production in the Southern Highlands (especially Ruvuma and Songwe/Mbeya) and Kagera region where land is more readily available, while scarcity in Kilimanjaro region is contributing to its decline there. The VCA4D Study also heard about potentially new areas of coffee production in Mara (specifically Tarime district), Kigoma, Tanga, and others (Sylvano et al 2023) although they were felt to be quite marginal at present (pers.comm.). Recent high coffee prices have encouraged farmers to expand their coffee farms, either by displacing other crops or opening up new plots. In Ruvuma, the VCA4D Team heard that some SHF were opening new farms in lowland areas for food crops in order to 'free up' highland plots for more coffee production.

Large farms mainly hold land through granted rights of occupancy (68.4 percent). Currently, large coffee estates only exist in the Arabica sub-chain. There are no large land holdings in the Robusta sub-chain. The exact number of Arabica estates is estimated to be around 42. The majority appear to be based on older land holdings (circa 1920s – 1980s) that pre-date current standards of transparency, participation and due diligence for large scale agricultural investments. On paper, Tanzania's land rights framework aligns with the Voluntary Guidelines on Responsible Governance of Tenure (VGGT) and other internationally recognized due diligence standards, but implementation gaps remain significant in practice. In 2019, the government and FAO launched Kiswahili-language VGGT guidelines and established a multi-stakeholder platform to promote access, awareness, and dispute resolution capacity at village and district levels. A follow-up technical cooperation program launched in 2021 provided targeted support to integrate VGGT-aligned reforms into land registration, conflict mediation, and local governance systems (FAO 2021). The VCA4D Study found no explicit reference to VGGT in relation to the coffee sector.

Since 2018, there have been changes to land and water governance that could have implications for the coffee sector. For example, the new National Land Policy (2023) now recognises water-based land rights for areas adjacent to wetlands, riverbanks, natural lakes and catchment zones. These are often used as sources of irrigation by SHF and estates. The Government is promoting Village Land Use Plans (VLUP) as a priority tool for formalising land allocations and protecting against competing land uses. However, there is evidence that these regulatory frameworks can advantage some actors over others. Lessons from the Water Users Associations (WUAs) model, show that small-scale and customary users can easily become excluded (Richards 2019). Despite ongoing reforms, customary rights still lack full legal parity in Tanzania in some situations, and land offices in rural districts are often under-resourced, which leads to implementation gaps. As a result, SHF may find it more difficult to formalise access rights near seasonal water courses, and estates may need to update their current tenure documentation.

The Tanzania Coffee Board began mass re-registration of coffee farms in September 2024, in response to EUDR traceability requirements. At the time of the 2025 VCA4D Study Team's visit, re-registration was said to have reached only 50 percent of farms (pers. comm.). Given that there is some doubt about the actual number of smallholder coffee farmers, coverage may be considerably less than this. At the May 2025 EUDR Conference in Kampala, Tanzania affirmed its

legal and technical preparedness framework for mapping and traceability. Secure land tenure will underpin these efforts, particularly land used for coffee production that is owned or managed by women and youth, who often face exclusion from land ownership. With support from initiatives like MARKUP II and regulatory leeway through EU extensions, Tanzania is positioned to gradually meet EUDR requirements, albeit with ongoing challenges.

4.2.1 Conclusion of Land and Water Rights

The coffee sector is predominantly based on smallholder customary-tenure. Formal titles remain rare. CCRO uptake is slow and uneven, with gender risks. Estates hold granted occupancy. Regional land dynamics facilitate coffee expansion in the Southern Highlands and Kagera, and reduction in Kilimanjaro region. Governance reforms (National Land Policy 2023, VLUPs, VGGT efforts) are advancing but challenges persist particularly for women and youth who often face exclusion from land ownership processes. EUDR-linked re-registration is ongoing, making secure, inclusive tenure a critical enabling condition.

4.3 Gender and youth

Since the 2018 VCA4D Study, Tanzania has made visible progress on gender equity. It swore in its first female president (Samia Suluhu Hassan) in 2021 and was ranked 48th in the Global Gender Gap Index in 2023, up from 82nd in 2021 and 64th in 2022 (World Economic Forum, 2023). However, despite sector efforts, persistent structural and social norms still constrain women and youth across the coffee value chain (World Bank, 2022a/World Bank, 2022b). Recent evidence from four coffee districts (Mbozi, Mbinga, Rombo, Kyerwa) shows enduring barriers in property rights, cooperative access and control over coffee income (Silvano and Jespersen, 2025). Men continue to dominate ownership, production decisions, marketing and trade, while women report limited benefits and voice, despite contributing their labour (VCA4D Study FGDs and interactions with the VCA4D Social Expert).

The VCA4D Survey shows how active women are in coffee production and primary processing. Men, on the other hand, are more visible when it comes to activities such as agrochemical application, pruning coffee trees, and most importantly, in trading and marketing coffee. Kagile et al (2023) found only 27.5 percent of women participating in coffee trading activities and limited control over the proceeds of coffee sales. Despite this, both women and men participating in the 2025 VCA4D FGDs acknowledged changes were taking place:

"Things are beginning to change now. As awareness about human rights and gender increases, especially through government programs and NGO training, women have started to claim their space not just as labourers but as decision-makers and even landowners. Some of us now have our own coffee farms—plots registered in our own names. That would have been unthinkable in the past. This shift is empowering. It means we are not only contributing labour but also controlling a portion of the production and income. There are still challenges, especially with older generations who may hold more traditional views, but younger men and educated families are showing more openness. There's a visible cultural shift toward recognizing women as full participants in coffee farming—not just helpers". Woman FGD, Kagera, May 2025.

With the average coffee farmer being 55 years old, youth engagement is critical. They can act as change-agents for the future of the coffee sector, and play an important role in achieving gender equity and sustainability. Many initiatives integrate youth skills and gender-transformative tools such as GALS, the Gender Household Approach, Youth Farmer Field Schools (e.g. HRNS), and the

EU-funded CODE P to strengthen joint-decision making, savings groups and women's leadership. GALS has been embedded in the GAP curricula. Government programmes under Kilimo Kwanza, such as the National Strategy for Youth Involvement in Agriculture, NYEEP grants via TADB, and TCB's "mobile coffee cafes" explicitly target youth and women. Tanzania was recently selected to host the Inter African Coffee Organization's (IACO) Centre of Excellence for Coffee in the Kilimanjaro Region and a training center in Dodoma. This initiative is part of a broader effort to boost the African coffee sector, focusing on research, value addition, and institutional capacity building. It also aims to unlock employment and entrepreneurship opportunities for youth. During the study the VCA4D Team heard mixed reviews of delivery and policy coherence.

However, there are still a lot of ongoing structural inequalities. For example, cooperative governance remains largely male-dominated, and access to land, credit, and extension services continues to disadvantage women in the coffee sector. Women were found to have smaller farms, to earn less income from coffee, participate less in off-farm activities, and are less likely to be involved in coffee trading. A recent study among 400 coffee farmers in Ruvuma, Kagera, Songwe and Kilimanjaro regions, concluded that the gender gap in the income earned from coffee production and trading represented 44 percent of women's structural disadvantages (Table 4-4) (Kangile et al, 2021). However, women did appear to have much better access to credit, probably due to their greater social capital and predisposition towards membership of support groups.

TABLE 4-4 INCOME DISTRIBUTION AND OTHER KEY VARIABLES IMPLICATED IN STRUCTURAL DISADVANTAGE AMONG MEN AND WOMEN COFFEE FARMERS IN RUVUMA, KAGERA, SONGWE AND KILIMANJARO REGIONS. SOURCE: KANGILE ET AL, 2021

Variable	Measurement	Women (n=52)	Men (n = 348)
Coffee farm size	Hectares	4.68	6.32
Coffee income earned	US$	434.37	1172.12
Participation in off-farm economic activities	Measured as 1 if participating, and 0 if not	0.04	0.12
Involvement in coffee trading	Percentage (%)	27.5	72.5
Access to credit	Measured as 1 if accessing, and 0 if not	0.44	0.29

4.3.1 Economic activities – diversification and dependence on coffee

The VCA4D Study confirms that over-reliance on coffee is exposing smallholder farmers to global price swings and powerful intermediaries, making household income unpredictable. Coupled with coffee's vulnerability to climate stress and pests/diseases, a bad season can wipe out earnings. Livelihood diversification is therefore vital, mitigating food insecurity and debt, strengthening households' resilience to shocks, and giving them confidence to invest and save (VCA4D FGD feedback). Yet alternative income sources are often limited, and diversification typically requires land, capital, skills and reliable market access. Gender and agroecology[6] further narrow options for smallholder coffee farmers.

In 2018, Dan & Associates Enterprises Ltd (DAE ltd) & IDH estimated that 25 percent of farmers in Mbinga District, Ruvuma, derived 100 percent of their HH income from coffee, making them much

[6] Kilimanjaro/Arusha regions have smaller farms with less capacity for agricultural diversification, while land is less constrained in the Southern Highlands while irrigation is limited in Kagera.

more vulnerable to fluctuating prices. The VCA4D Study likewise finds high levels of dependency[7] on coffee income among farmers surveyed in Kagera and Ruvuma (Figure 4.2). Farmers in Ruvuma showed the greatest levels of dependency on their coffee income, with 88 percent of respondents getting 75 percent or more of their household income from coffee sales. The degree of dependency does not seem to vary significantly by farm size (although a greater proportion of medium farmers were highly dependent), suggesting the factors that lead farmers to depend on coffee are likely to be common across all socioeconomic groups. In Kagera, the picture is very different, with only 32 percent of respondents being 'highly dependent' on coffee income, and small farmers appearing to be most dependent as a group compared to larger farmers. During the Focus Groups, 60.1 percent reported having high or very high dependency. The rates were highest among women in Kagera, who made up 64 percent of the 'very high' sample, compared to only 30 percent of very high dependent participants. All female-headed households sampled during the survey reported receiving 100 percent of their household income from coffee.

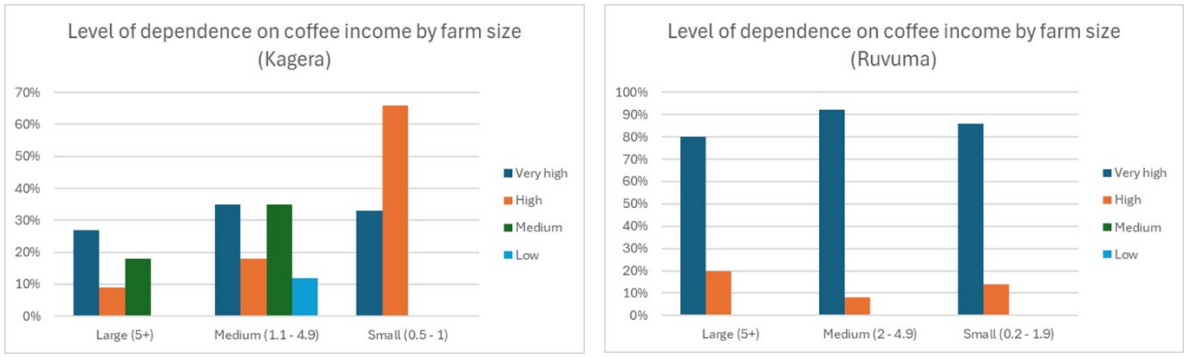


FIGURE 4.2 LEVEL OF DEPENDENCE ON COFFEE INCOME BY REGION AND FARM SIZE, MEASURED AS A PROPORTION OF TOTAL HOUSEHOLD INCOME. SOURCE: VCA4D SURVEY, 2025

"We are also farming other crops including maize, banana, beans for food but when we have excesses, we also sell them and get money. Some of us keep cattle including pigs, cows and goats. These are sometimes being sold to assist in buying inputs like fertilizer, and pesticides for coffee farming. But when we have other emergencies and we do not have money we also sell them". Youth FGD, Ruvuma, June 2025

The VCA4D Social Expert found a similar picture in Kagera and Ruvuma; both the 2018 and 2025 VCA4D Studies underline that diverse income sources are crucial for smoothing cash flow and meeting financial needs. In both regions, smallholder coffee households reported supplementing income with casual labour on farms, estates and construction. At busy times of year, the pull of paid agricultural labour competes with essential work on the home farm; when families cannot replace that labour, necessary tasks go undone and productivity suffers. Petty trading of food and farm produce, and small microbusinesses (e.g. milling, small shops, *bodaboda*, tailoring and poultry or other small livestock) were also common, though typically seasonal, insecure and thinly capitalised. Kangile et al. (2021) report additional income being derived from other crops (88.3 percent of surveyed respondents), livestock (47 percent), business (16.5 percent), off-farm activities (11.3 percent), fruits/vegetables (10.8 percent), remittances (6.8 percent) and salaries (3.8 percent), underscoring the dominance of agriculture-linked opportunities.

After coffee (estimated at US$1,141.87 per farm annually), Kangile et al. (2021) identify business/trading as the next highest source of income at US$1,084.54 per farm. Sales of livestock,

[7] The study adopted the categories 'high dependence' when coffee income was reported to be 50 - 74 percent of total household income. It was considered 'very high' when reported to 75 – 100 percent of total household income.

vegetables and fruits, other crops, remittances and off-farm activities each averaged under US$1,000 per farm. Men were more likely than women to engage in off-farm activities and small businesses. When coffee prices slump, households start or intensify small enterprises, suggesting non-farm work often functions as a coping strategy rather than a stable pathway out of poverty (Adhvaryu et al, 2021)[8]. Kangile et al. (2021) further conclude that some income sources widen inequality between wealthier and poorer HHs. The fairest and most equal sources (in order) were coffee production, other crop farming and livestock. A 1 percent increase in coffee income was associated with a −0.043 percent reduction in inequality, while a 1 percent increase in remittances reduced inequality by −0.006. Coffee farming is thus especially important for improving outcomes across all farmers, particularly the poorer ones, while off-farm income is strongly linked to higher inequality, tending to benefit better-off farmers more.

"Some of these young people are involved in what you might call small-scale coffee trading. For example, they buy unprocessed coffee cherries directly from farmers — especially those who choose not to sell through AMCOS — and then sell it elsewhere for a profit. In that way, they're participating in the value chain, even if they don't own farms themselves. It's a kind of informal business, but it helps them generate income and build experience in the sector." Yough FGD, Ruvuma June 2025

Gender strongly shapes access to different livelihood options. Men participate more in off-farm work, operate larger businesses and capture more coffee earnings. Women tend to concentrate in home-based petty trading and food vending and often have weaker control over income. Barriers that limit women's diversification include time poverty, limited asset ownership and collateral for credit, restricted mobility, and safety concerns including harassment in markets (Idris, 2018)[9]. Variation in access to, and control over, food and income sources was also evident in the 2018 VCA4D Study in Songwe and Mbeya (Table 4-5). A study in northern Tanzania describes how women rely on subsistence crops such as bananas, often leaving coffee incomes "in male hands" (Williams, 2022). Coffee payments were frequently reported to be slow and poorly aligned with household expenditure cycles. One woman farmer from Kilimanjaro reported that she relied on banana income to cover expenses throughout the year, including paying for labour, acknowledging that coffee brought higher returns but at the wrong time for her household's needs.

[8] Adhvaryu, Achyuta, Namrata Kala, and Anant Nyshadham. "Booms, Busts, and Household Enterprise: Evidence from Coffee Farmers in Tanzania." The World Bank Economic Review, vol. 35, no. 3, 2021, pp. 586–603.
[9] Idris, Iffat. *Barriers to Women's Economic Inclusion in Tanzania*. K4D Helpdesk Report, Institute of Development Studies, 2018

TABLE 4-5 MAIN CROPS GROWN BY SMALLHOLDER COFFEE FARMERS IN SONGWE AND MBEYA REGIONS, THEIR RELATIVE IMPORTANCE TO HOUSEHOLD LIVELIHOODS AND WHO CONTROLS THE INCOME FROM THESE CROPS

"Cash Crops"	**Food Security**	**Local Market & HH Economy**
Coffee (m)	Maize (m&w)	Beans (w)
	Beans (w)	Groundnuts (w)
"Magimbi – Shasa"[16] (m)	Groundnuts (w)	**Banana** (m&w)
Irish Potatoes (m&w)		Onions (m)
		Sunflower (w)
Sweet Potatoes (w)		Maize (m&w)
		Cabbage (m)
		Carrots (m)
		Tomato (m)
		Greens (w)
Key: (m) = men control the income		**Mango** (m&w)
(w) = women control the income		**Trees** (m)
(m&w) – both men and women control the income		**Avocado** (m&w)
Perennial crop that requires a long-term commitment		

Table source: 2018 VCA4D Tanzania Coffee Study

One area where women are active in their own right is local trading of harvested coffee. To access some cash value from coffee grown on their husbands' farm, many women in the 2025 VCA4D Study reported "holding back" a small proportion of wet cherries (both sub-chains), parchment (home processed coffee in the Arabica sub-chain) or dried cherries (Robusta sub-chain) that they had picked or processed, selling to local traders to meet immediate expenses such as food, medical care, clothing or school fees. One woman FGD participant in Ruvuma described herself as a "coffee trader". Others formed women's groups to buy coffee from local farmers, bulk it and sell on to AMCOS and local traders for a margin. Notably, Kangile et al. (2021) concluded that, once structural barriers are removed, women outperform men in trade.

The 2025 VCA4D Study also found that, in times of need, coffee-farming HHs with limited alternative income or cash-flow constraints were more likely to sell coffee early (at flowering/immature berry stage). This effectively became a loan against the harvest, although at very low farm-gate prices:

"Some families also sell coffee as Magoma (coffee in flowering or cherry stage) rather than waiting to pulp and dry it properly, but this is mostly due to economic hardship. The prices are lower, but people sometimes have no choice when they need immediate cash. So, while selling through AMCOS is the ideal for most of us, the realities of life mean that not all decisions are based purely on preference—they're often shaped by urgent needs, family dynamics, and the risks we face. Women FGD, Ruvuma, May 2025

Coffee estates (present only in the Arabica sub-chain) are also significant employers, providing seasonal opportunities locally and drawing in workers from surrounding areas. The impact of an estate on the local economy can be huge. Beyond direct jobs, seasonal workers rent rooms and spend earnings in local shops and markets. At the Aviv Estate (Ruvuma), the annual community livelihood surveys show striking change: in 2011, when the estate was established, all buildings in the area were made of local materials. By 2025, all buildings were brick with tin roofs.

4.3.2 Access to resources and services

Land and other assets: Discussions with women in the 2025 VCA4D Study show that customary practices and inheritance still override statutory rights, leaving independent women and women-headed HHs particularly disadvantaged. NBS (2024) reports that only 33 percent of women own agricultural land versus 47 percent of men. Just 9 percent of women have sole ownership (25 percent jointly with husbands), compared to 30 percent of men with sole ownership and 7 percent joint ownership. Without sole or joint title, married women are exposed to loss of land upon widowhood or divorce. Daughters are often denied land on the assumption they will marry into a husband's HH (whereas sons are allocated plots), a pattern frequently reported in the Arabica sub-chain where coffee farms are high-value assets. The VCA4D Study also shows smaller landholdings for women and youth in both sub-chains: in Ruvuma, male FGD participants averaged 10.1 acres, youth 4.75, and women only 3.6. In Kagera, men and women averaged 5.7–5.8 acres, while youth averaged 3.2. Kangile et al. (2021) similarly found larger farms and higher asset values for men (6.3 ha vs 4.7 ha for women), contributing to a coffee-income gap (men ≈ US$1,172; women ≈ US$434). FAO (2011) estimates that equal access to productive resources could raise women's yields by 20–30 percent and total agricultural output by 2.5–4 percent.

"They [AMCOS] *promise us loans, but these loans rarely arrive on time, and by the time we receive them, the need has already passed. That's why many of us also grow food crops like bananas (migomba), which give faster returns and help meet daily household needs."* Women FGD, Kagera, May 2025

Access to loans and savings behaviour: Formal credit access in coffee areas is very low. The 2022/23 NBS Agricultural Sample Survey found only 4.9 percent of agricultural HHs accessed loans for agriculture. The main providers were private moneylenders (29.7 percent), friends/family in-country (21.1 percent), and MFIs (18.7 percent). Public institutions and commercial banks each accounted for ~5 percent (5.4 percent and 5.3 percent respectively). Farmers of all genders reported that formal loans are hard to obtain (very few rural branches exist and banks were felt to "*look down upon* [coffee farming]", Men FGD, Kagera, May 2025) and unpopular. Women face additional barriers due to limited collateral and, reportedly, requirements to have male guarantors. Some men perceived donor/NGO gender-inclusive schemes as favouring women and youth. AMCOS/SACCOS support was viewed as inconsistent and unreliable (see Section 4.5). Despite constraints, Kangile et al. (2021) found women accessed credit more readily than men through informal groups and VICOBA. In the absence of formal loans, many HHs resort to selling their coffee at an immature stage in order to mobilise some of its value (see previous section).

"If coffee crops were more valued and if farmers—especially young ones—could get loans based on the worth of their crops, it would be easier for us to apply the knowledge we've gained. Without this financial support, even well-informed youth struggle to improve their production." Youth FGD, Kagera, May 2025

"We also participate in small community-based savings and lending groups. These groups allow us to borrow small amounts of money to support our coffee activities—whether it's buying fertilizer, paying for labor, or covering household expenses while waiting for harvest. Typically, the loans range between 50,000 to 100,000 Tanzanian shillings. While helpful, the challenge is that these groups have very limited capital, so the support we get is often not enough for the actual needs we face in coffee farming". Women FGD, Kagera, May 2025

"We also have VICOBA, where we can access loans with very low interest rates, although the amounts are sometimes not enough…. The most common solution is to approach wealthier individuals and sell them our coffee while it is still at the flowering stage, often at a very low price. After that, we… must

deliver the [harvested] *coffee to the person who lent us money. The value of the harvested coffee is far greater than the amount we received, meaning we end up losing, while the person who lent us the money gains twice as much as they gave".* Youth FGD, Kagera, May 2025.

The VCA4D FGDs indicate women were more likely to save than men though overall savings rates are low; women also reported better emergency support. Many women belong to multiple savings groups simultaneously to combine small loans.

"One of the biggest things we wish for is access to credit. If AMCOS could provide small loans to farmers, especially before the harvest season, it would help us manage our farms better. We often lack money for basic inputs, like fertilizer, and sometimes even for food or school fees. Having a reliable credit system through the cooperative—where we could borrow against our expected yield—would make a big difference". Men FGD, Kagera, May 2025

Access to extension services, inputs, and other support: Women are often excluded where AMCOS register a single HH member (typically male), limiting women's participation in training and access to inputs and improved varieties. Women were more likely to rely on friends/neighbours for information and less likely to attend training. Access appears more challenging in Kagera than Ruvuma. Time burdens, mobility constraints, and weaker cooperative membership further reduce participation.

"We learned from our parents by observing as well as participating in coffee farming. We have never had any formal training on coffee farming. The AMCOS have only told us to make sure that we do not dry our coffee at the ground because it will be dirt". Women FGC, Ruvuma, May 2025

Farmers linked to development initiatives or private buyers generally have better services and outcomes. In Mbeya and Rungwe, HRNS-supported farmers reported higher yields (248.66 kg/ha) than non-supported peers (115.18 kg/ha) and greater livelihood stability, attributed to access to credit/loans and cooperative marketing (Ngambila et al., 2024). Women were a small share of the sample (13 percent with HRNS; 17 percent without), underscoring persistent gender-norm barriers. Such direct buyer engagement was more evident in the Arabica sub-chain than in Kagera (Robusta sub-chain), where international buyers were reported to have no contact with AMCOS.

"There are companies such as Tylor Winch, Solidarity and DAE who buy coffee that are also providing training on coffee farming specifically on pruning, stumping, mulching, or using organic fertilizers. We have only one extension officer in this Ward, it is hard for her to visit every farmer. I think there should be a mechanism to ensure that all farmers have access to extension services from the professionals in the government. The AMCOS provide fertilizer as a loan but when is too late to apply ". Men FGD, Ruvuma, May 2025

4.3.3 Decision making

Control over coffee income and intra-HH dynamics: Access to, and control over, coffee income is a central driver of inequality and a frequent source of intra-household conflict, reportedly more acute in Kagera than in Ruvuma (VCA4D 2025 Focus Group Discussions).

"There are situations where a woman expressing interest in managing coffee sales or even asking about income is viewed suspiciously. It creates tension. In fact, in some households, a woman trying to take charge or have a say over coffee income can lead to serious conflict—even to the extent of breaking up marriages. That's how sensitive the issue can be". Womens FGD, Kagera, May 2025

Patterns of income control: In Ruvuma, women described several common arrangements (VCA4D Focus Group Discussions). The traditional model (more prevalent in Kagera) concentrates control with men. Payments go to men's accounts or into their hands. Transparency is low, and women must petition for funds and often resort to withholding a portion of harvest to side-sell (seen in both sub-chains). In Kagera, decision-making was described as less equitable overall. There was cooperation during production/marketing but this often gives way to secrecy once cash arrives, with men "*becoming secretive and controlling*". In this situation, women admitted to "*sneaking a few buckets to sell to middlemen, especially when we are desperate for money to buy basic needs or take care of children*" (Women FGD, Kagera, May 2025). Cooperative decision making was not considered common by those who took part in the focus group discussions in Kagera.

"When it comes to income from coffee, most of us women feel that decision-making is still largely controlled by men. In many households, men do not want to involve their wives when it comes to selling the coffee or deciding how the money will be used. Even though we actively participate in all the labour—planting, weeding, applying manure, harvesting and drying—when it's time for the coffee to be sold, we are often left out". Women FGD, Kagera, May 2025

Some husbands provide an allowance to their wives, but they reported this was often insufficient. If more money was needed, they had to petition for it, which was a common flashpoint for intra-household conflict in both sub-chains. At worst, some men reportedly disappear after coffee payments were made. They spend the income on alcohol or, where funds allow, taking another wife (polygamy is common in Songwe/Mbeya and parts of Ruvuma). HRNS staff noted the difficulty of promoting joint decision-making in polygamous HHs.

In an attempt to reduce conflict, some husbands in Ruvuma were also reported to have given their wives a portion of land entirely for their own use. The women were expected to generate income from it in exchange for not asking for any additional funds in future. While this gave the wife a degree of financial autonomy, the women did not like this system. They were still required to help with the rest of the farm and might struggle to make enough income if the land was too small or of poor quality. In a much less common scenario, daughters might also be given small parcels of land prior to marriage, reportedly so they could learn how to grow coffee (and by doing so, make themselves a better marriage prospect).

"In some families, it is the husband who takes full control of the coffee income. There are cases where men collect the payment and then go spend it on themselves—some even disappear for several days or weeks, wasting the money at bars and returning home only when it's finished. In such situations, women are left struggling to provide for the family using the little they earn from other crops like maize or beans, which they grow and sell independently." Women FGD, Ruvuma May 2025

Women in both regions preferred a pooled, transparent system where spouses agree jointly on spending. Survey findings echo divergent priorities. Women lean toward education and welfare while men toward farm investment and assets. NGOs promote collaborative financial management, with greater traction in the Arabica sub-chain than in Kagera. One Ruvuma participant worried that once her children finished school (which was a shared priority with her husband), HH decisions might revert to more traditional dynamics.

"I am a widow, so I now manage the income independently. I make all the decisions regarding how to allocate the earnings—from investing back into the farm, to handling family expenses. I have to be careful and plan ahead because I'm solely responsible." Women FGD, Ruvuma, May 2025

Widows, divorcees, and women who establish their own farms enjoy greater financial autonomy. They are able to make independent decisions on spending, saving, and production. However, female-headed HHs are often financially vulnerable and rely on networks of support. Some women have acquired titled land through trading or group saving. In Kagera, the VCA4D encountered a women's group engaged in coffee trading who were saving to buy land collectively.

Youth who are still living at home also have limited access to and control over coffee income, while they play an active part in HH labour capacicty. They "*don't earn direct income from coffee…,* [and]… *don't get paid. It's considered part of our role in supporting the household. So even though we put in a lot of labor, the money from selling coffee usually goes to our parents or the elders who manage the land. That's how it's always been"* (Youth FGD, Ruvuma, May 2025).

Decisions about selling act as a flashpoint: Deciding when and who to sell coffee to was also cited as an area where shared decision making takes place, but also where women and youth are often excluded, causing tensions within the HH:

"In some families, disagreements arise, especially during the selling season, and these are often fueled by selfish interests—typically from one partner wanting to control the income or choose buyers that offer quick cash but risky terms." Women FGD, Ruvuma, May 2025

4.3.4 Leadership and empowerment

The VCA4D Study finds wide variation in women's membership and influence across cooperatives. For example, Kingerikiti AMCOS (Ruvuma) reported 25 percent female membership, while Msunte and Bahanko AMCOS (Songwe) each have around 7 percent women members. Women and youth in Kagera reported markedly less involvement and weaker voice than their peers in Ruvuma.

"We are not involved in making decisions about how things are done. Whether it's setting prices, choosing buyers, distributing farming inputs, or deciding on who receives training opportunities, those decisions are made without consulting us. We are simply told what the outcomes are and expected to follow through." Womens FGD, Kagera, May 2025

"We are members of AMCOS, and our involvement mainly revolves around the meetings that are occasionally held. In these meetings, the main agenda is usually to discuss income and expenditures—how much money was made from coffee sales and how it was used. While we attend, the core decisions—especially about pricing—are made by the leadership". Youth FGD, Kagera, May 2025

In comparison, participants in the Ruvuma FGDs described AMCOS as more transparent, democratic, and participatory, often linked to greater capacity-building and closer buyer–farmer relationships in the more differentiated Arabica sub-chain. The VCA4D team met one of the most business-like AMCOS during the Ruvuma visit. Programmes (e.g., ICP/HRNS) in the Arabica sub-chain promote dual or female membership, and women's leadership typically coincides with targeted external support. Although women-led AMCOS exist (e.g., Mamsera Juu and Ushiri, Kilimanjaro), none were encountered in Kagera or Ruvuma.

"Yes, we do feel included in the conversations related to coffee production, marketing, and trade. We regularly have meetings with AMCOS, and those meetings are open to all members — including women. During these gatherings, we discuss important issues like how our coffee is being marketed, expenditure from the income and even payment timelines. Everyone is encouraged to contribute, and

we are given the chance to raise concerns or suggest improvements." Womens FGD, Ruvuma, May 2025

"I am actively involved in our AMCOS. Before every new coffee season begins, we hold what we call a strategic planning meeting. This is where we come together as members to discuss the upcoming season, outline the work plan, and decide on priorities — whether it's how to manage inputs, improve processing, or handle sales and logistics. It's a very collaborative process." Youth FGD, Ruvuma, May 2025

"In addition to that, there are warehouse-level meetings (mikutano ya maghala) that take place at the local level before the main general assembly. Each storage warehouse in our area holds a meeting where members raise issues, challenges, and suggestions. These issues are then compiled and brought forward to the larger general meeting of the cooperative." Youth FGD, Ruvuma, May 2025

Where women's agency is limited, one strategy that they adopt to counter these challenges was to form their own support groups within the AMCOS itself. In Mbeya/Rungwe, a study among members of the Umalila Agricultural Marketing Cooperatives found that - while formal decision making within the AMCOS was male dominated – the women members were coming together to exchange information with each other, help carry out labour-intensive tasks like pulping and drying, and support each other in accessing cooperative services (Ngambila et al, 2024).

"Despite the challenges, we do appreciate the role AMCOS plays—especially in organizing the market and ensuring payments reach us—but we wish there was more transparency, and that our voices as farmers were genuinely heard and considered. Right now, our participation feels more like compliance than contribution". Womens FGD, Kagera, May 2025

Broadly speaking, policy-making at district or national cooperative federations still remains male-dominated. Public speaking can also be a barrier for women, without supportive interventions (for example, the VCA4D Study convened separate men and womens FGD to create safe spaces). Many initiatives encourage women champions (e.g. Volcafe's GALS programme), promote shared decision making (e.g. HRNS) and support AMCOS to actively encourage women's participation. However, these are unevenly spread and have not yet achieved sector wide change. While membership and leadership potential improve through supported, gender-sensitive interventions, traditional cultural norms and single-member household registrations restrict access. The Robusta sub-chain shows much less engagement with women.

4.3.5 Hardship and division of labour

The VCA4D Study confirms that division of labour in smallholder coffee households tends to follow a consistent pattern across regions, where women juggle overlapping responsibilities for care work as well as contributing time to labour intensive field and post-harvest work. It is estimated that women contribute up to 80 percent of labour for coffee alongside other on-farm duties. This aligns with World Bank data for Tanzania showing that 64 percent of unpaid agricultural work is performed by women (vs 36 percent by men), reinforcing persistent time poverty that limits women's participation in training, decision-making, and other income-earning activities (World Bank, 2022). These constraints help explain Tanzania's 20-30 percent gender gap in agricultural productivity, 97 percent of which the World Bank attributes to women's reduced access to male family labour.

Both the 2018 and 2025 VCA4D studies find that most coffee labour is supplied by household members. Hired labour is used sparingly because cash flows are irregular and costs are high. Where workers are hired, men are more likely to be hired than women, and in Ruvuma, reciprocal labour makes up the majority of outside labour. Task segregation is common, with men being hired for heavier/technical work (e.g., land preparation, agrochemical application and stumping), and women for harvesting and post-harvest processing. Peak seasons create labour bottlenecks that intensify women's time pressure.

Coffee is intrinsically labour-intensive, particularly Arabica and improved varieties. Targeted initiatives (e.g., initiative for Coffee & Climate with HRNS and partners) have introduced time-saving options such as efficient cookstoves and rainwater harvesting tanks in an effort to reduce women's time spent collecting firewood and water, plus post-harvest tools like solar dryers and raised drying racks (lightening drying/handling, which are tasks largely done by women). Adoption and impact remain uneven due to limited scale, upfront costs, and supply/logistics constraints. While these tools can indeed save time or improve coffee quality, women often reallocate "freed" hours to other unpaid or farm work. As a result, total workload is unlikely to fall.

In Arabica zones such as Mbinga (Ruvuma), estates like Aviv Tanzania (Olam) often recruit women for selective picking and sorting, while estate technical crews (irrigation, agro-chemicals, stumping) are male-dominated, mirroring smallholder patterns. National and sector guidance (e.g., the Tanzania Coffee Sustainability Curriculum and TaCRI materials) emphasise quality-critical tasks like timely pruning, wet processing, and careful drying, which are areas where women already contribute heavily but can be excluded from technical training unless cooperatives and buyers make it explicitly inclusive.

Evidence from Kigoma shows women are far less likely to attend coffee trainings (10.2 percent of women vs 54.9 percent of men for production), often because husbands are the registered AMCOS members (Seleman, 2017)[10]. Men are also more active in marketing activities (43.7 percent of men vs 12.2 percent of women). The result is a feedback loop: men accumulate the skills and contacts tied to pruning, spraying, and selling, while women stay concentrated in time-consuming harvest and home-based processing work. Without broader changes such as more reliable cash flow for hiring labour, inclusive training schedules, and equitable control over income, coffee will remain labour-intensive, and women will continue to bear a disproportionate share of that burden.

4.3.6 Conclusion of Gender Equality

Tanzania has made notable progress on gender equity in recent years. In the coffee sector, however, structural inequalities remain pronounced. Although women contribute up to 80 percent of labor they are still largely excluded from decision-making, marketing, and income control. Women-owned farms are smaller on average (as are those owned by youth), they own fewer and lower value assets and earn significantly less coffee income. Women also participate far less in trading and off-farm economic activities. Income insecurity is a persistent challenge for many coffee-producing households in Tanzania, especially for women. Payments are delayed, and many resort to selling coffee to traders and borrowing against the future value of their harvest.

Recent initiatives such as the Gender Action Learning System (GALS) and the Gender Household Approach have begun to shift perceptions, particularly among youth and in areas with NGO

[10] Seleman, S. A. (2017). *Assessment of gender inequality in participation in coffee production and marketing: A case of Kigoma District Council* [Unpublished master's dissertation]. Sokoine University of Agriculture, Morogoro, Tanzania.

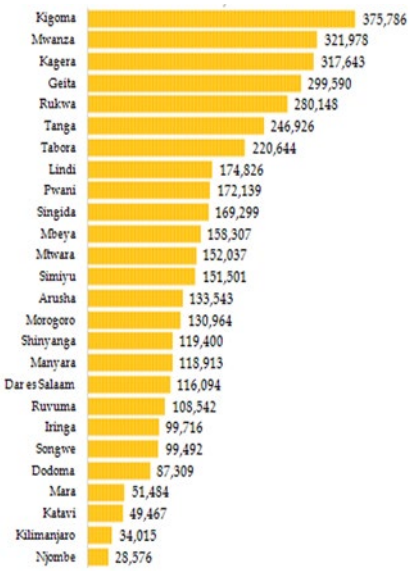
involvement. Focus groups in Kagera and Ruvuma in 2025 highlighted emerging cultural change, with some women reporting land ownership in their own names and growing involvement in household decisions. However, traditional norms and cooperative governance structures continue to disadvantage women, especially in older households and in Robusta-dominant regions. Without sustained, targeted efforts to address land rights, income sharing, and time poverty, the coffee sector risks deepening gender inequality even as it expands (Silvano & Jespersen, 2025).

TABLE 4-6 SUMMARY OF FINDINGS FROM THE VCA4D SURVEY AND FOCUS GROUP DISCUSSIONS DRAWING ATTENTION TO GENDER DIFFERENCES (SOURCE: VCA4D STUDY, 2025)

Ruvuma	Kagera
Women and youth have unequal rights of access to land (title inequalities, inheritance, capital)	
Men dominate land, decision making, cooperative membership, marketing, control income	
Women provide a disproportionate amount of unpaid labour on coffee Women are hired often than men (& often paid less when they are)	
Women resort to withholding & side selling coffee to access cash Women are less visible in coffee trading and marketing	
Women own fewer assets than men	
Women HHs show a greater dependence on coffee income	
Women express more pessimism about the future of coffee farming than men	
Household financial decision making has been influenced by development initiatives, but has not reached all HHs	Household financial management appears more 'traditional' (men have control & make decisions)
Appears food secure but workload (particularly women's) impacts on maternal and child development (nutrition)	Greater degree of food insecurity (incidence & coping strategies, greater reliance on food purchases)
Women and men's priorities over use of coffee income: Ruvuma – both men and women prioritize fertilizer Kagera – both men and women prioritise food purchases During focus group discussions – women prioritise education	
Women save and access small amounts of credit (through informal support groups), men have better access to formal credit services	
Slightly better savings figures 50 percent of respondents did not save, 37 percent saved once a year	Fewer savings Over 50 percent of respondents did not save in the last 12 months, 33 percent saving only once a year
Much better access to extension services & weather information. Women have less access compared to men.	Limited access to/availability of extension services & weather information. Women have less access compared to men.

4.4 Food and nutrition security

The VCA4D Study confirms that coffee income can improve food access by boosting purchasing power and enabling input use on staples. It also functions as a safety net. Kangile et al. (2021) found 56.9 percent of male coffee farmers reported better food security versus 36.54 percent of women (likely reflecting men's greater control over income, women's smaller farms and assets, and lower earning potential). Across sampled regions, coffee-farming HH incomes were found to exceed Tanzania's basic-needs (US$ 21.8) and food (US$ 14.9) poverty lines per adult equivalent per month (Kangile et al., 2021). Sumelius et al. (2024) likewise report that annual coffee income in Kilimanjaro, Mbeya, Songwe typically surpassed annual food expenditure. However, neither study disaggregates by region or coffee type, potentially obscuring important differences. For example, Kagera has the 3rd highest food-poverty incidence on the mainland (NBS, 2019), with larger, rain-fed, subsistence farms, fewer diversification options but dense cross-border trade. In contrast, Kilimanjaro shows the 2nd lowest food poverty (25th overall), despite declining Arabica output and smaller plots, due to more diversified, business-oriented livelihoods. In the Southern Highlands, Songwe and Ruvuma exhibit relatively lower food poverty (ranked 21st and 19th) than Mbeya (11th) and are viewed as national "food baskets".



"Coffee farming is extremely important to me and my family—it's essentially the backbone of our household economy. Almost everything we depend on financially comes from the proceeds of coffee. Whether it's paying school fees for our children, buying food, or covering medical expenses when someone falls ill, it's all supported by the income we generate from our coffee harvest.". Womens FGD, Ruvuma, May 2025

"That said, coffee is a seasonal crop, and we can't rely on it for everything throughout the year. That's why we also grow food crops like maize, beans, or cassava—to make sure we have something to eat daily. Those food crops help us survive, but they don't bring in much money, and the market for them is unavailable.". Mens FGD, Ruvuma, May 2025

During the 2025 VCA4D FGD, participants from Kagera described the importance of coffee income for their HHs but also acknowledged how vital it was to diversify their farm to provide food and mitigate against coffee price fluctuations, poor governance and low productivity. Participants emphasised intercropping (bananas, cassava, maize) and side businesses to bridge lean periods, when households can be pushed into coping strategies (such as "*butura*" or side selling). The survey revealed that only twelve households in Kagera and one in Ruvuma reported experiencing a period of food insecurity severe enough for them to resort to coping strategies. In Ruvuma, fertile highland farms under the "*Mantego*" mixed system combine coffee with maize, beans, wheat, bananas, avocados, oranges, sweet potatoes, fishing, and small livestock. This was "*a survival strategy*" that also supports food needs (FGDs, May 2025). In Ruvuma, coffee expansion has displaced maize to lower altitudes for those who can afford new plots there. Recent price rises and stronger extension have also improved outcomes in parts of Kagera, but vulnerability remains.

"…unlike staple foods such as beans or maize, we don't consume coffee ourselves. It's purely a cash crop. So, if there's a problem with the market or we're not paid on time, it becomes useless to us—we can't eat it or trade it locally like we can with food crops." Youth FGD, Kagera, May 2025

"….that's why many of us also practice mixed cropping. We plant other food crops alongside coffee to shield ourselves from total loss. Mixing crops is a kind of survival strategy". Mens FGD, Kagera, May 2025

"Most of us intercrop our coffee with food crops like bananas (migomba), cassava (mihogo), groundnuts (karanga), and beans (maharage). This way, we can ensure food security for our families while still maintaining our coffee farms. The food crops help us survive, especially in seasons when coffee income is not available". Womens FGD, Kagera, May 2025

Highland farms in Ruvuma are fertile, often steeply sloping and renowned for the '*Mantego*' farming system; a mixed farming system in which culturally, "*a complete Mangego man is the one with coffee*" (Youth FGD participant, Ruvuma, May 2025). Participants described farming crops including maize, beans, wheat, banana, fruit trees including avocado and oranges, and sweet potato which are *"used for food although if we get a huge amount we also sell them." (*Mens FGD, Ruvuma, May 2025). Others spoke of fishing or livestock such as goats and cows to create another source of income and food, which was "*especially helpful during off-seasons*" (Womens FGD, Ruvuma, May 2025). One male participant spoke of the importance of mixed cropping: "*We plant other food crops alongside coffee to shield ourselves from total loss. Mixing crops is a kind of survival strategy".* The VCA4D Study Team were told that the expansion of coffee was resulting in other crops, particularly maize, was being displaced to lower lying areas. This was an option for farmers who could afford to establish farms there. As in Kagera, 'side selling' and selling coffee at an immature stage were also prevalent:

"But reality sometimes forces us to sell a little coffee informally. When an emergency strikes—say, a child falls sick or there's no food at home—we might sell a small quantity of coffee just to get by. These are not planned sales, and they don't go through AMCOS. They're acts of survival." Womens FGD, Ruvuma, May 2025

The VCA4D Study shows a strong relationship between the ability to save, access to emergency finance and food security pressured during lean seasons. A significant proportion of survey respondents and FGD participants reported a greater reliance (or specialisation) in coffee, as indicated by the proportion of total HH income it reportedly contributes to. Most also reported using coffee income to buy food from their coffee earnings (more in Kagera than Ruvuma), especially women respondents. Women's better networks helped cope better, according to female FGD participants in both regions. According to the Tanzania Food Security Bulletin 2024–25 and FAO monitoring, up to 40% of rural HHs in the most vulnerable districts of Ruvuma and Kagera must buy food during lean months. When AMCOS payments are delayed or insufficient, this can lead some households to resort to coping mechanisms such as those described in Table 4-7 – these were reported by 12 HH from Kagera and 1 HH from Ruvuma.

TABLE 4-7 USE OF COPING STRATEGIES DURING PERIODS OF FOOD INSECURITY AMONG THIRTEEN HOUSEHOLDS IN KAGERA AND RUVUMA. SOURCE: VCA4D SURVEY, 2025

Coping strategy
Borrowed food from neighbours
Reduced the number of meals
Limited portion size

Bought less preferred food
Restricted adult food consumption

There is also strong relationship between how busy smallholder farming households are with on farm and off farm activities, and their ability to provide adequate and nutritious food. This shows itself in high rates of maternal and child/infant malnutrition and is common in coffee growing areas of the Southern Highlands (Songwe, Mbeya and Ruvuma) and Kagera. Songwe has the 4th highest malnutrition rates, with 43.3 percent stunting among children 0–59 months (2018/19) and 77.8 percent average/above-average birth weight. In Ruvuma stunting rates are 41 percent (84.4 percent birth weight), Kagera 39.8 percent (95.3 percent), and in Mbeya 33.8 percent (85.5 percent). In comparison, the rates in Kilimanjaro are 20 percent (88.7 percent). Stakeholders in the 2018 VCA4D (Songwe/Mbeya) flagged workload (especially women's workload) as an underlying driver of poor diets for young children due to adults leaving home early to work in the fields leaving older siblings to care for their younger brothers and sisters. Parents have limited time to prepare nutritious meals and instead rely on poor quality foods with limited micronutrient diversity, with mealtimes being poorly supervised, and also resulting in the slow introduction of complementary foods during weaning (e.g., 10 percent recorded in Mbeya in 2014). As shown by the VCA4D Study, women's workloads are very high. The reliance on reciprocal labour arrangements can also increase the pressure on household labour capacity, compounded by limited nutrition knowledge.

4.4.1 Conclusion of Food and Nutrition Security

Coffee income plays a crucial role in enhancing household food security. It funds food purchases, inputs for subsistence crops and buffers against lean periods. However, its effectiveness is highly gendered, time and place specific. Where men control coffee income, women may result in side-selling to meet immediate needs. This can also happen when coffee payments are slow. Limited ability to save, and access to emergency support compounds the problem. Strengthening timely payments, savings behaviour, equitable control over income and greater livelihood diversification could significantly increase coffee's contribution to sustained food and nutrition security.

4.5 Social capital

4.5.1 Strength of producer organisations

"*The support systems have weakened…… Many farmers have started to lose trust in the cooperatives because we feel like we're not being supported when we need it most*." Men FGD, Ruvuma, May 2025

Across Kagera, Ruvuma and Kilimanjaro, the VCA4D Study found AMCOS capacity to be highly mixed. Where leadership enforced clear production rules (e.g., rapid cherry delivery to CPUs in Arabica) and negotiated buyer terms well, cooperatives were perceived as reliable by both members and buyers. The most successful AMCOS operated on a very business-like footing compared to the majority who followed a more traditional cooperative model. A recent study commissioned by the (TCB) in 2023[11] surveyed the capacity of AMCOS across the country and found that 60 percent did not have formal business plans, 75 percent had limited financial management skills, and 80 percent faced challenges in accessing and utilising market information effectively. The study highlights the significant gap in leadership, planning, and managerial skills within AMCOS, which will impact on their ability to operate efficiently and compete effectively in

[11] The study was conducted as part of the CASA project (Commercial Agriculture for Smallholders and Agribusiness), facilitated by TechnoServe and implemented by TAPBDS.

the market. The capacity of Unions also varied, with KDC and KDCU in Kagera being highly business oriented and dominant in the Robusta sub-chain. In the Arabica sub-chain, Unions were far less visible and active.

"Selling coffee to the AMCOS is also challenging because they pay late. It takes more than two to five months to be fully paid. So if you face any problem in between it becomes too hard to solve it". Women's FGD, Ruvuma, May 2025

".....and most importantly, they [AMCOS] *must find a way to ensure timely payments. When farmers deliver coffee, they should be paid as soon as possible—not months later. This delay is the main reason many farmers sell their coffee to private buyers, even at lower prices. It's not what we want to do, but when you're desperate, you don't have a choice. Timely payment would encourage loyalty and improve trust between AMCOS and the farmers".* Male farmer, Kagera, May 2025

"Inputs like fertilizers and other farm supplies rarely arrive on time—if they come at all. In the past, our AMCOS used to provide fertilizers to members, which was helpful, but these days they no longer do. Without these essential inputs, it's hard to maintain a productive farm.". Women FGD, Ruvuma, May 2025

Service delivery gaps remain widespread with delayed coffee payments (often taking 2–5 months) and lack of seasonal pre-finance were repeatedly cited as the main drivers of side-selling and loss of confidence and trust in AMCOS. Inputs and training support were also inconsistent or late. Access to capital is a key determinant of strength: without subscriptions and bank credit, AMCOS cannot pre-finance members or buffer cash-flow needs, reinforcing side-selling. Structural rules further weaken balance sheets and loyalty (farmers may join only one AMCOS but can sell to multiple AMCOS, and traders can sell to many). Programmes such as CFAT are professionalising groups, but many AMCOS remain at a basic, service-provision stage. Recent evidence from Kilimanjaro, Mbeya, Songwe concludes that policy changes and reforms have eroded cooperatives' ability to compete with private traders on equal terms, curbing farmer benefits (Sumelius et al., 2024).

TABLE 4-8 OVERVIEW OF COOPERATIVE SOCIETIES AND AMCOS MEMBERSHIP IN KEY COFFEE GROWING REGIONS. SOURCE: SILVANO ET AL, 2023

Name	Region	Coffee Type	Number of Registered AMCOS
Kagera Coopearative Union (KCU)	Kagera	Robusta	135
Karagwe District Cooperative Union (KDCU)	Kagera	Robusta	89
Kilimanjaro Native Cooperative Union (KNCU)	Kilimanjaro	Arabica	90
Arusha Cooperative Union	Arusha	Arabica	42
Mbinga Farmers' Cooperative Union Ltd	Ruvuma	Arabica	114
Songwe Region Cooperative Union (SORECU)	Songwe	Arabica	67

4.5.2 Information and confidence

A recent study (Sumelius et al., 2024) suggests each value-chain actor tends to maximise their own interests at farmers' expense, with smallholders having little integration into upstream decisions. VCA4D Study participants reported limited market information and weak inclusion in AMCOS decisions on marketing and prices, despite being acutely aware of the differences between trader and AMCOS prices as well as the side-selling trade-offs. This information asymmetry was being reinforced by opaque deductions and uncertainty over final payments from AMCOS. The rollout of the TMX e-trading in Kagera in late 2024 was widely viewed as positive. It is felt to have improved price transparency, cut transport costs, and made payments faster. However, it may also confer an information advantage to KCU and KDCU, which compile AMCOS lot data for the TCB auction catalogues. While unions cannot trade directly at auction, affiliated business entities can, potentially benefiting from advance visibility of catalogue information (although it should be noted that the VCA4D Study did not find direct evidence of abuse).

The VCA4D Survey found neighbours were the most common source of market and agronomy information and this differed sharply by gender. Women were more likely to collaborate for value addition and marketing through informal support groups. An HRNS survey across four regions (including Mbeya and Kagera) showed women who faced systemic barriers often joined or formed VSLAs, rotating credit groups, or informal coffee collectives to pool savings, share labour, access inputs/credit, and sell small volumes via cooperatives (Ngambila et al., 2024). Qualitative evidence also documents women's informal trade networks. Some women spoke of setting aside 2–4 kg of beans to sell independently in response to men typically controlling the main coffee revenues (Manzanera et al., 2016). A survey of 400 farmers in Ruvuma, Kagera, Songwe, Kilimanjaro estimated that gender gaps in coffee income and trading reflected 44 percent of women's structural disadvantages (Kangile et al., 2021).

TABLE 4-9 SUMMARY OF SUPPORT RECEIVED BY VCA4D SURVEY RESPONDENTS BY REGION (SOURCE: VCA4D SURVEY, 2025)

Ruvuma	Kagera
Good access to TaCRI advice (92 percent had access)	Very limited access to TaCR((66 percent had no access at all)
Roughly equal access to Government extension services	
Good access to AMCOS support (56 percent)	56 percent said they received little or no support
Good links to buyers (55 percent)	Little or no links to byers (90 percent)
92 percent drew on neighbours for 'extension' advice	Only 36 percent turned to neighbours for 'extension' advice
69 percent were connected with an NGO	93 percent had little or no contact with an NGO
56 percent had some connection with coffee processors	93 percent had no contact with coffee processors
86 percent had no connection with savings groups	96 percent had no connection with savings groups
36 percent have no savings / 26 percent only once a year	34 percent have no savings / 21percent only once a year
70 percent were borrowing money	86 percent did not borrow money

80 percent had not received any training	78 percent had not received training in the last year

4.5.3 Conclusion of Social Capital

The VCA4D study found that the capacity and trustworthiness of AMCOS remain a critical concern for smallholder coffee farmers in Tanzania. Despite past reforms and efforts to strengthen producer organisations, many AMCOS continue to face serious governance (see Section 3.3), leadership, and financial management challenges. Farmers across regions reported delayed payments, lack of pre-season credit, and limited support with inputs as key drivers of income insecurity and a major cause of informal "side-selling" to private traders. The 2023 TCB survey highlights the scale of the problem. It shows the majority of AMCOS are operating without formal business plans, suffer from weak financial skills, and lack access to market intelligence, limiting their ability to negotiate favourable prices and effectively represent farmer interests.

These systemic issues have eroded farmers' confidence in cooperatives. While AMCOS are still appreciated for facilitating market access, they are increasingly viewed as ineffective in delivering timely support and payments. Many were created hastily after the 2018 "Mlangoni Mmoja" directive, with some operating more as service providers than farmer-led institutions. The VCA4D study observed that only the most business-oriented AMCOS are able to compete effectively with traders. However, the majority remain underdeveloped. Without targeted investment in governance, financial systems, and member engagement, AMCOS risk continuing to decline, leaving farmers, especially women, without the institutional support they need to benefit fully from the coffee sector.

4.6 Living conditions

There is good evidence that coffee farming can improve smallholder's living conditions (summarized in Table 4-9), particularly when it is coupled with institutional support, training, quality inputs, effective governance, and reliable markets. Among 400 farmers in Ruvuma, Kagera, Songwe, Kilimanjaro, Kangile et al. (2021) found very high house ownership (98.7 percent, no gender difference) and the use of generally good housing materials. All households had toilets (92.5 percent covered/flush; 8.5 percent basic pit latrines). Access to electricity was reported by 58.3 percent (with 49.3 percent using it for lighting, via grid or solar), and 44.3 percent used piped water as their main domestic source, though firewood remained the dominant cooking fuel. Consistent with this, the VCA4D Survey shows farmers often invest coffee income in housing: X percent in Kagera and X percent in Ruvuma, though education, healthcare, and food typically rank higher than housing.

TABLE 4-10 IMPROVEMENTS TO LIVING CONDITIONS FOUND AMONG 400 COFFEE FARMERS IN RUVUMA, SONGWE,KAGERA AND KILIMANJARO REGIONS

Livelihood Condition	Coffee Farmers (%)		
	Men	Women	Overall
Better food security	56.9	36.54	54.25
Owning house	99.14	96.15	98.75
Corrugated iron sheet house	99.71	100	99.75
Bricks/block exterior wall	84.77	84.62	84.75
Cement/tiles floor	81.03	84.62	81.5
Ownership of toilet	100	100	100
Electricity	55.75	75	58.25
Not using firewood as main source of fuel for cooking	4.31	7.69	4.75
Use of piped water	43.1	51.92	44.25

Table Source: Kangile et al, 2021

Healthcare

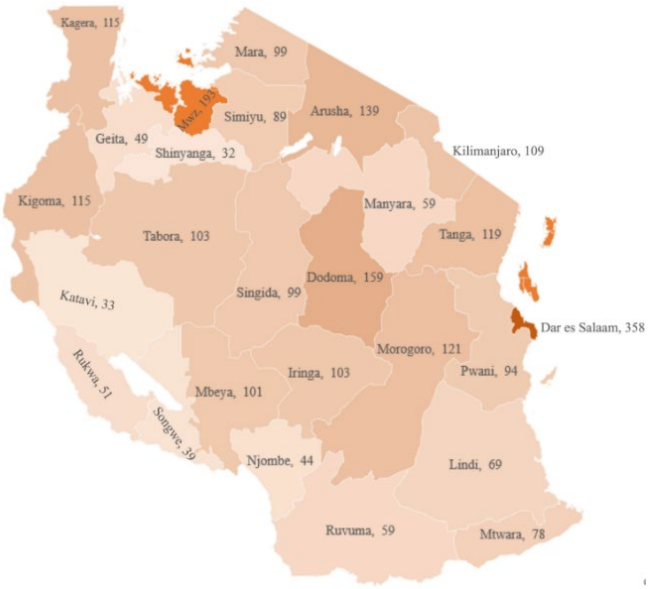


FIGURE 4.3 DISTRIBUTION OF NUMBER OF HEALTHCARE FACILITIES AMONG REGIONS IN TANZANIA FROM 2017 TO 2021.SOURCE: KITOLE ET AL, 2025

For Arabica (Kilimanjaro, Mbeya, Ruvuma, Songwe) and Robusta (Kagera) producers, coffee income is a critical enabler of healthcare. It is used to cover fees, transport and treatment. In the VCA4D Survey, healthcare was a frequently cited use of coffee income, with women citing it more often than men and regional differences between Kagera and Ruvuma. Service availability, however, varies sharply (Figure 4.3). Kitole et al. (2025) report 39 facilities in Songwe versus 115 in Kagera. Scale Efficiency[12] scores were 0.267 (Ruvuma), 0.461 (Songwe), 0.475 (Mbeya), 0.554 (Kagera), with Arusha/Kilimanjaro at 1.0.

Education

"As a parent you will do whatever you can to get money to pay school fees for your child and ensure that all the school requirements like uniform, school shoes, exercise books and pens are available"
(Mens FGD, Ruvuma, May 2025)

[12] The study evaluates the relationship between healthcare inputs (e.g., hospital beds, medical staff, and diagnostic equipment) and outputs (e.g., patient recovery rates and reduced hospital stays) to measure scale efficiency.

Coffee income also enables schooling and is highly valued by parents. Participants noted that delayed coffee payments often forced them to make difficult decisions about use of coffee income. Although the VCA4D Study found very little evidence of child labour, they do contribute their time as part of the household. This can potentially disrupt school attendance, particularly at busy times. Alenga et al. (2021) estimate non-attendance among 15–20-year-olds at 65.7 percent (Mbeya), 56.1 percent (Ruvuma), 53.8 percent (Kagera) versus just over 50 percent nationally. Kilimanjaro is lower at 43.2 percent, with distance to secondary school and household socio-economic status being listed as key factors. Despite constraints, national schooling for 15–24-year-olds averaged 6.6 years in 2023, projected to be 8.4 years by 2043 (African Futures). Msangi et al. (2024) link higher education among youth to greater agricultural investment. The next generation of coffee farmers are likely to have achieved a greater level of education than the current generation.

"After covering those farming costs, whatever small amount remains usually goes toward household expenses — things like school fees, building or repairing our homes, and other daily needs". Mens FGD, Ruvuma, May 2025.

Access to mobile technology among smallholder coffee households is relatively high but uneven. Nationally, 75 percent of adults own a mobile phone (men 80 percent, women 71 percent), but rural ownership is below average (69 percent) with only 19 percent of adults owning a smartphone. Connectivity in rural areas is improving but app-based services are not yet scaled up (FinScope Tanzania 2023). Digital literacy among smallholders was rated as 'average' in a 2023 assessment, with participants showing strengths in accessing/communicating information but being weaker on managing, evaluating, and creating digital content. These skills are considered instrumental in effective use of agronomy, price, and climate tools (Magesa et al., 2023). Evidence from Tanzania also links mobile phone use in farming to higher reported profits and yields, highlighting the benefits of developing practical, farmer-facing digital services (Quandt et al., 2020). For Tanzania's coffee sector, this implies that pairing basic handset channels (SMS/USSD and mobile money) with targeted digital literacy and gradual smartphone uptake could accelerate extension, price transparency (e.g. e-auctions), traceability, and on-time payments, especially for women, who face lower device ownership and often weaker digital access.

4.6.1 Conclusion of Living Conditions

Where supportive institutions, timely payments, and market access are present, coffee income improves housing, enables healthcare, and funds education. Farmers do prioritise these investments, but the benefits hinge on payment timing, service availability, and household control over income. These factors remain uneven across regions and between men and women. Mobile phone ownership and greater ICT literacy will underpin the future efficiency of the coffee sector by facilitating increased access to information, traceability, financial literacy.

4.7 Social sustainability: conclusions and recommendations

This section reflects on key social issues highlighted through the VCA4D Social Analysis, and how these can contribute to a better understanding of 'sustainability' and 'viability' within Tanzania's coffee sector. Understanding smallholder farmers' lived experience can help design policies and programmes that tackle bottlenecks, have a higher chance of achieving the current Government ambitions for the sector, and provide an early warning of deeper stress. Smallholder coffee farmers and informal labour are the backbone of Tanzania's coffee sector. They are also an integral part of the origin/ethical credibility buyers and markets are increasingly seeking. A range

of systemic factors are preventing smallholder farmers from accessing the full benefit of their coffee and appear to be fostering behaviours and coping strategies that compound this situation.

Kangile et al (2021) concluded that coffee farming is especially important for improving the lives of smallholder farmers, especially the poorer ones, as it can reduce inequality by -0.043 for every 1 percent increase in income. Evidence also shows that livelihood diversification is essential for reducing risk for coffee farmers but can end up contributing to inequality because alternatives are often more accessible to better-off households unless combined with targeted support in the form of finance, training and market linkages. Often the barriers for smallholder farmers are less about knowledge and more about liquidity, risk, friction or time.

4.7.1 Summary of main findings

	Key issues identified	
	Common to both Value Chains	
	Arabica Value Chain Specific	Robusta Value Chain Specific
Working conditions	Household labour accounts for majority of labour input on smallholder coffee farms. The rest is informal labour. Tanzania's employment and labour rights framework is robust but only covers those in informal employment – estates, warehouses, processing factories, export. Third party and private sector certification schemes provide additional protections but very limited cover	
Land and Water Rights	Large scale land holdings are not a major feature of the coffee sector. Customary land rights are not yet equal in the eyes of the law. Registration for CCROs among SHF is slow to roll out and shows gender inequalities Recognition of water-based land rights could exclude small scale water users.	
Gender Equality	• The two value chains appear to be at different stages in terms of youth and gender equality. Over the years, Arabica (and Kilimanjaro in particular) has received a lot more attention and investment from Government, development actors and the private sector in terms of youth and gender focused initiatives. Men continue to dominate both coffee value chains – ownership & control over resources, income, decision making and leadership although things are changing Women own smaller farms and lower value assets than men Many women enjoy limited access to/control over coffee income. In response they secretly withhold a portion of the harvest to sell and will also set up their own informal support groups. Many smallholder households are dependent on coffee (where it represents 50 percent or more of their HH income), which makes them vulnerable to price fluctuations. They experience financial insecurity when coffee payments from AMCOS are slow and have limited access to credit. As a result, they will often sell some of their coffee to traders, or 'sell' immature coffee as collateral for loans as a way to access cash.	
Food and Nutrition Security	Income from coffee improves families' ability to buy food, invest in farm inputs, and buffer against shocks such as illness or crop failure. However, the benefits vary by gender and geography. Delayed payments from AMCOS, significantly undermines the potential for coffee income to contribute to food security, forcing farmers to sell coffee informally or at immature stages to meet urgent needs. Smallholder farmers practice mixed farming, intercropping coffee with other crops, growing a range of staples and keeping livestock. Households are more vulnerable to food insecurity at certain times of year, and will adopt strategies to cope such as reducing the number of meals, borrowing food, etc.	

	Workload (particularly among women) is a significant contributor to childhood stunting as it reduces time spent on proper care and supervision of children
Social Capital	The limited capacity of many AMCOS was highlighted a critical issue – significant gap in leadership, planning, and managerial skills within AMCOS, which will impact on their ability to operate efficiently and compete effectively in the market. The VCA4D Study also met with very good AMCOS. The capacity of AMCOS has also suffered due to recent policy changes. Levels of trust between AMCOS and farmers varies. The two Unions in Kagera (KDC and KDCU) are very strong, and business oriented. The way the Robusta VC is currently structured around online auctions, gives them early access to catalogue information. The RVC excludes exporters from any contact with farmers and AMCOS, and so AMCOS are reliant on the Unions.
Living Conditions	When coffee farming is complimented by institutional support, training, inputs, good governance and reliable access to markets, it can have a positive impact on livelihoods and living conditions Coffee farmers invest in housing, the farm and other assets. They often have better access to water, electricity and sanitation than non-coffee households Coffee income can increase access to education and health care

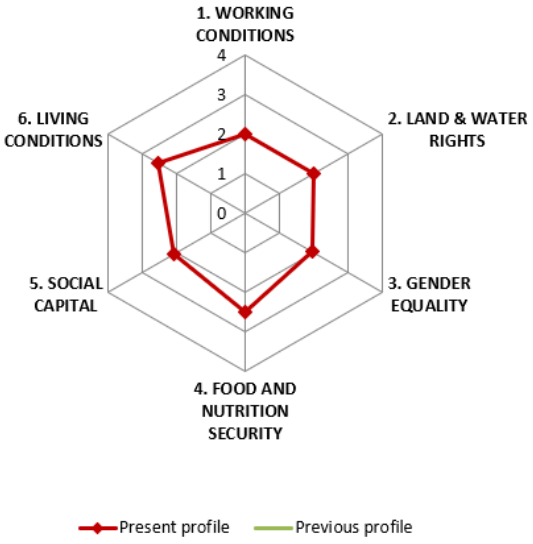


FIGURE 4.4 OVERVIEW OF THE VCA4D SOCIAL ANALYSIS PROFILE SCORE FOR TANZANIA COFFEE

4.7.2 Reflections on sustainability, viability and vulnerability

There is interest among Government and other stakeholders in developing a clearer understanding of what might constitute a 'viable' smallholder coffee farm. This could help TCB and partners to adjust policies and target support where they are likely to have the greatest impact. Reportedly based on research carried out by TaCRI[13], the figure of "500 coffee plants" was being cited as a benchmark at which a farmer could cover their costs and start to make a profit from coffee cultivation. This appears to be in contradiction with the National Coffee Sustainability

[13] At the time of writing this report, the VCA4D Team had not been able to access the research paper(s) concerned in order to carry out a full review the results and assumptions against the VCA4D Study findings.

Curriculum (NCSC) which uses an enterprise budget approach (not "number of trees"). The VCA4D Study findings suggest that "number of trees" is far too crude a measure and could potentially be misleading. From a social perspective, the viability of smallholder coffee production appears to hinge on their level of dependence on coffee income and vulnerability to several critical, and highly dynamic issues that trigger often unhelpful coping strategies (e.g. price volatility, yield variability, cash-flow mismatch - reliability and timeliness, not just income level - and input/credit and labour constraints.

The NCSC provides the framework to calculate 'break-even price' and 'break-even yield'. However, it does not consider risk and timing. Price and yield both fluctuate. Using scenarios where price is high/medium/low and yield is good/average/poor it should be possible to check the *probability* of a shortfall at current practices. This could then be combined with a cash-flow calendar showing when money is needed vs. when coffee payments actually arrive to identify the months where farmers are most likely to economise on agronomic practices. Based on these, it should be possible to develop a 'viable minimum farm profile'[14] (a simple, geographically specific benchmark for what it would take for a smallholder coffee farmer in that area to break even and earn a basic surplus). With this information, it would be easier to identify the leverage points (e.g. pricing guidance, input finance, credit guarantees, timely payments) that represent the biggest risks or cash bottlenecks. This would be much more politically actionable than a tree count and fits well with TCBs current strategic emphasis on increasing production and quality while protecting farmer welfare.

4.7.3 Recommendations

Recommendation 1: Robusta is likely to become increasingly dominant in future (total volume and % of Tanzania's output), with consequent geographic changes - continued expansion in Kagera, coffee becoming established in new areas and 'traditional' areas in decline (as has already been seen in Kilimanjaro). These changes will be felt most keenly by smallholder farmers. A less top-down, more coordinated and disaggregated approach will be needed to ensure social benefits are maximized and social impacts are minimized. These could include:

- Develop regional coffee 'transition' strategies that reflect the socioeconomic and agro-ecological situation. From a social sustainability perspective, this could include developing market linkages and farmer/AMCO capacity in 'new' and upcoming areas, and supporting alternative livelihood activities, specialisation and value addition for areas in decline. Youth and gender equality should be mainstreamed in all strategies.
- Create regional or zonal stakeholder platforms that bring Unions, AMCOS, local government, traders and NGOs together to coordinate and support context specific priorities.

Develop a social impact monitoring system/Coffee Livelihood Observatory for the coffee sector. It could track the impact of coffee transitions through monitoring indicators for youth employment, gender dynamics, land tenure and capacity of cooperatives. It would then be possible to identify and quickly respond to emerging social issues like marginalisation, income shifts or land-use pressures, rather than waiting until they were already a burden on SHF. It could be created in partnership with key stakeholders such as academic research institutions such as Sokoine University, NGOs (e.g. HRNS or Solidaridad) and district government. The data would be relevant for government planning and investors.

[14] Which would include, for example: (i) a realistic yield range, (ii) the costs of the farming practices, labour and inputs needed to hit the yield, (iii) a likely farm-gate price band, (iv) the probability that income will fall below costs and/or subsistence needs, and (v) the amount of pre-harvest cash needed to pay for inputs and labour in a timely manner.

Recommendation 2: Assuming there is continued political support for AMCOS as the main bridge between smallholder coffee farmers and the broader market, a lot more investment is needed to address the ongoing issues of weak governance, poor management and limited infrastructure. AMCOS could play a critical role in enhancing the competitiveness and sustainability of Tanzania's coffee sector and improving smallholder's income – both in terms of better prices but also helping to mitigate for seasonal HH financial management challenges. To do this, they will need substantial capacity development in order to be ready to play this role more effectively.

Recommendation 3: Tanzania's coffee sector is reliant on women's unpaid labour - particularly for harvesting and processing – but they still lack control over income, land or decision making. Women's already-heavy workloads could be adversely impacted by changes in coffee production practices. Putting effort into closing the gender gap in both value chains will help improve HH level outcomes, as well as help the coffee sector achieve wider development objectives such as its contribution to economic growth (by boosting the local economy), climate resilience (through influencing agricultural practices) and social development (e.g. better education outcomes for children and youth). Some ideas for this include:

- Encouraging the use of shared processing facilities (including CPUs) in the Arabica VC, to reduce women's workload. However, this comes with the caveat that by removing them from the burden of processing, they would also lose access to the small amounts of parchment coffee many women secretly take to sell, in response to being excluded from the benefits of coffee income.
- Interventions that support women's participation in land access and income rights. This could include investing in more equitable implementation of the CCROs in areas where coffee is expanding (e.g. joint titling, women's ownership and ensuring the process does not marginalise women or youth). Encouraging AMCOS to pay coffee income into shared accounts or supporting the implementation of the regional coffee strategies (see first recommendation)
- Support and incentivise gender balanced governance and membership of AMCOS, and the formation of women-led savings groups or micro-enterprises. This, and the previous bullet point, seem to be a particular priority in Kagera at the moment.

Promote the use of tools such as 'participatory gender audits' to help AMCOS, district authorities, extension providers to identify gaps and design appropriate interventions.

Recommendation 4: One of the most urgent issues, from a social perspective, is to address the issue of smallholder coffee farmers struggle with structural income insecurity. It is not just about how much they earn, but when they receive it and how predictable that income is. Many farmers complained about delayed payments from AMCOS, a lack of consistent cash flow and pressure to take on exploitative loans. Even if their income appears adequate, households that derive 50 percent or more of their income from coffee can also be considered 'dependent', and vulnerable to price fluctuations, etc. Finding ways to ensure greater financial security will help farmers to invest in their farms and household wellbeing and ultimately lead to better coffee quality and sustainability.

- Scale up support for community level savings and loans groups in coffee producing areas. Informal VSLAs appear to work well, particularly for women. At the same time, provide literacy training for smallholder households, to help them plan, budget and save.
- Create or strengthen pre-harvest advance schemes and AMCOS payment guarantees to provide a more immediate cash flow. This would need to go hand-in-hand with support and training as many AMCOS have limited accountability and financial management

capacity. Partnering with a reputable finance or microfinance institution(s). Payments to farmers need to be made quickly (within 7 days?) of the AMCOS receiving their coffee. Auction receipts and direct sales contracts could be used as collateral.

Social narrative	Why might this work?	Basis
Heritage: In many areas, coffee is grown on family farms. Knowledge of coffee production is handed down from generation to generation. Young farmers represent the future, as well as Tanzania's heritage.	It suggests authenticity, tradition and connection with the land. It also contrasts with commercial estates. It could even include heritage coffee varieties and geographic designation (precedent – Kilimanjaro)	Photos of farms, family bios, maps showing specific microplots, geographic and cultural stories
Climate resilient coffee: Supporting the adaptation of smallholder farmers to adopt climate-smart, regenerative practices such as agroforestry, intercropping, etc.	Climate resilience will be a key component of social sustainability (both reducing impact and maximizing benefits). Many companies might be motivated by the alignment with their social impact values, as well as by sustainability conscious buyers.	Certification (with caveats), compliance with EUDR, carbon offset (with caveats)
Empowering women and youth: Supporting youth and gender equity by highlighting their contribution to coffee production and sustainability. Linking with women or youth producers or supporting initiatives that promote social change.	Again, this would align with corporate social impact values and sustainability conscious buyers. It could link with individual AMCOS, youth entrepreneurs and development initiatives	Stories, data on AMCOS membership and possibly visibility of specific AMCOS
Traceability: With EUDR creating a greater focus on traceability, this could provide an opportunity to tell coffee's origin story. Traceability to named AMCOS, communities and geographic designation.	Currently a large proportion of Tanzania's coffee goes into blends. Producers and production are anonymous. Higher value specialty markets (and the EU) want transparency and traceability, which offers the potential for greater producer visibility	Auction data, EUDR compliance data, farm interviews

- Scope the feasibility of providing evidence that can be used to secure a short-term loan through something like a regulated warehouse receipt system, or the TMX online auction system being trialled in Kagera.
- Scope the feasibility of developing SACCOS (care i
- Encourage the use of mobile banking, and scope the potential of tools such as 'digital wallets' and 'income smoothing' (e.g. Tigo Pesa Trust accounts)

Recommendation 5: The dominance of smallholder coffee farmers is a unique feature of Tanzania's coffee sector. While it comes with challenges, it can also be seen as a unique selling point (USP) from which to create compelling stories (with a strong social element) that could help differentiate Tanzanian coffees and reach higher value markets:

5. IS THE VALUE CHAIN ENVIRONMENTALLY SUSTAINABLE?

5.1 Setting boundaries

The **scope** of the environmental analysis will be **limited to the coffee value chain within Tanzania**. A systematic literature review of coffee LCA studies has revealed that the Global Warming Potential (GWP) of exporting coffee, the major impact category for this part of the value chain, is minimal (3 % of total GWP) if container ships are used (Chéron-Bessou et al., 2024). Tanzanian coffee is almost entirely shipped by container from the port of Dar es Salaam, rather than by air freight.

Additionally, the environmental analysis **will not include secondary processing**, referring to the transformation of green coffee beans into ground coffee, **or consumption,** as the environmental impact thereof is highly dependent on assumptions relating to packaging, the amount of coffee used per coffee drink, the use of other ingredients such as sugar and milk, cup washing and waste disposal. These assumptions are highly variable across coffee LCA studies (Chéron-Bessou et al., 2024), resulting in a comparison of apples and oranges.

The 2018 VCA4D study on the Tanzanian coffee value chain also revealed that the same trends apply to both locally consumed and exported coffee. Furthermore, although accurate data on the proportion of locally consumed versus exported coffee does not exist, actors agree that more than 90% of Tanzanian coffee production is exported.

This VCA4D study aims to provide policymakers in Tanzania with relevant and actionable information and recommendations. Thus, the environmental impact of **1kg of green coffee beans** at the port of Dar es Salaam, ready for export, will be assessed.

5.2 Recap of the 2018 VCA4D study

5.2.1 End-point impacts

The 2018 Tanzania study on the arabica coffee value chain in the Southern Highlands, more specifically in Mbeya and Songwe, showed that the primary determinant of all LCA end-point impact categories is the cultivation of coffee. Depending on the end-point impact category in question, the cultivation phase explained 50–90%. This is true for human health (DALY/kg coffee), fossil resource depletion ($/kg coffee) and ecosystem quality (species.year/kg coffee), irrespective of the agricultural practices or production system (estates, smallholders, (non)-organic, irrigated or not, etc.). This confirms that the cultivation phase is the major contributor to the environmental impact of the coffee value chain in Tanzania. Coffee yield is crucial in this respect.

In essence, the 2018 study found that low-input coffee systems scored well for 'human health' and 'resource depletion' as defined in the LCA methodology, as a result of not using or using minor quantities of agro-chemicals and mineral fertilisers (*Table 5-1*). As the opposite is true by definition for high input systems, high input systems scored poorly on 'human health' and 'fossil resource depletion'. As a result of using significant amounts of mineral fertilisers and agro-chemicals, high-input systems have a higher yield per hectare. Thus, they are characterised by a higher land use efficiency, which resulted in a better score for 'ecosystem quality'. The inverse is true for low-input coffee systems.

TABLE 5-1 SUMMARY OF END-POINT IMPACTS COMPARED BETWEEN LOW AND HIGH INPUT COFFEE SYSTEMS (VCA4D TANZANIA COFFEE, 2018)

	Low input Coffee system	High input Coffee system
Human health [DALY/kg green coffee]		
Fossil resource depletion [$/kg green coffee]		
Ecosystem quality [species.year/kg green coffee]		

5.2.2 Mid-point impacts

According to the 2018 study, land use change is the primary determinant of the Global Warming Potential (GWP) for low-input coffee systems, as yields per hectare are low (*Table 5-2*). In contrast, the 2018 study found that mineral fertilisers and agro-chemicals are the main drivers of GWP and terrestrial and freshwater acidification, as yields per hectare are higher. However, it is worth noting that the 2018 study did not account for land-use history. Depending on the prior land use history, land use change may also be a significant determinant of GWP for high-input systems (e.g., transitioning from forest to coffee monoculture). Therefore, the findings relating to 'ecosystem quality' should be interpreted with caution.

TABLE 5-2 SUMMARY OF MAJOR DETERMINANTS FOR EACH MID-POINT IMPACT CATEGORY, COMPARING LOW AND HIGH INPUT COFFEE SYSTEMS (VCA4D TANZANIA COFFEE, 2018)

	Low input Coffee system	High input Coffee system
Global Warming Potential [kg CO2eq / kg green coffee]	Land use change	Mineral fertilisers (+ fuel for irrigation)
Terrestrial acidification [kg S02eq / kg green coffee]	NA	Mineral fertilizers (+ Agrochemicals)
Freshwater acidification [kg S02eq / kg green coffee]	NA	Mineral fertilizers (+ Agrochemicals)

5.2.3 Water use

Given that irrigation was linked to higher yields in the 2018 study, the use of irrigation led to a lower impact for the end-point and mid-point impact categories used in the 2018 study. Besides irrigation, the wet processing method for arabica uses large amounts of water. Given that ecopulpers use much less water than regular pulpers found in most CPUs, and manual pulpers used for home processing use much more water than pulpers in CPUs, water consumption can be decreased significantly by using ecopulpers or by shifting to processing at CPUs instead of home processing.

5.2.4 Conclusion

The cultivation phase is the primary determinant of environmental impact. Inherent trade-offs exist between low-input and high-input systems. Low input systems score well on 'human health' and 'resource depletion', while high input systems score well on 'ecosystem quality'. Mineral

fertilisers, agro-chemicals, irrigation and land use change were found to be major determinants of environmental impact.

Yield is the most important driver of environmental impact. Yield should be increased efficiently, taking into account the concept of yield-limiting variables. Adding large quantities of fertilisers or agro-chemicals is of little added value if water scarcity is the most limiting yield factor. While each region and coffee species has its specific characteristics and needs, overall, we can conclude that in most cases, the combined use of organic and mineral fertilisers and irrigation will lead to a lower environmental impact, provided it is not used excessively.

5.3 Results of the 2024 – 2025 study

5.3.1 Coffee yield

Arabica vs Robusta

Comparing smallholder coffee yields (kg green coffee/ha) per species reveals that the yield per hectare on robusta farms in Ruvuma is significantly higher than on arabica farms in Kagera (Figure *5.1*). Thus, in our study, yields per hectare are significantly higher for arabica farmers in Ruvuma (303 ± 65 kg green coffee/ha) than for robusta farmers in Kagera (104 ± 35 kg green coffee/ha). No significant differences were found between Karagwe and Muleba, both of which are robusta-producing districts (*Figure 5.1*). Note that care should be taken when using the absolute yield values, as measurements are based on farmers' recall of the size of their coffee plots, rather than actual measurements of the area. Also note that globally, on average, robusta yields per hectare are greater than those of arabica, as robusta has the potential to yield higher yields in high-input coffee systems. In contrast, our study finds that arabica yields per hectare in Mbinga, Ruvuma, are greater than those of robusta in Kagera, likely due to arabica systems in Ruvuma being high-input systems, while robusta systems in the Kagera region are low-input systems.

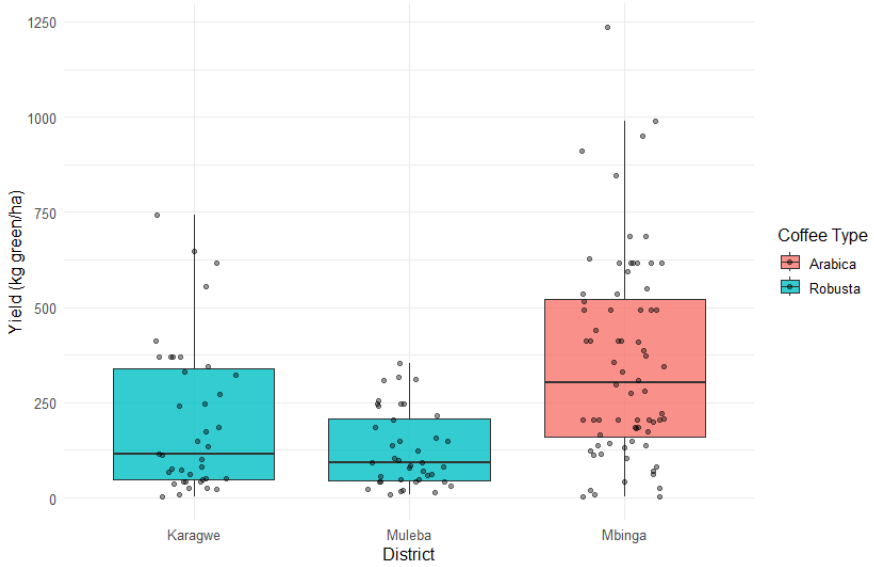


FIGURE 5.1 GREEN COFFEE YIELD PER HECTARE BY DISTRICT AND COFFEE SPECIES, WITH KARAGWE AND MULEBA PRODUCING ROBUSTA, WHILE MBINGA PRODUCES ARABICA (N = 137)

Arabica smallholders vs Arabica estates

Arabica yields in estates in Kilimanjaro reportedly range between 575 and 1,250 kg of green coffee per hectare, with many estates achieving approximately 1 ton of green coffee per hectare. Arabica

yields in estates in Ruvuma were reported to reach 1750 kg green coffee per hectare. No estates exist in Ruvuma. Thus, arabica estates in Ruvuma appear to be more productive than those in Kilimanjaro, which may be attributed to ecological differences between the regions (including climate, water availability, etc.) and management practices. Though it should be noted that data on estates in Mbinga is limited, as there are not many estates. Additionally, Arabica estates are approximately 2–6 times more productive than smallholder Arabica farmers in Ruvuma. Consequently, Arabica estates will score much better in terms of land use efficiency.

When excluding estates from the analysis, no correlation was found between yield per hectare and coffee plot size (Figure S1), with p-values greater than 0.21 and correlations smaller than ±0.21.

Monocultures versus agroforestry
Given that less than 10% of Arabica farmers in Ruvuma practice monocropping, it is not possible with our study population to compare yields per hectare between monocultures and agroforestry systems for Arabica.

5.3.2 Coffee yield drivers

Yield drivers according to arabica and robusta farmers
Given that modelling the effect size of different biotic and abiotic variables on coffee yield is outside the scope of the VCA4D methodology, though it is crucial to understand which factors drive yield, we turn to coffee farmers for guidance on their relative qualitative importance.

Overall, when examining the entire sample of smallholder farmers, the most important yield-limiting factor reported by 37.2% of farmers is adverse weather conditions (*Figure 5.2*). The second most important yield-limiting factor reported is a lack of capital for agro-inputs, including fertilisers, pesticides, insecticides, and fungicides, reported by 36.3% of farmers. The third most important yield-limiting factor reported is pests and diseases, reported by 28.7% of farmers. Note that climate change is an overarching problem that aggravates the effects of certain pests and diseases.

When examining the data at the district level, we observe that weather is the most commonly reported yield-limiting factor in all three districts for both arabica and robusta (*Figure 5.3*). However, it seems especially problematic in Karagwe, given that 59.4% of farmers report weather as the most important yield-limiting factor, compared to 29–33% for Mbinga and Muleba. This is further substantiated by the fact that the most frequently reported second and third most important yield-limiting factors in Karagwe are also related to the weather.

A lack of capital for agro-inputs appears to be the second most important yield-limiting factor in all districts, after weather, as reported by 33–39% of arabica and robusta farmers (*Figure 5.3*). Here, no large differences can be observed between the districts or regions. No apparent differences between districts can be observed in terms of pests and diseases reporting (*Figure 5.3*). Nonetheless, apart from the weather and lack of capital, the 3rd most important yield-limiting variable, according to farmers, is pests and diseases.

Yield drivers according to arabica estates
According to the arabica estates in Ruvuma, the major challenge relating to yield optimization is the weather, as it is the least controllable input variable. Currently, the weather does not pose a major problem for arabica estates in Ruvuma, as they can induce flowering by irrigation. However,

arabica estates in Ruvuma did highlight that water scarcity is likely to become a major problem in the future.

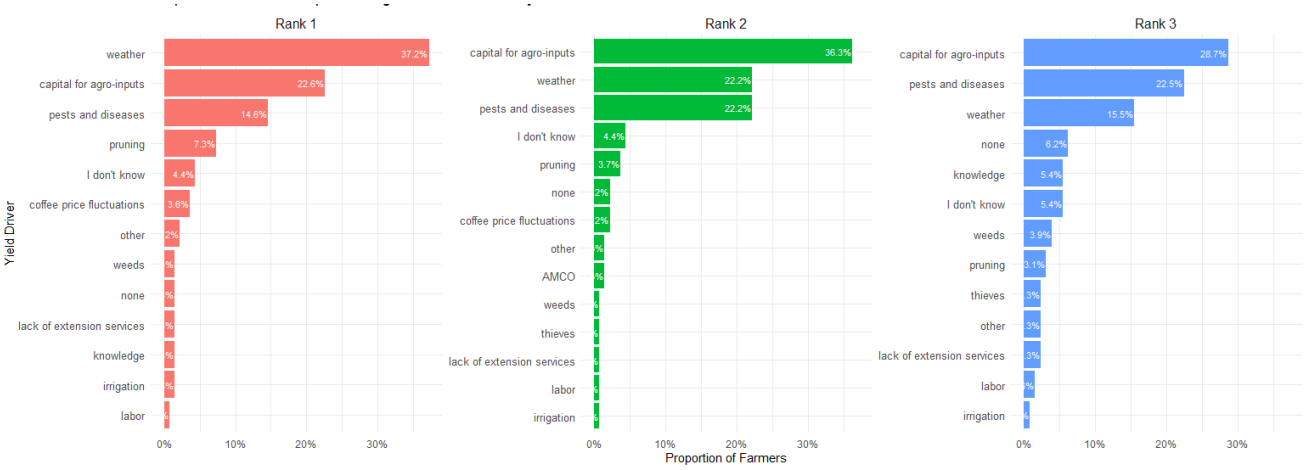


FIGURE 5.2 PROPORTION OF COFFEE FARMER-REPORTED YIELD-LIMITING FACTORS (ARABICA FROM RUVUMA AND ROBUSTA FROM KAGERA COMBINED), WITH RANK 1 BEING THE MOST IMPORTANT FACTOR (N = 137)

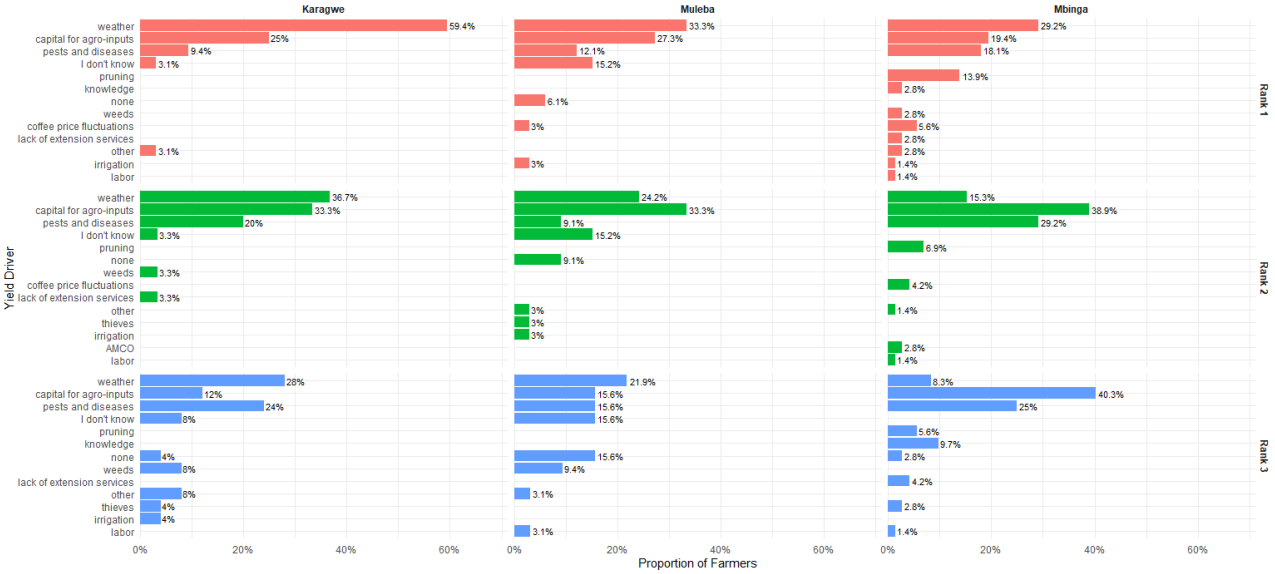


FIGURE 5.3 PROPORTION OF COFFEE FARMER-REPORTED YIELD LIMITING FACTORS DISAGGREGATED BY DISTRICT, WITH RANK 1 BEING THE MOST IMPORTANT FACTOR. KARAGWE AND MULEBA PRODUCE ROBUSTA, WHILE MBINGA PRODUCES ARABICA (N = 137)

Yield drivers according to researchers and key informants

According to recent literature, declining rainfall, rising temperatures, increasing vapour pressure deficit and an increase in coffee pests and diseases are significant challenges in the Southern Highlands, the main region for arabica production (Kasongi et al., 2024; Mbwambo et al., 2021; Wagner et al., 2021).

In the Kagera region, where practically all of the robusta is grown in Tanzania, the number one problem mentioned by all stakeholders is climate change, which is disturbing rainfall patterns. In

recent years, changing rainfall patterns have been reported to result in significant yield losses. The Black Coffee Twig Borer (BCTB) (*Xylosandrus compactus*) is reported to be the second biggest challenge according to TaCRI, leading to severe yield losses. Farmers and extension officers also reported soil fertility issues, though this varies from district to district. Karagwe was reported to have serious soil fertility issues, while for Kyerwa, it was reported that soil fertility was not an issue.

Conclusion on coffee yield drivers
Thus, we can conclude that for arabica in Ruvuma and robusta in Kagera, estate managers, farmers, and researchers more or less agree on the major problems: weather, soil fertility issues, and the lack of capital to purchase agro-inputs, as well as pests and diseases. However, it should be noted that farmers may overlook several variables due to a lack of awareness. For example, coffee variety, coffee spacing, pruning, stumping and coffee plant age are commonly known to be important yield drivers, though they were not or barely mentioned by farmers. Therefore, more in-depth research is required, especially region- or district-specific research; nonetheless, this already provides guidance moving forward.

5.3.3 Energy demand and fossil resources depletion

While energy demand and fossil resource depletion are relevant impact categories, there is an evident lack of harmonisation across LCA studies when it comes to how these are measured, calculated, and reported (Chéron-Bessou et al., 2024). This makes the comparison of energy indicator values across coffee LCA studies nearly impossible. Therefore, we will not attempt to quantify this mid-point impact using the LCA approach.

According to a review of LCA of coffee value chains (Chéron-Bessou et al., 2024), the main contributors to energy consumption and fossil resource depletion are **primary processing**, if done mechanically, and coffee cultivation, mainly through the energy cost of producing **mineral fertilisers** and sometimes also the fuel used for irrigation.

Primary processing & Energy demand
In the case of robusta coffee in Kagera, 97% of coffee cherries are sun-dried, while only 3% are mechanically dried. Afterwards, the dried cherries are processed in large factories which have efficient and quite new equipment. In theory, fuel used for irrigation could be a significant source of energy demand. However, only 7.1% of arabica farmers in Ruvuma and 11% of robusta farmers in Kagera use irrigation in their coffee fields. However, none of the smallholder farmer irrigation systems in our study were motorised, thus there is no fuel consumption. In essence, there is little room for reducing energy demand in the primary processing part of the value chain, and the energy demand is relatively low.

In the case of arabica coffee in Ruvuma, only 12% of farmers sold parchment last year, the result of home processing. Therefore, the majority of arabica coffee was sold as fresh cherries to the CPU and processed there. Of those that process arabica at home, 85.7% use a manual pulper. Thus, home processing should not be considered as an area of high interest for intervention relating to energy demand. Given that the majority of arabica coffee in Ruvuma is processed at CPU's, which often use old pulpers, sometimes dating back to the 1960s, one could consider gradually renewing the pulpers at the CPU's to improve fuel efficiency. Arabica estates use modern processing equipment with good fuel efficiencies. In contrast, most of the fuel they use is consumed by tractors and generators due to power outages.

Mineral fertilisers & Energy demand

Another potential major source of energy demand in the coffee value chain is the production of mineral fertilisers (Chéron-Bessou et al., 2024; VCA4D Tanzania, 2018).

In the case of robusta coffee in Kagera, only 4.5% of farmers use mineral fertilisers. More specifically, none of the farmers in Karagwe in our study used mineral fertilisers, while 9.1% of farmers in Muleba used them (*Figure 5.4*). In contrast, 91% of robusta farmers reported using organic inputs in coffee production. Thus, there is no room to reduce energy demand here as the energy consumption is negligible. In contrast, among arabica farmers in Mbinga, 98.6% reported using mineral fertilisers (*Figure 5.4*) and 72% reported using organic fertilisers (*Figure 5.4*).

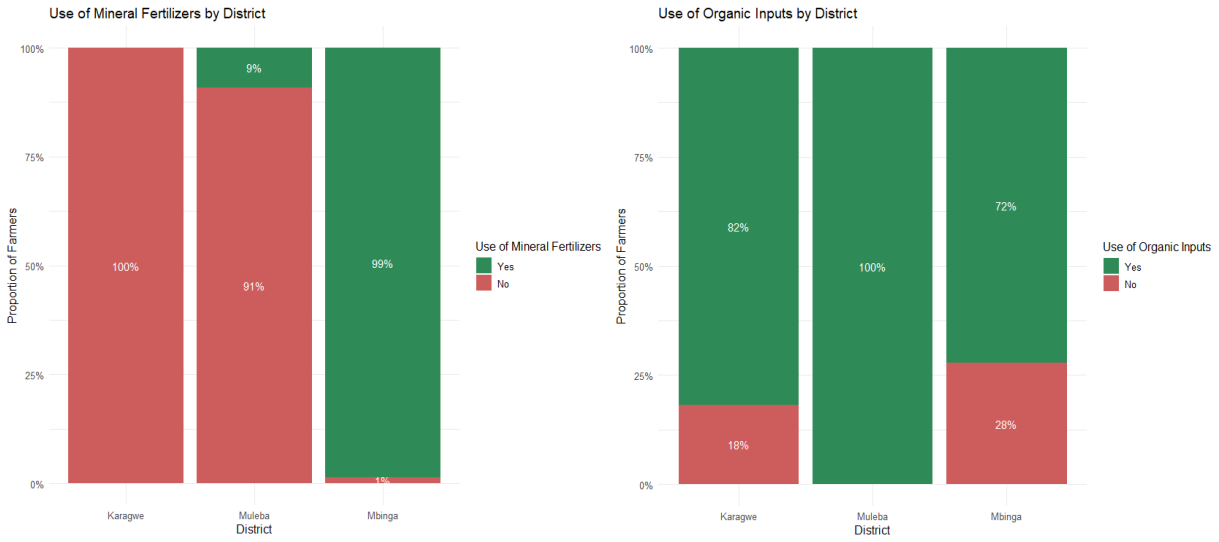


FIGURE 5.4 PROPORTION OF COFFEE FARMERS REPORTED USING MINERAL FERTILISERS (LEFT) AND ORGANIC FERTILISERS (RIGHT) IN COFFEE CULTIVATION, SEGREGATED BY DISTRICT, WITH KARAGWE AND MULEBA PRODUCING ROBUSTA, WHILE MBINGA PRODUCES ARABICA (N = 137)

5.3.4 Fertiliser use efficiency and environmental impact

Combined fertiliser use in coffee farms

Thus, the question becomes: Can the efficiency of mineral fertiliser use in arabica cultivation in Mbinga be improved? The efficiency of mineral fertiliser use can be improved by combining it with organic fertilisers and using the correct type of mineral fertiliser. Using the right amount of fertilisers, applying them at the right time, and using a good application method are also important, but fall outside the scope of this study.

All arabica farmers in Mbinga use some type of fertiliser. Practically none of the arabica farmers use organic only. Most arabica farmers (71%) in Mbinga use both mineral and organic fertilisers (*Figure 5.5*). 28% of coffee farmers in Mbinga use only mineral fertilisers. This segment can be considered a target group for improving fertiliser use efficiency and reducing environmental impact by discussing the possibility of also using organic fertilisers in addition to mineral fertilisers. Fertiliser use efficiency has a wide-ranging impact on various environmental variables, beyond just energy demand.

The opposite could be considered for robusta farmers in Kagera, as 18% of robusta farmers in Karagwe do not use any fertiliser, with the remaining 82% using only organic fertilisers (*Figure 5.5*). Similarly, 91% of robusta farmers in Muleba use only organic fertilisers, and only 9% use both

types. Fertiliser use efficiency and, thus, environmental impact in terms of global warming potential can be improved if more robusta farmers in Kagera use mineral fertilisers in addition to organic fertilisers. However, using mineral fertilizer will increase terrestrial acidification.

Types of fertilisers used in coffee farms

When investigating the types of mineral fertilisers and lime that coffee farmers use, we found that less than 1% of all smallholder coffee farmers in our study apply lime to their coffee fields (*Figure 5.6*). In contrast, arabica estates in Kilimanjaro and Ruvuma reported using 0.5 to 3 tons of lime per hectare to increase the pH of acidic soils and achieve an optimal soil pH for coffee plants. The reason for this is that if soil pH is far from optimal, the applied mineral fertilisers will be limited in their effectiveness. Therefore, it is recommended that if smallholder coffee farmers apply mineral fertilisers, they should also apply agricultural lime. Ideally, the quantity of lime to be applied is based on the analysis of soil and leaf samples, as is done in the estates.

In terms of mineral fertilisers used by smallholder coffee farmers, the main problem in Kagera is that most robusta farmers do not use mineral fertilisers (*Figure 5.4*). Therefore, when examining the types of mineral fertilisers used, we will focus on arabica farmers in Mbinga and Ruvuma. Our study shows that more than 70% of arabica farmers in Mbinga use Nitrogen (N)- focused mineral fertilisers (*Figure 5.6*). Given that the Mbinga arabica-growing region is known for its soils of volcanic origin, such as Nitisols, and that nitrogen (N) is often limiting in these soil types if no mineral fertilisers are applied, it makes sense for arabica smallholder coffee farmers to apply N-based mineral fertilisers, such as CAN and urea. In contrast, the use of composite fertilisers (NPK, DAP, and SoA) and P-containing fertilisers (NPK and DAP) is limited, as only 10-20% of arabica farmers reported using them (Figure 6). Given that volcanic soils are prone to P-fixation, and practically none of the farmers apply lime in combination with P-based fertilisers, phosphorus is likely a yield-limiting nutrient for smallholder arabica farmers in Mbinga. Given that less than 20% of farmers use NPK and no other sources of K-containing fertilisers were reported, it is likely that potassium (K) is a yield-limiting nutrient for smallholder arabica farmers in Mbinga. Similar concerns may be raised for other macro- and micronutrients (Ca, Mg, Mn, Zn, B, S) that are important for coffee yield.

Thus, in conclusion, while the majority of smallholder arabica farmers in Ruvuma use some form of mineral fertiliser, the environmental impact of arabica production in Ruvuma can be reduced by assisting farmers in selecting the appropriate mineral fertiliser to use, in combination with organic fertilisers and lime. This should also enable arabica farmers to do more with the limited financial means at their disposal. While arabica and robusta farmers reported the lack of capital to invest in fertilisers and other agro-chemicals as a major constraint (Figure 2 and 3), the results on the types of fertilisers (not) being used (*Figure 5.4*, *Figure 5.5* and *Figure 5.6*) show that more can be done with less using the concept of integrated soil fertility management (ISFM), given proper technical assistance. Besides the importance of the type of fertilisers being used, coffee farmers might also benefit from support relating to the best method of application, including the timing and frequency of application.

In contrast, we conclude that integrated soil fertility management is being applied in a highly efficient manner on the arabica estates visited in our study in Kilimanjaro and Ruvuma. The arabica estates use a combination of organic and mineral fertiliser and lime. Furthermore, the amount of each nutrient to be applied is calculated based on soil and leaf nutrient analysis, soil pH, and the quantity of coffee cherries harvested.

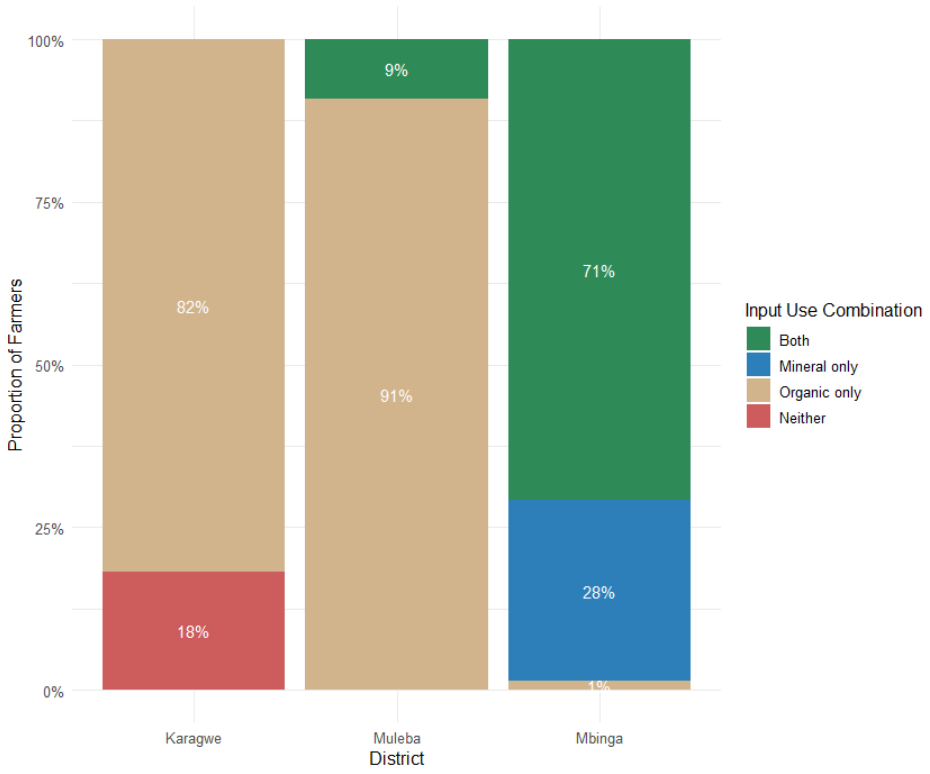


FIGURE 5.5 PROPORTION OF COFFEE FARMERS REPORTED USING BOTH MINERAL AND ORGANIC FERTILISERS, EITHER OR NONE IN COFFEE CULTIVATION, SEGREGATED BY DISTRICT, WITH KARAGWE AND MULEBA PRODUCING ROBUSTA, WHILE MBINGA PRODUCES ARABICA (N = 137)

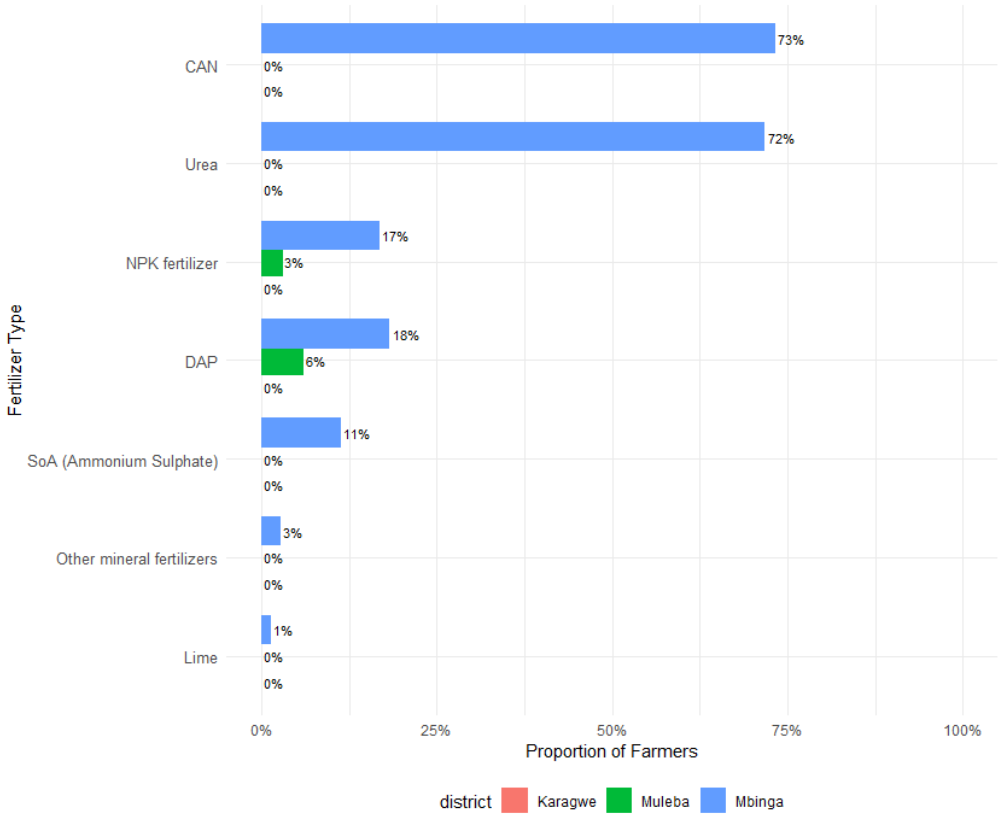


FIGURE 5.6 PROPORTION OF COFFEE FARMERS USING DIFFERENT TYPES OF MINERAL FERTILISERS AND LIME ON THEIR COFFEE FIELDS, SEGREGATED BY DISTRICT, WITH KARAGWE AND MULEBA PRODUCING ROBUSTA, WHILE MBINGA PRODUCES ARABICA (N = 137)

5.3.5 Acidification & Eutrophication

Terrestrial acidification

The primary causes of direct terrestrial acidification in the context of coffee value chains are N-based fertilisers used for coffee cultivation (*Table 5-2*). In the case of Mbinga arabica farmers, the primary sources of terrestrial acidification are urea, CAN, and SoA, which lead to NH_3 volatilisation, which can be measured as SO_2 equivalents in LCA studies. Mineral fertiliser production also leads to indirect terrestrial acidification through manufacturing emissions (e.g. SO_2 and NO_x). In general, pesticides, insecticides, and fungicides are not major direct contributors to terrestrial acidification. Their impact comes indirectly via emissions during production and is relatively much smaller than the impact of nitrogen-based fertilisers.

Given that more than 70% of arabica farmers in Mbinga use CAN and/or urea, and approximately 10-20% use SoA and NPK (*Figure 5.6*), improving their use efficiency will enable them to reduce the terrestrial acidification (kg SO2 eq) per kg of green coffee. How this can be done is explained in the section above. Additionally, adding lime to counter terrestrial acidification is highly recommended for a multitude of reasons, as explained in the section above.

Given that none of the robusta farmers in Kagera use CAN, urea, or SoA, and only 3% use NPK fertilisers, terrestrial acidification as a result of N-based fertiliser use is considered very limited. Similarly, fewer than 10% of robusta farmers in Kagera use some form of agro-chemical (pesticides, insecticides, or fungicides). Thus, indirect terrestrial acidification from agro-chemical manufacturing for robusta production in Kagera is also limited.

Freshwater acidification
The primary causes of freshwater acidification in the context of coffee value chains are coffee pulp effluent waste from wet mills and N-fertiliser runoff. Therefore, the reasoning above on N-fertilizer application and terrestrial acidification can also be applied to freshwater acidification. Additionally, in the case of wet processing of arabica coffee, pulp effluents are a concern if not properly treated. Lack of wastewater management from arabica CPUs is common in Mbinga, Ruvuma. However, it seems unlikely that this can be easily changed, as there are no direct, immediate benefits that cooperatives gain from improving wastewater management, in contrast to improving fertiliser use efficiency. Therefore, if one wants to reduce the environmental impact of coffee pulp effluents from arabica processing, this would likely require outside intervention.

While estates reported treating wastewater from wet mills, and some infrastructure was observed, the extent to which this is done is difficult to confirm.

As robusta coffee in Kagera is processed using the natural method, which does not involve water use for fermenting or washing coffee, the potential concern regarding coffee pulp effluents in wastewater is currently not applicable to this region.

Eutrophication
A review of LCA studies on coffee value chains found that at both the farm and drink levels, fertilisers were identified as the primary contributors to acidification and eutrophication (Chéron-Bessou et al., 2024). N- and P-based fertilisers are often considered the main contributors to eutrophication. Besides fertilisers, coffee pulp effluent from wet mills, if untreated, is also a significant cause of eutrophication.

However, the above should be considered within a broader context. It is essential to note that, in Sub-Saharan Africa (SSA), wastewater from sewage and industries in urban areas, often discharged untreated into the environment, is the primary source of nutrients causing eutrophication of surface water bodies (Nyenje et al., 2010). Flying over Lake Victoria, this becomes clear in an instant. This is fundamentally different from eutrophication in the so-called North (Nyenje et al., 2010), which is mainly caused by agriculture due to the excessive use of fertilisers in combination with soils that do not fix P, in contrast to most soils in SSA, for example, the nitisols of volcanic origin in the Mbinga arabica region.

5.3.6 Human Health, Ecotoxicity and Working Conditions

A review of LCA studies on coffee value chains revealed that at both the farm and drink levels, pesticides were identified as the primary contributors to ecotoxicity (Chéron-Bessou et al., 2024). In the case of robusta production in Kagera, 92% of coffee farmers do not use any pesticides, insecticides or fungicides. None of the farmers reported using any of these agro-chemicals on their other crops. Therefore, this is not a concern in the Kagera region, where robusta is mainly produced.

In contrast, all arabica farmers in Ruvuma reported using some form of pesticide, insecticide, or fungicide on their coffee plants. Only 3% of those arabica farmers reported using such agro-chemicals on their other crops. Thus, arabica production in Ruvuma should be considered a potential risk to human health and ecotoxicity. Approximately 40% of arabica farmers in Ruvuma use pesticides, 50.7% use fungicides, and 85.3% use insecticides. A small-scale study conducted by TPHPA and HRNS in Ruvuma, Mbeya and Songwe found that more than 40% of coffee farmers were overexposed to toxic agro-chemicals. Given the small sample size though the worrying rate

of overexposure, it is recommended to conduct additional studies in this regard. Besides bio-monitoring, efforts should be made to reduce the use of the most toxic substances while improving their safe use. For example, Highly Hazardous Pesticides (HHPs) can be replaced by safer alternatives that are available in Tanzania, according to TPHPA. Additionally, more emphasis should be put on Integrated Pest Management, where the use of pesticides has a place, but is combined with other practices. For example, in the case of the Coffee Berry Borer (CBB), ethanol traps could be used. Clean planting material and improved varieties also play an important role.

Regarding the use of agro-chemicals on arabica estates in Kilimanjaro and Ruvuma, we found that IPM was a core management strategy. Spot applications were applied where possible, and monitoring plays a crucial role in managing pests and diseases. Nonetheless, large amounts of agro-chemicals are being used on the estates. Based on our limited observations, safe working conditions are applied, and protective equipment is provided. Notwithstanding, given the large amounts of agro-chemicals used, it would be prudent to conduct bio-monitoring to detect potential overexposure to toxic chemicals.

5.3.7 Water use – Irrigation & Wet processing

A review of coffee LCA studies found that irrigation water is by far the most significant driver at both cradle-to-primary processing gate and cradle-to-grave levels (Chéron-Bessou et al., 2024). The second most important driver of water use is the processing method, particularly when wet processing is employed, which is dependent on processing efficiency (Chéron-Bessou et al., 2024). The study also found that water impact indicators were hardly comparable due to the system variability and method inconsistencies. Therefore, in this study, we will not quantify water indicators, but instead discuss their qualitative impact and potential areas for improvement.

Irrigation
In terms of irrigation, significant differences exist between estates and smallholder farmers. Most arabica estates irrigate their coffee as it is a very important yield driver in Tanzanian coffee production. Important differences were observed between arabica estates regarding the irrigation method, the amount of water applied, and the source of water used. Most importantly, some arabica estates calculate the water needs of their coffee using reference evapotranspiration (ET), field capacity (FC), rainfall measurements, and climate data. This enables one to determine precisely how much to irrigate. Thus, if all estates used these tools, water usage could be reduced without negatively affecting yield. In terms of the irrigation method, some use sprinklers, some use drip irrigation, while others use a combination of both. According to the arabica estates, the sprinkler method consumes roughly 10 times more water per hectare than drip irrigation. Some also reported that sprinklers result in a higher percentage of flowering (100%) than drip irrigation (70%), as well as the elevated material cost of drip irrigation, which makes some estates hesitant to switch from sprinklers to drip irrigation. Nonetheless, given the massive discrepancy in water consumption, in combination with the concerns raised by the estates themselves that weather and water availability, in relation to climate change, are the main challenges they face, it is important to nudge the shift towards drip irrigation.

In contrast to the arabica estates, only 11% of robusta farmers in Kagera use irrigation, while 7.1% of arabica farmers in Ruvuma use irrigation. In Kagera, if robusta farms are irrigated, 71% use groundwater. In Ruvuma, of those irrigating their arabica coffee, 60% use water from a river or stream and 20% use tap water. None of the smallholder arabica farmers reported using rainwater.

Water used for coffee processing

The second most important driver of water use is the processing method; if wet processing is used, and it is dependent on the processing efficiency (Chéron-Bessou et al., 2024). Given that none of the robusta in Kagera is processed using the wet processing method, water use during processing is practically non-existent. In contrast, all arabica coffee in Ruvuma is processed using the wet processing method, which can consume large amounts of water. Furthermore, roughly 80% of the arabica produced by smallholders in Ruvuma is sold as fresh cherries, implying that it is processed at the CPUs. A large proportion of CPUs have very old processing equipment. Improving the water use efficiency of CPUs would make a significant difference, as also identified by the 2018 VCA4D study. While many CPUs use outdated, inefficient pulpers, most estates utilise eco-friendly pulpers that use a limited amount of water. Therefore, the CPUs in arabica-producing regions should be the second most important target for intervention relating to water use.In conclusion, the most important areas for intervention in water use within the coffee value chain are the arabica estates and their irrigation methods, followed by CPUs in arabica-producing regions.

5.3.8 Land Use Change, Deforestation and Biodiversity

Land Use Change History

To assess the environmental impact of land use change related to coffee production, it is necessary to examine the prior land use before the coffee farm was established (*Figure 5.7*). Significant regional differences, and thus differences between arabica and robusta farms, can be observed. In Kagera, more than half of all land uses prior to robusta coffee were reported as grassland, while in Ruvuma where arabica is grown this represented only 6%. The second and third most common land uses prior to coffee in Kagera were reported as old coffee plantations (18%) and fallows (9.4%). In Kagera, 4.7% of respondents reported tree plantation as the prior land use, which may pose a problem in the context of EUDR, depending on when the transition occurred, as tree plantations are considered a 'forest' under EUDR. Note that all these cases were observed in Muleba, not Karagwe. Besides regional differences, significant differences also exist at the district level (*Figure 5.7*).

While the most common prior land use in Kagera was grasslands, in Mbinga, 44% of farmers reported natural forest as the land use prior to coffee cultivation. In Kagera, only 1% of prior land use was reported as natural forest. The second most common prior land use in Mbinga was annual crops (34%), while this was not reported for Kagera (0%). Additionally, 18% of the prior land use was an old coffee plantation, as seen in Kagera (*Figure 5.7*).

EUDR – Coffee as a driver of Deforestation?

To assess whether any problems might arise from the EUDR, we can examine the coffee fields that were newly created after 31 December 2020. Note that our dataset does not include coffee fields established in 2024 and 2025, as the study was conducted in those years. Of all the coffee plots in the study, 8.37% were established after 2020. More specifically, in Kagera, only 3.63% of robusta plots were reported to have been established after 2020, while in Mbinga, this figure was 14.8% for arabica plots. This indicates that the recent expansion of arabica farms in Mbinga, Ruvuma, is much greater than for robusta farms in Karagwe and Muleba, Ruvuma, with recent expansion of arabica farms in Mbinga being significant as expected.

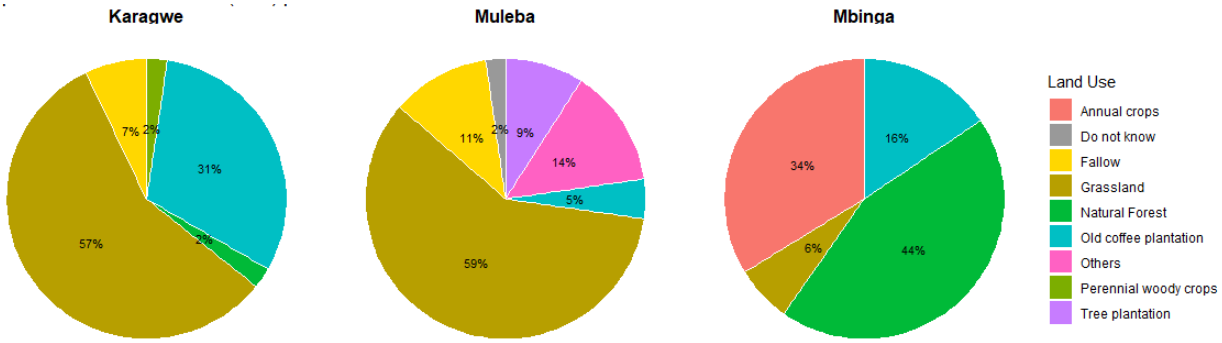


FIGURE 5.7 REPORTED LAND USE PRIOR TO CONVERSION TO COFFEE FARMS BY DISTRICT, WITHOUT RESTRICTING DATE OF CONVERSION,KARAGWE AND MULEBA PRODUCE ROBUSTA, WHILE MBINGA PRODUCES ARABICA (N = 137)

When assessing the prior land use of the robusta plots in Kagera, only 0.91% of plots were established after 2020 and had a prior land use considered as 'forest' according to the EUDR methodology. More specifically, the prior land use of that one plot was a tree plantation, not a natural forest. The other plots converted to robusta coffee after 2020 in Kagera, which used to be grassland. Thus, robusta coffee-driven deforestation after 2020 in Karagwe and Muleba is insignificant. Nonetheless, many of the largest buyers of robusta from Kagera reported that they had stopped buying robusta from Kagera altogether. Thus, it appears likely that EUDR will have negative unintended and unwarranted consequences for robusta coffee farmers in Kagera.

Of the arabica plots established after 2020 in Mbinga, most (58%) were previously used for annual crops, 16.7% were grassland, 16.7% were old coffee plantations, 8% were natural forest, and none were tree plantations (Figure S3). Therefore, only 1.23% of all arabica plots in our study sample in Mbinga had a prior land use considered as 'forest' according to the EUDR methodology and were converted to coffee after 2020. Thus, we can conclude that while significant expansion of arabica plots has taken place after 2020 in Mbinga, relatively few of those are linked to deforestation.

When examining the total sample (arabica in Ruvuma and robusta in Kagera), on average, only 1.05% of coffee plots should be considered deforested after 2020 and converted to coffee, according to the EUDR. Half of which was natural forest, and half was a tree plantation. However, given the inherent flaws within the EUDR methodology, this proportion is likely to be much larger. Given that only 1.05% of arabica and robusta coffee plots are of concern regarding deforestation issues, it seems disproportionate to implement a policy that will likely negatively affect the majority, if not all, of Tanzanian coffee farmers. Nonetheless, significant deforestation of natural forests has taken place in Mbinga, Ruvuma, to enable arabica production, although it occurred prior to 2021 (Figure S7). More specifically, most of the deforestation in Mbinga, from natural forest to arabica coffee, appears to have taken place from the 1950s until the 1990s (Figure S4 – S8). Additionally, it is worth noting that in 2022, Mbinga observed the largest number of newly created arabica fields throughout the studied time period (1950–2022) (Figure S6), most of which were previously used for annual crops.

In order to deal with some of the potential issues that are likely to arise as a result of the EUDR, the EU has financed a Framework Contract supporting the geo-localization of the coffee farms. To date 24 000 coffee farms have been delocalized, with the aim of covering 200 000 coffee farms by end November. In addition, the European Forestry Institute is providing support to the Tanzanian government regarding legal aspects relating to the EUDR.

Climate change, Global Warming Potential and Land Use Change

Global Warming Potential (GWP) is the most commonly reported impact category of coffee LCA studies (Chéron-Bessou et al., 2024). The reason for this is two-fold: (i) climate change is one of the most important environmental challenges of our time, and (ii) the coffee value chain (CVC) is known to have a significant impact on GWP. Furthermore, the major driver of GWP along the CVC is coffee cultivation (Chéron-Bessou et al., 2024). Moreover, the main drivers of the GWP of green coffee bean production are land use change (LUC), fertilisers, and wet processing (Chéron-Bessou et al., 2024).

LUC is most often the primary driver of GWP resulting from the coffee value chain when included in LCA calculations, although it is often not included in coffee LCA studies due to the high amount of effort required to quantify it accurately (Chéron-Bessou et al., 2024). Quantification of GWP resulting from LUC associated with coffee cultivation is outside the scope of VCA4D projects due to time constraints. Therefore, as the most important driver of GWP in the coffee value chain cannot be quantified, the GWP of fertilisers and wet processing in the coffee value chain will also not be quantified in kg CO_2 per kg green coffee. Fertilisers and wet processing have been discussed in depth in the sections above; therefore, this section will focus on the qualitative impact of land use change.

While more data is required to make strong statements, we can reason that, in general, annual crops, (non-woody) fallows and grasslands have relatively low carbon stocks. Therefore, we might expect a neutral to positive GWP impact by conversion to a coffee farm, if the newly established coffee farm is an agroforestry system with a high density of tree species. Conversion of these low-carbon stock land uses to coffee monocultures may have a neutral GWP effect. Potentially high carbon stock land uses include natural forests (depending on the type of forest), tree plantations, and perennial woody crop plantations. Conversion of these high-carbon stock land uses to coffee monoculture likely has a negative GWP impact, while conversion to coffee agroforestry systems might be negative to neutral. Thus, we can say that the GWP of the coffee value chain is highly dependent on whether the prior land use had a low, medium or high carbon stock, whether the resulting coffee system is a monoculture or an agroforestry system, and the coffee yield per hectare.

Therefore, in general, the best way to improve the GWP effect on the coffee value chain is to avoid the conversion of high carbon stock land uses (natural forests and perennial woody crop plantations), promote coffee agroforestry, increase coffee yield per hectare, and increase fertiliser use efficiency. In Mbinga, it is crucial to avoid converting natural forests into arabica farms. Although not of major concern currently (see section on EUDR), ideally, this should be monitored, as the expansion of arabica coffee farms has nonetheless been rapid in recent years in Mbinga. Another important way to improve the GWP impact of arabica production in Mbinga is by increasing yield per hectare, among other measures, by improving fertiliser use efficiency through the use of the right types of mineral fertilisers and by applying lime. In Karagwe and Muleba, the most effective way to enhance the GWP impact of robusta cultivation is by increasing yield per hectare, which involves incorporating lime and mineral fertilisers in addition to the existing organic fertilisers. In both regions, and thus both arabica and robusta species, limiting the negative yield effect of adverse climatic conditions will also significantly improve the GWP effect of the coffee value chain.

When comparing arabica estates and smallholder arabica farmers, the estates likely have a lower GWP impact than smallholder farmers, as their land use efficiency is significantly higher. This can be explained by the observation that arabica estates are about 2–6 times more productive (kg green coffee/ha) than smallholder arabica farmers in Ruvuma. In contrast, the difference in carbon

stocks between arabica estates and smallholder farmer fields will likely not vary orders of magnitude, as both are, on average, "simple coffee agroforestry systems" with limited tree densities.

Biodiversity

To provide some insight into the biodiversity-related effects of coffee cultivation, part of the solution lies in assessing the coffee system itself. Here, we will limit ourselves to woody species. Our study found that only 9.9% of arabica farms in Ruvuma have no trees at all, which we consider to be coffee monocultures (*Figure 5.8*). In Kagera, the proportion of (robusta) coffee monocultures is significantly higher, at 36% of coffee farms. Moreover, apparent differences can be observed between the two robusta producing districts in Kagera, with 26.4% monocultures in Karagwe and 45.6% monocultures in Muleba. Hence, significant differences can be observed when comparing arabica and robusta, as well as when comparing robusta districts.

The proportion of (robusta) coffee monocultures is almost double as high in Muleba (46.5%) as in Karagwe (26.4%), and the proportion in Karagwe is more than double as high as in Mbinga (9.9%) (*Figure 5.8*). The proportion of low diversity coffee systems in Mbinga (87.7%) is significantly higher than in Muleba (45.6%) and Karagwe (58.5%). The largest proportion of high-diversity coffee systems was observed in Karagwe (15.1%), with the proportion of high-diversity coffee systems on average being greater in Kagera (12%) than in Ruvuma (2.5%).

Almost all arabica systems in Ruvuma are agroforestry systems; however, practically all exhibit very low to low woody diversity (*Figure 5.8*), as most contain only one or two woody species in addition to arabica itself. *Grevillea robusta* is extremely dominant in arabica smallholder coffee agroforestry systems in Mbinga, similar to some arabica estates. This overreliance on *Grevillea* seems excessive and risky for smallholder farmers. Therefore, we recommend increasing the diversity of tree species in the low-diversity arabica systems in Mbinga, which account for approximately 90% of all arabica farms. In contrast, in Kagera, the evenness of tree species in robusta coffee agroforestry systems appears to be less extreme, although diversity remains low in most cases, with fewer than five tree species present in the low-diversity robusta coffee systems.

When assessing woody diversity of coffee systems at a landscape level, rather than a farm level, it appears that woody species diversity and evenness are better in robusta systems in Kagera than arabica systems in Ruvuma. Of the 26 tree species observed in coffee farms across the study, 92% were found in Karagwe (robusta), 69% in Muleba (robusta), and only 38% in Mbinga (arabica).

In terms of tree diversity, most arabica estates score low, as some have 100% *Grevillea robusta*, while others have only 2–3 leguminous tree species in their coffee plantations. While many arabica estates mentioned that they want to increase the shade level up to 25–35%, currently, most estates have much lower shade levels, with tree densities ranging roughly from 5 to 75 trees per hectare. Note that arabica estates which use a higher range of 75 trees per hectare tend to use *Grevillea* only. Consequently, even at the 75 trees per hectare range, tree basal shade per hectare and shade levels remain low. It remains to be seen whether arabica estates will actually increase shade levels on their farms.

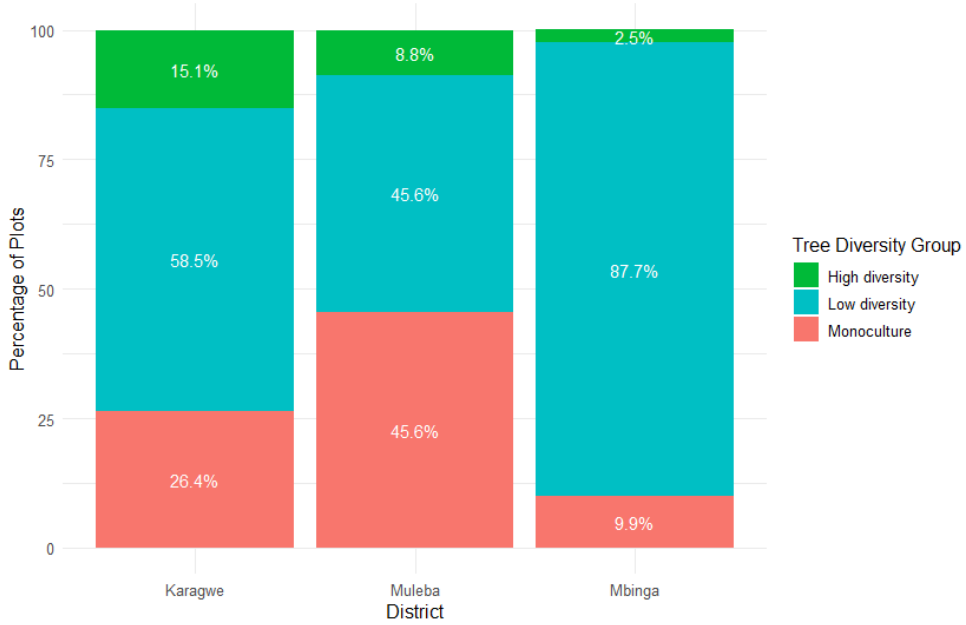


FIGURE 5.8 PROPORTION OF COFFEE SYSTEMS PER DISTRICT, ACCORDING TO WOODY DIVERSITY, KARAGWE AND MULEBA PRODUCE ROBUSTA, WHILE MBINGA PRODUCES ARABICA (N = 137)

5.4 Conclusion of the Environmental Analysis

The environmental impact of arabica and robusta production in Tanzania reveals a complex interplay between productivity, agro-input and land use efficiency. Across the board, **the cultivation stage emerges as the dominant driver** of environmental impact along the coffee value chain. The cultivation stage is the primary driver of the 3 end-point impact categories: **human health, fossil fuel resource depletion, and ecosystem quality**. Human health impact and fossil fuel resource depletion are mainly determined by **productivity** (kg green beans/ha) and the **efficient use of agro-inputs**. More concretely, the human health impact is mainly driven by the efficient use of mineral fertilisers, while the efficient use of pesticides largely determines the human health impact.

In terms of mid-point impact categories, high mineral fertiliser use and the lack of use of agricultural lime are the main drivers of terrestrial acidification and eutrophication. The lack of management of wastewater from arabica wet processing units and N-fertiliser runoff are the leading causes of freshwater acidification. Global Warming Potential (GWP) is mainly driven by **land use change**, mineral fertiliser use and the lack of processing of coffee pulp effluent at arabica CPU's. **Water** impact indicators are determined, like all environmental impact categories, by coffee productivity, as well as the efficiency of irrigation and arabica wet processing units.

The analysis underscores that arabica and robusta yield is the most influential determinant of environmental impact. However, how yield is achieved matters profoundly. In high-input systems, productivity gains may come at the cost of increased human health impacts and fossil fuel resource depletion if the inputs are not used efficiently. In contrast, low-input coffee systems suffer from very low yields per hectare. The low **land-use efficiency comes** at the cost of a significant negative impact on ecosystem quality. Smallholder robusta coffee farmers in Kagera are considered low-input systems with very low yields. Smallholder arabica coffee farmers in Mbinga are considered to have medium-input systems with low yields. Arabica estates are high-input systems with a high yield.

In terms of land use change, it would be incorrect to make generalisations regarding environmental impact. Although post-2020 **robusta coffee-driven deforestation** in Karagwe and Muleba is **minimal** (<1% of coffee fields), major buyers have stopped sourcing robusta from Kagera. Our results indicate that a significant expansion of arabica farms has occurred over the past few years in Mbinga. Nonetheless, in Mbinga, only 1.23% of arabica plots established after 2020 were converted from land classified as 'forest' under EUDR criteria. This indicates that despite notable coffee expansion, very few recently established plots are associated with deforestation. As a result, the **EUDR may unintentionally and unjustifiably harm smallholder arabica farmers** in Ruvuma and smallholder robusta farmers Ruvuma, and possibly elsewhere in Tanzania.

Tree diversity in coffee systems shows clear regional variation. In Mbinga (Ruvuma), almost all arabica farms include trees; however, the diversity is very low and dominated by ***Grevillea robusta***, raising concerns about resilience. In contrast, robusta systems in Kagera—particularly those in Karagwe—show greater species richness and a higher share of high-diversity farms, although many robusta farms have fewer than five tree species. Muleba stands out as the district with the highest proportion of coffee **monocultures**. Overall, while most coffee farms in both regions use agroforestry systems, the diversity and evenness of tree species remain limited, especially in arabica farms in Mbinga. Thus, there is clearly room to improve the biodiversity value of coffee systems in both regions.

5.5 Recommendations on Environmental Impact

Given the inherently diverse and far-reaching environmental impacts along the agricultural value chains, especially coffee, it is essential to prioritise the most pressing issues and identify practical, achievable areas for improvement.

5.5.1 Recommendations regarding Coffee Estates

Arabica estates should prioritise improving water use efficiency, particularly through technologies such as drip irrigation. This is especially important in areas where climate change is expected to increase weather-related stress, which is the case for the majority of coffee-producing regions in Tanzania, and where current irrigation practices utilise sprinkler systems. Enhancing water management would directly support yield stability and long-term sustainability.

In parallel, arabica estates should also work toward increasing tree diversity, tree densities and shade cover within their coffee systems. Currently, many rely heavily—sometimes exclusively—on a single species, such as *Grevillea robusta*. Introducing a more diverse mix of tree species would improve ecosystem quality, while arabica yields are not likely to decrease significantly if shade levels are increased to only 25-30%.

Given the large amount of pesticides and fungicides used in arabica estates, it would be prudent to monitor the exposure of the estate workers, especially those applying the agro-chemicals, in order to minimise adverse human health impacts.

5.5.2 Recommendations regarding Smallholder Coffee Farmers

The most impactful way for arabica and robusta smallholders to reduce the environmental impact of coffee production is **to increase coffee yields efficiently**. This requires a better understanding of yield-limiting factors, which can differ by coffee species, district and agro-ecological context. In

our study, the most frequently reported farmer constraints were weather-related yield losses, a lack of capital for agro-inputs, and pest and disease problems.

While many arabica and robusta farmers report that a lack of capital is the major constraint relating to agro-inputs, we observed that many smallholders lack an understanding of Integrated Soil Fertility Management (ISFM) and IPM principles, leading to the **inefficient use of fertilisers and agro-chemicals**. In Mbinga, most arabica farmers buy mineral fertilisers. The focus should be on learning to **produce more with the same inputs**. This means using **a combination of agricultural lime, mineral and organic fertilisers**. It also includes selecting the correct type of fertiliser, applying it at the right time, and using the most appropriate application methods.

A universal gap observed across both regions, and thus both arabica and robusta, is the complete absence of **agricultural lime** use. This is critical for optimising nutrient uptake and ensuring fertiliser efficiency. Yield and environmental impact improvement can be achieved through a balanced approach that integrates lime, organic inputs, and mineral fertilisers.

In Kagera, almost none of the robusta farmers use mineral fertilisers, as many produce **organic coffee**. Though given the **very low yields**, there is a need to reassess whether these systems are truly delivering economic benefits to farmers. Alarmingly, several robusta farmers reported being told that switching to organic farming would increase yields, in addition to the higher price, without a clear basis in agronomic evidence, which raises concerns regarding **disinformation**.

To address **weather-related limitations**, more research is needed into viable mitigation strategies, including the potential of small-scale irrigation. Regarding **pests and diseases**, the dissemination and implementation of Integrated Pest Management (IPM) strategies should be prioritised. However, there is currently a significant knowledge gap regarding which pests and diseases are most problematic in specific locations—an issue that requires targeted research.

Additionally, the **potential health risks** associated with pesticide use by smallholder farmers in the southern highlands warrant further investigation. Highly Hazardous Pesticides (HHPs) can be replaced by safer alternatives that are available in Tanzania.

5.5.3 Cross-cutting and Policy-level Recommendations

Wastewater treatment from wet processing units remains important, and there is significant room for improvement; however, efforts may be more effective if initially focused on the issues mentioned above.

While recent arabica and robusta coffee-driven deforestation appears minimal in both regions, the new EU Deforestation Regulation (**EUDR**) is already having unintended and disproportionate effects on smallholder robusta farmers in Kagera. This is highly concerning. Given the complexity of EUDR compliance in practice, further technical support and institutional readiness are essential to minimise harm and ensure farmers remain engaged in export markets. Additionally, continue to monitor land use change dynamics in regions like Mbinga, where recent arabica expansion is rapid, to ensure that the arabica coffee value chain remains deforestation-free.

6. SYNTHESIS & RECOMMENDATIONS

6.1 Summary of Main Findings

The comprehensive analysis of the Tanzanian coffee value chain reveals a complex interplay of economic, social, and environmental factors, with significant differences between the Arabica and Robusta sub-chains and across various actor types.

6.1.1 Economic Analysis: Contribution to Growth and Inclusiveness

The Tanzanian coffee sector, comprising both Robusta and Arabica value chains, contributes approximately 0.5% to the national GDP and 8.3% to the agricultural GDP, underscoring its importance as a niche yet significant economic driver. Both chains are profitable at every stage, and collectively generate a substantial positive balance of trade of 901,745 MTZS, making coffee a crucial foreign exchange earner.

However, a deeper examination reveals distinct economic profiles and challenges. The Robusta chain demonstrates robust macroeconomic efficiency with a high rate of domestic integration (95%), utilising local resources and minimizing reliance on imported inputs. However, this approach, which does not include the adequate use of mineral fertilisers, results in very low yields per hectare. Generating 22,866 MTZS in taxes beyond subsidies, Tanzanian Robusta is a net contributor to public finances. Though it exhibits a low Domestic Resource Cost (DRC) of 0.04, its low-yield production model means it cannot compete on the same scale as the highly productive systems found in Brazil and Vietnam. Profitability in the Robusta chain is broadly distributed across producer categories, with large, medium, and small producers collectively capturing over 60% of the total Net Operating Profit (NOP). However, this broad distribution at the category level masks extreme individual-level income inequality, with a Gini coefficient of 0.8253. This disparity arises because a vast number of smallholders earn very little, while a few large entities (e.g., exporters, soluble manufacturers) capture substantial profits, leading to 96% of actors earning only 40% of the total income. Wage employment in Robusta is dominated by large and medium producers, who hire seasonal and permanent farmworkers.

In contrast, the Arabica chain, despite producing a higher-value product, exhibits significant dependencies and fiscal challenges. The Arabica chain, with a lower domestic integration rate (67%), relies heavily on subsidies, particularly for imported fertilisers. This results in a negative indirect value added and a net drain of 51,021 MTZS on public funds. However, since mineral fertilisers are an indispensable component of coffee production, these economic downsides must be viewed in the context of their necessity, and the focus should be on optimising their use rather than their elimination. While its international competitiveness (DRC of 0.06) is still strong, the Arabica value chain as a whole is less efficient from a macroeconomic standpoint than Robusta, relying on policy support to maintain its private profitability. This is in contrast to its strong agronomic productivity and efficient input use, where Arabica is more efficient than Robusta in Tanzania. Profits in the Arabica chain are highly concentrated among medium-scale producers, who capture an estimated 55% of the total NOP. The Arabica chain exhibits a lower Gini coefficient (0.4566) compared to Robusta, suggesting relatively more equitable income distribution, largely because income is concentrated among a numerically larger group of medium-sized actors rather than a very small elite. Wage employment in Arabica is largely concentrated on estate plantations, which, despite their limited number and localised nature, account for about 53% of total formal wages. This concentration highlights the significant role estates play in formal employment, but their impact on the local economy must be compared to that of a more widely dispersed smallholder farmer population, who also provide seasonal employment opportunities.

A pervasive challenge across both chains is the low return to family labor for smallholders, particularly Arabica small farmers, which raises concerns about their long-term engagement and

livelihood sustainability. While coffee can offer a better income than many alternatives, as evidenced by the boom in the Southern Highlands, its attractiveness as a livelihood option is relative and can diminish when other, more profitable options arise. This is especially relevant for younger generations, who are turning away from agriculture in general, not just coffee, potentially threatening the sector's future production base.

6.1.2 Social Analysis: Social Sustainability

The social sustainability of Tanzania's coffee value chain is characterised by a heavy reliance on informal and unpaid household labour, particularly from women, who contribute up to 80% of labour but often lack access to, and control over, income, land, or decision-making. This creates significant gender inequalities, with women owning smaller farms, possessing fewer assets, and earning substantially less coffee income than men. Youth also face barriers to land access and income control.

Land tenure issues are prominent, with most smallholders operating under customary rights that lack full legal parity, and the formalisation process (CCROs) is slow and often biased against women. Water rights are increasingly formalised, but this can disadvantage small-scale users. The capacity and trustworthiness of AMCOS are critical concerns, as many suffer from weak governance, poor management, and limited infrastructure, leading to delayed payments, lack of pre-season credit, and limited support. These issues erode farmer trust and drive informal "side-selling"., Along with power imbalances between the actors higher up the value chain, and producers, there are also systemic and persistent information asymmetries.

Coffee income has the potential to improve household food security, healthcare access, and educational attainment, but its seasonal nature creates significant cash flow challenges. Delayed payments force farmers into coping mechanisms like selling immature coffee or informal sales to meet urgent needs. Despite these challenges, farmers widely practice mixed cropping and livestock keeping to diversify livelihoods and ensure year-round food availability. Women's demanding workload can negatively impact childhood nutrition, as they struggle to supervise children. Women often form informal support groups and VSLAs to poo savings and gain collective bargaining power, mitigating their exclusion from formal structures. Overall, while progress in gender equity is observed at the national level, persistent structural barriers at the local level, particularly in the Robusta sub-chain, prevent the coffee sector from achieving its full social potential.

6.1.3 Environmental Analysis: Environmental Sustainability

The environmental analysis highlights that the cultivation stage is the primary determinant of environmental impact across the entire coffee value chain in Tanzania. This stage significantly influences human health, fossil fuel resource depletion, and ecosystem quality, with coffee yield and the efficient use of agro-inputs being the most influential factors. High mineral fertiliser use and the absence of agricultural lime contribute to terrestrial acidification and eutrophication, while inadequate wastewater management from Arabica wet processing units and N-fertiliser runoff cause freshwater acidification. Global Warming Potential (GWP) is primarily driven by land use change, mineral fertiliser use, and the lack of processing of coffee pulp effluent at Arabica CPUs.

Coffee yields vary significantly, with Arabica in Ruvuma (high-input) yielding much higher than Robusta in Kagera (low-input). Arabica estates are 2–6 times more productive than smallholders, demonstrating superior land use efficiency. Farmers identify adverse weather, lack of capital for agro-inputs, and pests/diseases as key yield-limiting factors, concerns largely shared by estates and researchers.

Regarding energy demand, primary processing and mineral fertiliser production are main contributors. In Kagera, sun-drying of Robusta and minimal mineral fertiliser use result in low energy consumption. In Ruvuma, Arabica CPUs with old pulpers offer room for efficiency improvements, and estates' energy use is dominated by tractors and generators.

Fertiliser use efficiency is a key area for improvement. In Mbinga, while most Arabica farmers use mineral fertilisers, 28% use only mineral inputs, indicating a need for integrated soil fertility management (ISFM) with organic fertilisers and agricultural lime to optimise nutrient uptake and reduce environmental impact. In Kagera, the near absence of mineral fertiliser use for Robusta, coupled with very low yields, suggests a reassessment is needed to ensure economic benefits.
Pesticide use poses potential human health and ecotoxicity risks, particularly for Arabica farmers in Ruvuma, where all farmers use some form of agro-chemical. A worrying rate of overexposure to toxic agro-chemicals has been observed, necessitating further investigation and promotion of Integrated Pest Management (IPM) and safer alternatives.

Water use is significant in Arabica wet processing and irrigation. Estates, which irrigate extensively, could significantly reduce water consumption by shifting from sprinkler to drip irrigation. Improving water use efficiency at Arabica CPUs is also crucial.

Finally, land use change and deforestation dynamics are critical for GWP and biodiversity. While post-2020 coffee-driven deforestation in Karagwe and Muleba is minimal (<1%), and only 1.23% of recently established Mbinga coffee plots were converted from 'forest' under EUDR criteria, the EU Deforestation Regulation (EUDR) is already having unintended and disproportionate negative effects on smallholder coffee farmers in Kagera. This suggests the EUDR may unjustifiably harm Tanzanian farmers.

Biodiversity in coffee systems varies; Mbinga's Arabica farms primarily use agroforestry but with very low tree diversity dominated by *Grevillea robusta*, raising resilience concerns. Kagera's Robusta systems, particularly in Karagwe, show greater species richness, though overall diversity remains limited. This indicates significant room to improve the biodiversity value of coffee systems in both regions.

6.2 Comparative Dashboard for sub-chains and regions

Table 6-1 consolidates the main characteristics, production potential, profitability, organisational strength, bargaining power, resources, structural issues, choke points, and investment opportunities of Tanzania’s two coffee sub-chains, Arabica and Robusta.

TABLE 6-1 COMPARATIVE DASHBOARD FOR ARABICA AND ROBUSTA COFFEE VALUE CHAINS

Category	Arabica	Robusta
Current trends and characteristics	50–60% of national output; concentrated in Southern Highlands (Ruvuma, Songwe, Mbeya); 90% smallholders, 10% estates; mix of auction (20%) and direct sales (80%). Declining contribution from north (Kilimanjaro/Arusha).	Close to 50% of national output, concentrated in Kagera; 100% smallholder-based; demand rising; undifferentiated market (commodity grade); strong AMCOS focus on volume; cross-border trade with Uganda.
Production potential	Major challenge: yield effects due to weather shocks; need better quality control, pruning, rejuvenation, IPM and ISFM; improve seedling selection and use of lime/mineral fertilisers.	Similar weather-related shocks constrain yields; need for improved quality control, pruning, rejuvenation, ISFM and IPM; expand use of lime and mineral fertilisers.
Potential profitability	Opportunities for premiums via direct exports and traceability; stronger AMCOS capture value, weaker ones excluded; smallholders face cycles of debt and price volatility; potential through efficiency gains.	Potential for better margins via product differentiation and direct buyer linkages, but requires stronger AMCOS; local value addition potential (soluble/processing plants) limited by investment constraints.
Strength of farmer organisations	Dominated by AMCOS, with strong legacy unions in Kilimanjaro (KNCU); mixed capacity across regions, strong AMCOS negotiate well, weaker ones struggle.	Strong unions (KCU, KDCU) dominate marketing; AMCOS highly influential but often prioritise bulk selling over member services.
Actor bargaining power	Smallholders largely price-takers; auction linked to New York "C" price; direct sales provide a premium; policy volatility since 2018 still undermines confidence, Buyers will want greater traceability for their coffee.	Smallholders are price-takers; unions hold most power; exporters and processors dominate value capture; online auction exists but farmers feel underpaid.
Level of resources / knowledge	Public R&D by TaCRI and donor programmes exist but fragmented; uneven access to nurseries/seedlings; women and youth face barriers to resources; mixed AMCOS governance capacity.	Extension services limited; soil fertility declining in parts of Kagera; input use inefficient; limited local research and training.
Structural issues	Aging trees, financial gaps, and transport challenges (e.g. Ruvuma distant from port); inconsistent traceability.	Soil fertility decline; long distance to export points; organic production has challenges; dependence on commodity-grade exports.
Main chokepoints	Price volatility; thin margins for smallholders; seedling survival; farmers' financial insecurity; CPU capacity limits.	Price volatility; lack of traceability; limited finance access; over-reliance on commodity market with low premiums.
Investment potential	Close inequality gap by raising premiums for smallholders; expand direct export capacity; improve CPU capacity and use, strengthen AMCOS governance; increase price transparency and direct contracts, improve input/extension services; youth and women inclusion; digital tools for traceability and records.	Invest in seedlings and farmer field schools on basic management practices, ISFM and IPM; modernise local factories; empower AMCOS and strengthen buyer linkages; continue EUDR preparedness; last-mile extension and financial services; improve traceability and certification capacity.

Table 6-2 consolidates regional characteristics, strengths, production potential, profitability, risks, organisational strength, power dynamics, resources, structural issues, choke points, and investment opportunities for Ruvuma, Songwe, Mbeya, and Kilimanjaro.

TABLE 6-2 COMPARATIVE DASHBOARD FOR REGIONS

Region	Ruvuma (Arabica)	Songwe (Arabica)	Mbeya (Arabica)	Kilimanjaro (Arabica)
Current trends & characteristics	Main producer in Southern Highlands (Mbinga). Smallholders dominate, one estate (Olam Aviv). Strong AMCOS/Unions, potential for speciality coffee. Distant from Dar; logistical issues.	Key region with rising importance. AMCOS governance mixed/weak. Presence of NGOs/programmes. Potential for organic/speciality markets. Better connected to Dar.	Anchor for Arabica in Southern Highlands. Overlapping base with Songwe. Historic production and aggregation. Growing speciality reputation.	Declining output, historic region with brand recognition. Mix of smallholders and estates. Shrinking plots, aging trees, high fragmentation. Proximity to Moshi and auctions.
Strengths / leverage points	Good cup quality; speciality potential. Strong AMCOS presence.	Potential for quality/speciality growth; improving connections and reputation.	Historic anchor with strong logistics. Increasing aggregation via AMCOS.	Brand recognition, traceability, strong cooperative relationships. Access to Moshi grading/auctions.
Production potential – quality & quantity	Strong quality potential. Larger and more consistent volumes possible. Requires CPU upgrades and input access.	Potential quality improvements with aggregation and better AMCOS governance.	Improves with aggregation. Consistent exporter-led production.	Rejuvenation of old trees needed. Fragmented plots limit scale. Potential for speciality micro-plots.
Potential profitability	Premium potential via direct exports. Needs brand recognition. Access to inputs via loans.	Quality improvements could deliver higher premiums. Speciality growth possible.	Potential for higher premiums if quality is standardised.	Maintains premiums for Kilimanjaro label. Stability depends on replanting and investment.
Climate risks	Major constraint reported by farmers: temp/humidity stress. Needs shade, mulching, tolerant varieties.	Similar climate risks as Ruvuma. Vulnerable to rainfall variability.	Same regional risks, though aggregation helps buffer.	High vulnerability due to aging trees and fragmented plots. Pest/disease risk high.
Strength of farmer organisations	Active AMCOS with varied capacity. Remote wards may lack representation.	Weak AMCOS governance overall, though some strong cases exist.	Mixed AMCOS, many new since 2018. Capacity varies.	Strong cooperative legacy but weakened by decline.
Power imbalances	Zonal auction/direct sales options provide bargaining potential.	Weak AMCOS governance undermines bargaining power.	Exporters and processors hold major power. AMCOS relatively weak.	Highly fragmented farmers; exporters dominate. Influence exceeds production share.

Level of resources / knowledge	Mixed CPU access; home processing common. Training growing (Gov/NGO). Government loans via AMCOS.	Multiple CPUs but poor condition. Limited extension/training capacity.	Multiple CPUs.	Good access to Moshi grading. Knowledge uneven across farmers.
Structural issues	Coordination between AMCOS and processors positive. Distance to Dar/Moshi a constraint.	Variable AMCOS capacity. Exporters dominate.	Dense smallholder network. Exporters/processors strong. Logistics good.	Declining farmer base. Estates challenged by rising costs and risks.
Main choke points	Access to finance and smoothing. Remote wards bypassed if AMCOS weak. Distance to port.	Quality/consistency issues. Access to working capital limited. Logistics difficult during rains.	Quality and consistency depend on AMCOS. Access to speciality constrained by inputs.	Declining farmer numbers. Replanting/rejuvenation costs rising.
Investment potential	Volume/output growth. Direct export programmes. AMCOS governance upgrades. Training and CPUs needed.	Replanting/rejuvenation. Standardisation of CPUs. Capture premiums.	Aggregation and quality assurance. Digital AMCOS membership. Drought-tolerant varieties.	Aggregation and traceability. Water harvesting. Digital QA systems.

6.3 Risk Analysis

The performance of Tanzania's coffee value chain is shaped by a set of risks that cut across economic, institutional, social, and environmental dimensions (presented in Table 6-3). These risks threaten the viability of actors along both the Arabica and Robusta chains and have implications for inclusiveness, sustainability, and long-term competitiveness. The risk analysis presented below synthesises the key findings from the four dimensions of the study.

TABLE 6-3 PRESENTATION OF KEY RISKS

Risk Category	Comments	Relevant Indicators	Probability	Severity
Price trends	Global coffee prices have risen sharply in recent years, but current peaks are unlikely to be sustained.	Global Arabica and Robusta price indices; TCB export price data	High	High -export earnings highly exposed to global price fluctuations
Price volatility	Coffee is among the most volatile agricultural commodities. Frequent boom–bust cycles undermine farmer investment and long-term planning.	Extent of price changes in import/export markets; volatility indices	Very high	Very high – directly affects household income stability and sector competitiveness
Logistics & infrastructure	Poor rural roads and long distances to processing centres inflate transport costs, reduce farm-gate prices, and increase post-harvest losses.	Road density; transport costs	Medium	Medium to high – persistent barrier for smallholders, particularly in remote regions
Policies & institutions	High transaction costs (e.g. licensing), and subsidy dependence (Arabica fertiliser).	Licensing costs; public funds balance; share of subsidised inputs	High	High – especially for Arabica where subsidies distort competitiveness
Governance & inclusion	Persistent weaknesses in AMCOS management. Weak cooperative capacity limits farmer bargaining power.	AMCOS audit data	High	High – undermines collective action and inclusiveness
Social relations	Gender inequality remains entrenched, with women contributing substantial labour but controlling limited income.	Gender wage gaps; land title distribution; youth participation rates	High	Medium – reduces inclusiveness and threatens long-term generational renewal
Climate change	Both Arabica and Robusta yields are highly vulnerable to rising temperatures, erratic rainfall, and pest/disease pressure.	Yield variability; farmer reports; climate projections	Very high	Very high – long-term systemic risk to sector sustainability
Trade regulations (EUDR)	Implementation of the EU Deforestation Regulation (EUDR) poses a major risk for smallholders, especially in Kagera. Weak traceability, incomplete farmer registration, and informal trade reduce compliance.	% of farms registered with TCB; share of exports to EU	High	High- if unaddressed, may exclude vulnerable farmers from EU markets

The most critical risks for the Tanzanian coffee value chain are climate change (very high probability and severity) and the implementation of the EU Deforestation Regulation (high probability, high severity). These systemic risks threaten not only sector profitability but also smallholder inclusion. In addition, persistent issues of price volatility, weak institutional capacity, and entrenched social inequalities compound vulnerability. Unless managed proactively, these risks could undermine both the resilience and long-term sustainability of Tanzania's coffee economy.

6.4 Recommendations

6.4.1 Sustainable Upgrade of the VC

6.4.1.1 Governance

- Develop Regional Coffee Strategies – tailored to the specific needs/priorities of the different coffee growing regions and their transition journey.
- Establish Regional or Zonal Stakeholder Coordination Platforms to support and inform Regional Strategies and local priorities.
- Build on Tanzania hosting the Inter Africa Coffee Organization (IACO)'s Centre of Excellence for Coffee to establish a 'Coffee Observatory' to monitor the rate and impact of coffee transitions in Tanzania* and the implementation of Regional Strategies. This can showcase 'good practice' for other producing countries.
- Strategic and coordinated investment in consistent and sustained policy implementation that will establish greater systemic gender equality in the sector – e.g. roll out of CCROs, governance of AMCOS and village committees, etc.
- Address the unintended and disproportionate negative effects of the new EU Deforestation Regulation (EUDR) on smallholder coffee farmers, particularly in Kagera. Provide essential technical support and foster institutional readiness to ensure compliance minimises harm and maintains market access.
- Maintain continuous monitoring of land use change dynamics, especially in rapidly expanding coffee regions like Mbinga, to ensure the coffee value chain remains deforestation-free.
- Investment in facilities that improve coffee quality and reduce women's workload (e.g. CPU processing in the Arabica sub-chain, drying tables)

6.4.1.2 Production

For Coffee Estates:

- Prioritise water use efficiency, particularly by transitioning from sprinkler to drip irrigation systems. This is vital for yield stability and long-term sustainability, especially in regions facing increased weather-related stress due to climate change.
- Increase tree diversity, densities, and shade cover within coffee systems. Move beyond monocultures dominated by single species like *Grevillea robusta* to a more diverse mix of tree species, which enhances ecosystem quality without significantly compromising yields if shade levels are maintained at 25-30%.

For Smallholder Coffee Farmers:

- Focus on efficiently increasing coffee yields as the most impactful way to reduce environmental footprint. This requires a deeper understanding of region-specific yield-limiting factors, such as adverse weather, capital constraints for inputs, and pest/disease pressures.

6.4.1.3 Support

- Promote the widespread use of agricultural lime by smallholder farmers, a critical input currently almost entirely absent among smallholders, to optimise nutrient uptake and fertiliser efficiency.
- Enhance understanding and adoption of Integrated Soil Fertility Management (ISFM) and Integrated Pest Management (IPM) principles. Provide technical assistance to smallholder

farmers, particularly in Mbinga, on combining agricultural lime with mineral and organic fertilisers for optimal nutrient uptake and reduced environmental impact. Emphasise correct fertiliser type selection, timing, and application methods.

6.4.1.4 Processing

- While important, efforts to improve wastewater treatment from wet processing units should be strategically prioritised, potentially after addressing more immediate and impactful cultivation-level issues.

6.4.1.5 Human health

- Implement robust monitoring of estate workers' exposure to agro-chemicals, especially for those applying pesticides and fungicides, to minimise adverse human health impacts.
- Investigate the health risks associated with pesticide use in the southern highlands and promote the replacement of Highly Hazardous Pesticides (HHPs) with safer, available alternatives.

6.4.1.6 Research

- Invest in research for viable small-scale strategies to mitigate weather-related yield limitations in the context of climate change.
- Conduct targeted research to identify the most problematic pests and diseases in specific locations. Prioritise the dissemination and implementation of IPM strategies by smallholder farmers for pest and disease control.
- In Kagera, reassess the economic viability of low-yield organic farming systems that currently forgo mineral fertilisers. Address any disinformation suggesting that organic farming alone guarantees increased yields without agronomic basis.

6.4.2 Finance and investment

6.4.2.1 Smallholder financial security

- Scale up support for community-level savings and loans groups, such as Village Savings and Loan Associations (VSLAs), complemented by financial literacy training to strengthen household financial planning.
- Establish or reinforce pre-harvest advance schemes and AMCOS payment guarantees to reduce reliance on informal lenders. Ensure timely payments, ideally within seven days of coffee delivery, using auction receipts or direct sales contracts as collateral.
- Explore innovative mechanisms including warehouse receipt systems, leveraging the TMX platform for short-term loans, and expanding Savings and Credit Cooperative Societies (SACCOS). Promote mobile banking and digital wallets to smooth incomes and reduce vulnerability.

6.4.2.2 Tailored investment

- Direct investments toward midstream segments (processors, cooperatives) where margins are currently weak, to enhance efficiency and competitiveness.

- Promote investments in small-scale processing and quality infrastructure, enabling producers to capture greater value.
- Targeted public–private partnerships should support upgrading technologies that improve yields, quality, and resilience, while reducing environmental footprints.

6.4.2.3 Localised input supply chain

- Reduce reliance on imported fertilisers by incentivising domestic production and distribution (e.g., supporting firms such as Minjingu Mines).
- Facilitate the development of input distribution networks that ensure timely and affordable access to agro-inputs, particularly for smallholders in remote areas.
- Encourage private-sector engagement in last-mile delivery while maintaining quality control through TFRA and related institutions.

6.4.3 Marketing and Trade

6.4.3.1 Strengthening AMCOS

- Greater (and more consistent/coordinated) investment in the development of, and support for, AMCOS so they can play their part as the bridge between farmer and market more effectively.

6.4.3.2 Compliance with EUDR/ responsibility reporting

- Provide technical and institutional support to ensure compliance with the EU Deforestation Regulation (EUDR), minimising exclusion risks for smallholders.
- Develop traceability and reporting systems that are accessible to farmers, cooperatives, and exporters, ensuring that compliance requirements do not create disproportionate burdens.

6.4.3.3 Leveraging Tanzania's USPs for marketing

- Capitalise on the dominance of smallholder farming as a distinctive feature of Tanzanian coffee. Highlight authenticity, heritage, and family-based production systems as marketing narratives.
- Showcase adoption of climate-smart practices, such as agroforestry, as a competitive advantage in sustainability-conscious markets.
- Emphasise the role of women and youth in production, aligning with international buyers' corporate social responsibility priorities.
- Strengthen traceability systems to support market positioning in specialty and high-value segments.

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APPENDIX FROM ECONOMIC ANALYSIS

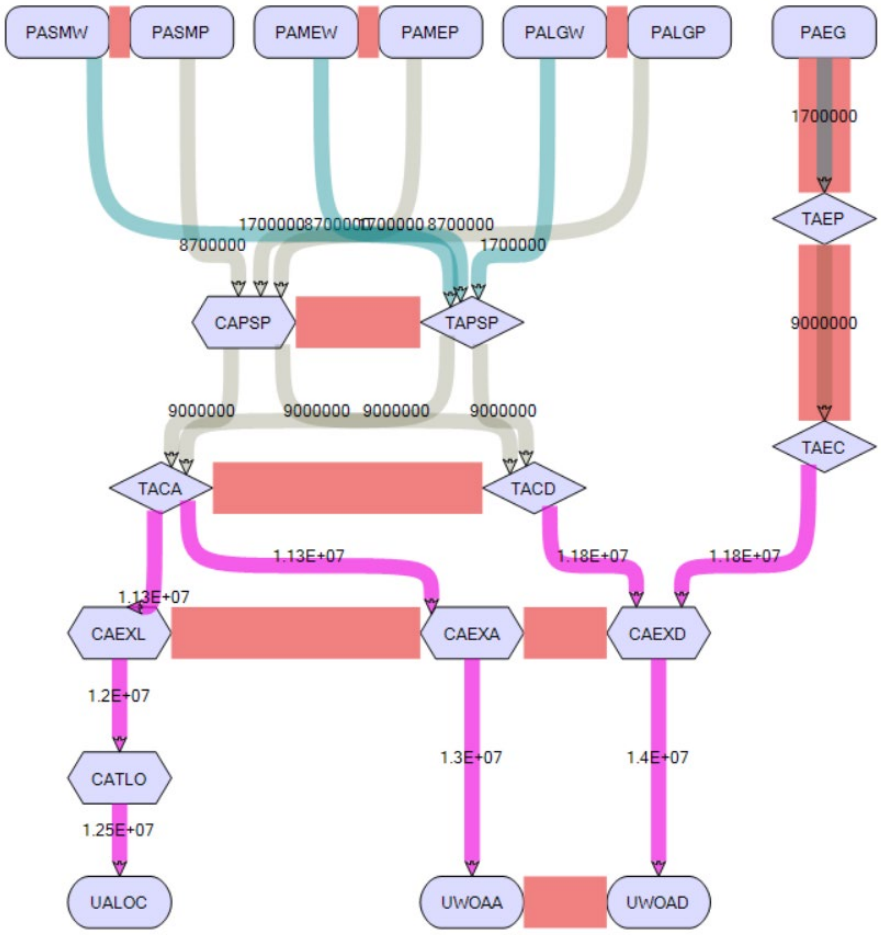

FIGURE A1 ARABICA VALUE CHAIN OPERATIONS CHART

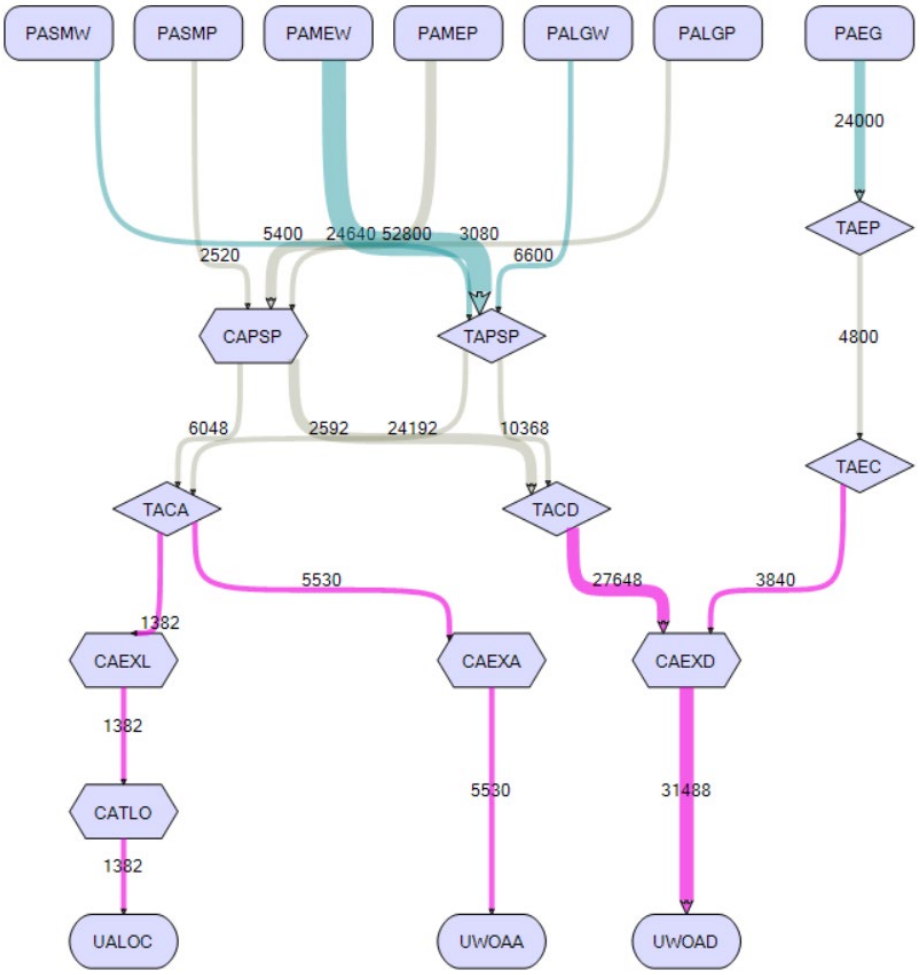

FIGURE A2 ARABICA VALUE CHAIN FLOW GRAPH

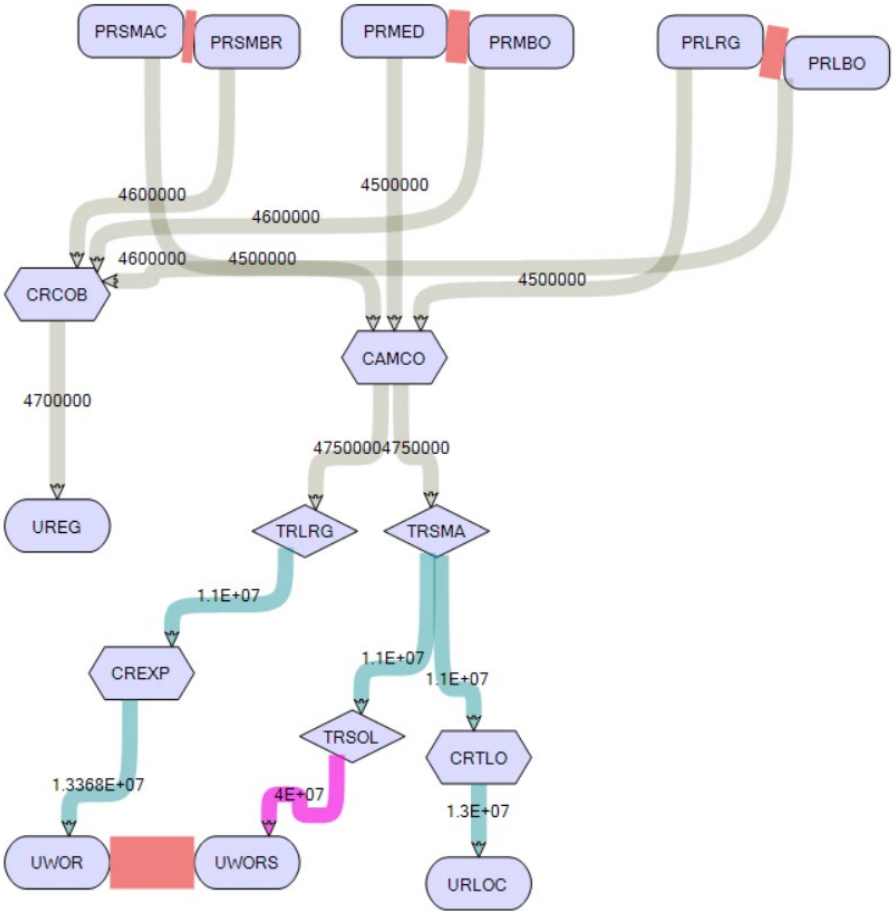

FIGURE A3 ROBUSTA VALUE CHAIN OPERATIONS CHART

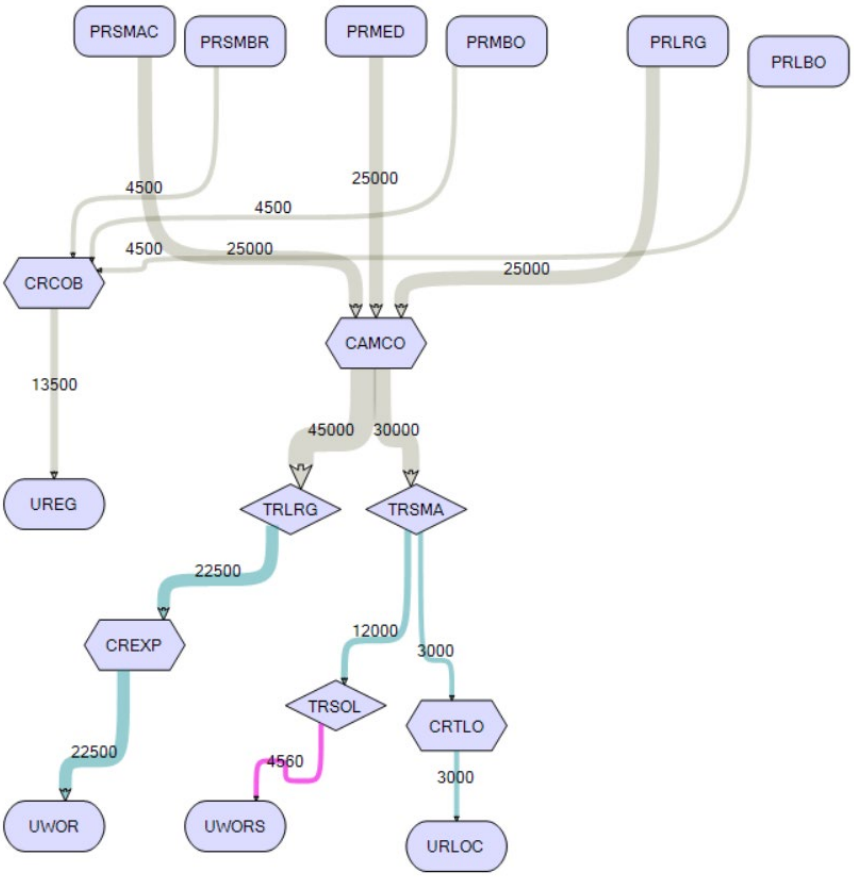

FIGURE A4 ROBUSTA VALUE CHAIN FLOW GRAPH

TABLE A0: IMPLEMENTATION OF THE TANZANIA COFFEE VALUE CHAIN STUDY

Phase	Timeline	Regions Covered	Stakeholders Met	Purpose/Activities
Mission 1	16 Nov – 3 Dec 2024	Kilimanjaro, Kagera (plus Dodoma, Moshi workshop)	EUD, Government of Tanzania, national stakeholders, producers, traders, processors, private companies, NGOs, government actors	Kick-off meetings- national stakeholder workshop, field visits, scope definition, functional analysis development
Mission 2	Jan 2025	Southern Highlands (Ruvuma, Mbeya/Songwe)	Producers, plantation managers, farmers, cooperative leaders, processors	Extend fieldwork to Southern Highlands, focus on Arabica dynamics, collect data to expand analysis
Survey & FGDs	May – Jun 2025	Kagera, Ruvuma	Smallholder farming households (men, women, youth); surveyed + FGDs + interviews	Collect household-level data on livelihoods, coffee production operating account, labour, gender/youth roles; enrich analysis with lived realities

TABLE A1 CONSOLIDATED OPERATING ACCOUNTS PER ACTOR AND FOR THE ROBUSTA VALUE CHAIN

Actor	Production	IGS	Wages	Taxes	Depreciation	Net Operating Profit	VA	VA/ Product	Nb of Actors
Robusta Small Prod	133,200	53,276	250	4,425	1,547	73,703	79,924	60%	96,154
Robusta Medium Prod	133,200	32,073	4,425	4,425	1,818	90,459	101,127	76%	47,170
Robusta Large Prod	133,200	16,409	7,799	4,425	128	104,439	116,791	88%	7,812
Robusta Primary Society	356,250	337,500	821	0	0	17,929	18,750	5%	274
Robusta Large Processor	247,500	213,803	562	0	7	33,128	33,697	14%	1
Robusta Small Processor	165,000	142,528	375	0	3	22,093	22,472	14%	1
Robusta Collec Border	63,450	62,590	0	0	35	825	860	1%	519
Robusta Exporter	300,780	251,658	0	6,016	0	43,106	49,122	16%	3
Robusta Soluble Manf	182,400	132,039	126	3,648	13	46,574	50,361	28%	2
Robusta Local Trader	39,000	33,207	150	0	0	5,643	5,793	15%	5
VALUE CHAIN	585,630	106,733	14,508	22,939	3,551	437,900	478,897	82%	151,941

TABLE A2 CONSOLIDATED OPERATING ACCOUNTS PER ACTOR AND FOR THE ARABICA VALUE CHAIN

Actor	Production	IGS	Wages	Taxes	Depreciation	Net Operating Profit	VA	VA/ Product	Nb of Actors
Arabica Small Prod	31,104	14,368	262	540	580	15,354	16,736	54%	23,077
Arabica Medium Prod	304,128	84,815	5,369	6,947	3,709	203,288	219,313	72%	92,632
Arabica Large Prod	38,016	12,255	472	695	430	24,164	25,761	68%	5,789
Arabica Estate Prod	129,312	87,053	8,332	0	177	33,750	42,259	33%	10
Arabica Primary Society	388,800	373,248	939	0	0	14,613	15,552	4%	313
Arabica Processor	404,352	389,101	264	0	33	14,954	15,251	4%	8
Arabica Exporter	529,306	455,583	0	10,586	0	63,137	73,723	14%	6
Arabica Local Trader	17,280	16,589	0	0	0	691	691	4%	4
VALUE CHAIN	529,997	120,710	15,638	18,768	4,929	369,951	409,287	77%	121,839

APPENDIX TABLE A3 INDIVIDUAL ACTORS ACCOUNT AND FINANCIAL INDICATORS FOR ROBUSTA VC

Actor	Production	IGS	Wages	Taxes	Depreciation	Net Operating Profit	Return on turnover	NOP per Average NOP	Return to family labour day
Robusta Small Prod	1,385,280	554,068	2,596	46,020	16,088	766,507	55%	0.27	6388
Robusta Medium Prod	2,823,840	679,941	93,810	93,810	38,542	1,917,737	68%	0.67	15981
Robusta Large Prod	17,049,600	2,100,400	998,280	566,400	16,323	13,368,197	78%	4.64	111402
Robusta Primary Society	1,301,500,000	1,232,999,878	3,000,000	0	0	65,500,122	5%	22.73	
Robusta Large Processor	247,500,000,000	213,803,183,247	562,499,939	0	6,600,000	33,127,716,815	13%	11,494.52	
Robusta Small Processor	165,000,000,000	142,528,363,501	375,000,000	0	3,300,000	22,093,336,499	13%	7,665.86	
Robusta Collec Border	122,199,997	120,543,138	0	0	67,500	1,589,358	1%	0.55	
Robusta Exporter	100,260,000,000	83,886,000,000	0	2,005,200,000	0	14,368,800,000	14%	4,985.63	
Robusta Soluble Manf	121,599,989,583	88,025,786,667	84,000,000	2,431,999,792	8,800,000	31,049,403,125	26%	10,773.39	
Robusta Local Trader	7,800,000,000	6,641,400,000	30,000,000	0	0	1,128,600,000	14%	391.60	
VALUE CHAIN	3,854,335	702,464	95,487	150,971	23,369	2,882,045	75%	1.00	

APPENDIX TABLE A4 INDIVIDUAL ACTORS ACCOUNT AND FINANCIAL INDICATORS FOR ARABICA VC

Actor	Production	IGS	Wages	Taxes	Depreciation	Net Operating Profit	Return on turnover	NOP per Average NOP	Return to family labour day
Arabica Small Prod	1,347,840	622,596	11,344	23,400	25,150	665,350	0.49%	0.22	4436
Arabica Medium Prod	3,283,200	915,616	57,961	75,000	40,042	2,194,581	0.67%	0.72	14631
Arabica Large Prod	6,566,400	2,116,809	81,520	120,000	74,233	4,173,838	0.64%	1.37	27826
Arabica Estate Prod	12,931,200,195	8,705,284,603	833,244,461	0	17,666,666	3,375,004,465	0.26%	1,111.52	
Arabica Primary Society	1,242,000,044	1,192,319,990	3,000,000	0	0	46,680,054	0.04%	15.37	
Arabica Processor	50,543,997,434	48,637,640,538	33,000,000	0	4,134,375	1,869,222,520	0.04%	615.61	
Arabica Exporter	88,217,600,876	75,930,418,250	0	1,764,352,018	0	10,522,830,609	0.12%	3,465.57	
Arabica Local Trader	4,326,251,857	4,153,201,783	0	0	0	173,050,074	0.04%	56.99	
VALUE CHAIN	4,349,976	990,736	128,352	154,041	40,455	3,036,392	0.70%	1.00	

TABLE A5 ROBUSTA PARITY PRICE COEFFICIENTS

Category	Item	Life time	Balance	Tradable	Labor	Capital	Txv/-Sub	OutM	InpM	LabM	CapM	OutP	InpP	LabP	CapP
1-epreciation	A_PROC_PLANT	43	23	0.7	0.1	0.2	0.05		16	2	5		15	2	5

1-epreciation	Equipment	3	3493	0.8	0.1	0.1	0.05		2794	349	349		2661	349	349
1-epreciation	Motorbike	20	35	0.9	0.05	0.05	0.05		32	32	2		30	2	2
2-Consumable	Chemical use	0	8906	0.63	0.03	0.32	0.04		5611	267	2850		2850	267	2850
2-Consumable	Electricity	0	104	0.46	0.23	0.4	0.06		48	24	42		45	24	42
2-Consumable	Mineral Fertilizers	0	1326	0.92	0.01	0.07	-0.5		1220	13	93		2440	13	93
2-Consumable	Organic input	0	89827	0.19	0.06	0.74	0.04		17067	5390	66472		16411	5390	66472
2-Consumable	Petrol	0	478	0.3	0.01	0.66	0.09		143	5	315		132	5	315
2-Consumable	Water	0	16	0.31	0.1	0.58	0.02		5	2	9		5	2	9
3-Output	Dried Cherry R	0	63450	1	0	0	0	63450	0	0	0	63450	0	0	0
3-Output	Green Bean R	0	339780	1	0	0	0	339780	0	0	0	339780	0	0	0
3-Output	Soluble coffee	0	182400	1	0	0	0	182400	0	0	0	182400	0	0	0
4-Labor	A LABOR	0	14508	1	0	0	0		0	14508	0		0	14508	8
5-Service	Maintenance	12	32	0.07	0.67	0.67	0.21		4	1	8		3	1	35
5-Service	Storage	90	0.58	0.02	0.39	0.39	0.01		52	2	35		52	2	2688
5-Service	Transport	9	5974	0.45	0.13	0.45	0.02		2688	777	2688		2636	777	0

TABLE A6 ARABICA PARITY PRICE COEFFICIENTS

Category	Item	Life time	Balance	Tradable	Labor	Capital	Txv/-Sub	OutM	InpM	LabM	CapM	OutP	InpP	LabP	CapP
1-Depreciation	Equipment	3	4324	0.7	0.1	0.2	0.05		3027	432	865		432	432	865
1-Depreciation	Milling machine	37	200	0.7	0.1	0.2	0.05		140	20	40		20	20	40
1-Depreciation	Pulper	36	405	0.8	0.1	0.1	0.05		324	40	40		40	40	40
2-Consumable	A FERTILIZER	0	89253	0.92	0.01	0.07	-0.5		82113	893	6248		164226	893	6248
2-Consumable	Chemical use	0	14713	0.63	0.13	0.32	0.04		9269	1913	4708		4708	1913	4708
2-Consumable	Electricity	0	528	0.46	0.23	0.4	0.06		243	121	211		229	121	211
2-Consumable	Fuel	0	21	0.3	0.01	0.66	0.09		6	0	14		14	0	14
2-Consumable	Organic input	0	9607	0.19	0.06	0.74	0.04		1825	576	7109		7109	576	7109
2-Consumable	Water and electricity	0	450	0.31	0.1	0.66	0.09		140	45	297		128	45	297
3-Output	Greenbean A	0	1059964	1	0	0	0	1059964	0	0	0	1059964	0	0	0
4-Labor	A WAGES	0	29031	1	0	0	0		0	29031	0		0	29031	0
5-Service	TRANSPORT	0	6138	0.45	0.13	0	0		2762	796	2762		2708	796	2762

APPENDIX FROM ENVIRONMENTAL ANALYSIS

Supplementary materials

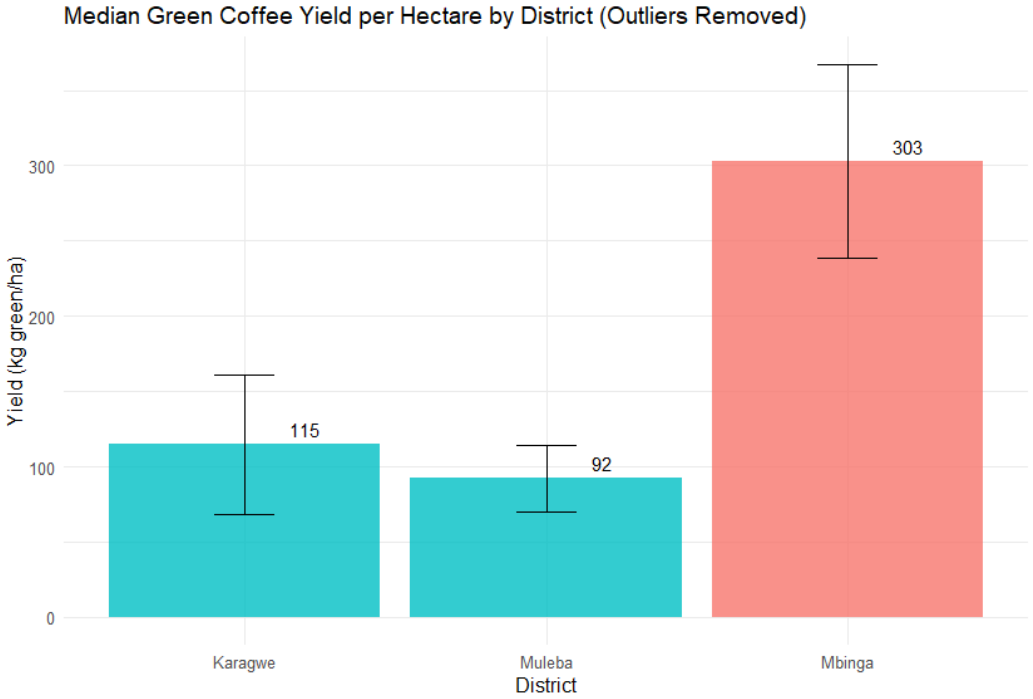

FIGURE S1: MEDIAN GREEN COFFEE YIELD PER HECTARE (KG GREEN COFFEE / HA) BY DISTRICT (N = 137)

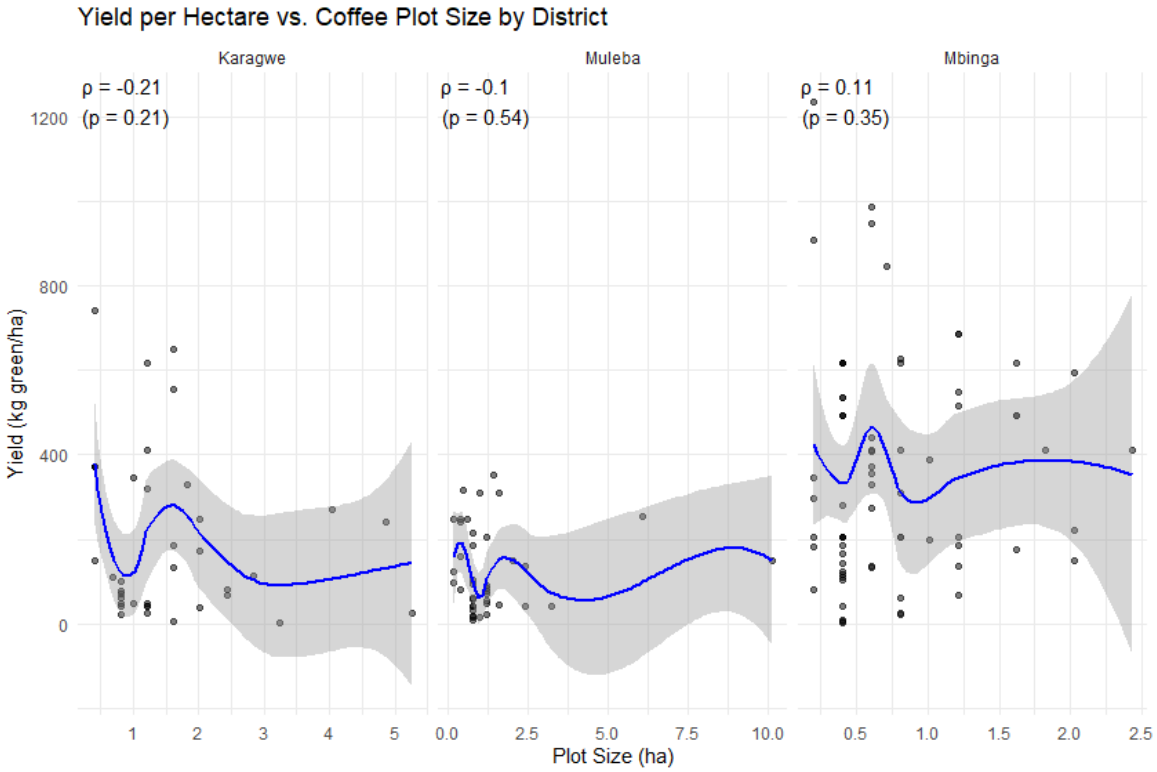

FIGURE S2: COFFEE YIELD PER HECTARE VERSUS COFFEE PLOT SIZE, FACETTED BY DISTRICT, NOT INCLUDING ESTATES (N = 126)

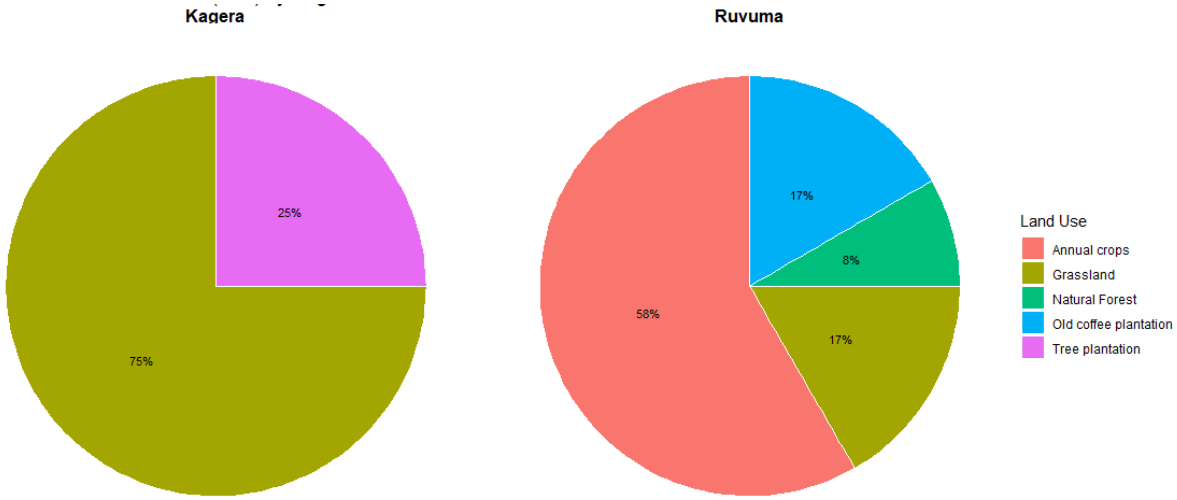

FIGURE S3:DISTRIBUTION OF LAND USE PRIOR TO CONVERSION TO COFFEE, FOR PLOTS CONVERTED AFTER 31 DECEMBER 2020, DISAGGREGATED BY REGION (N = 137)

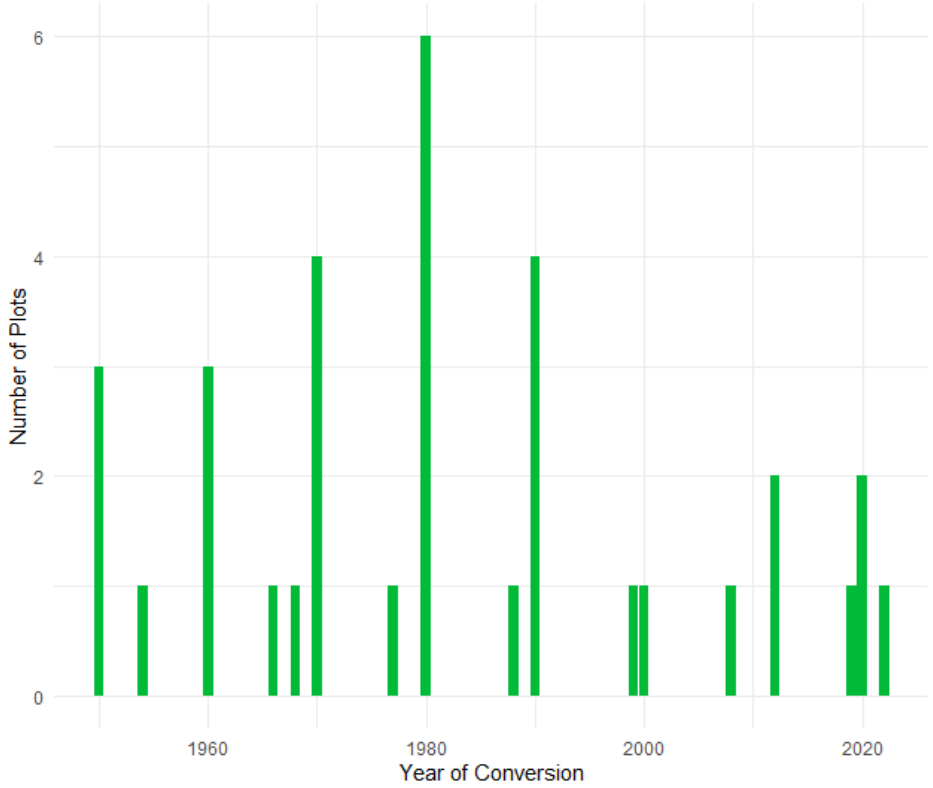

FIGURE S4:NUMBER OF PLOTS CONVERTED YEARLY FROM NATURAL FOREST TO COFFEE IN MBINGA, RUVUMA (1950 – 2022) (N = 71 FARMERS)

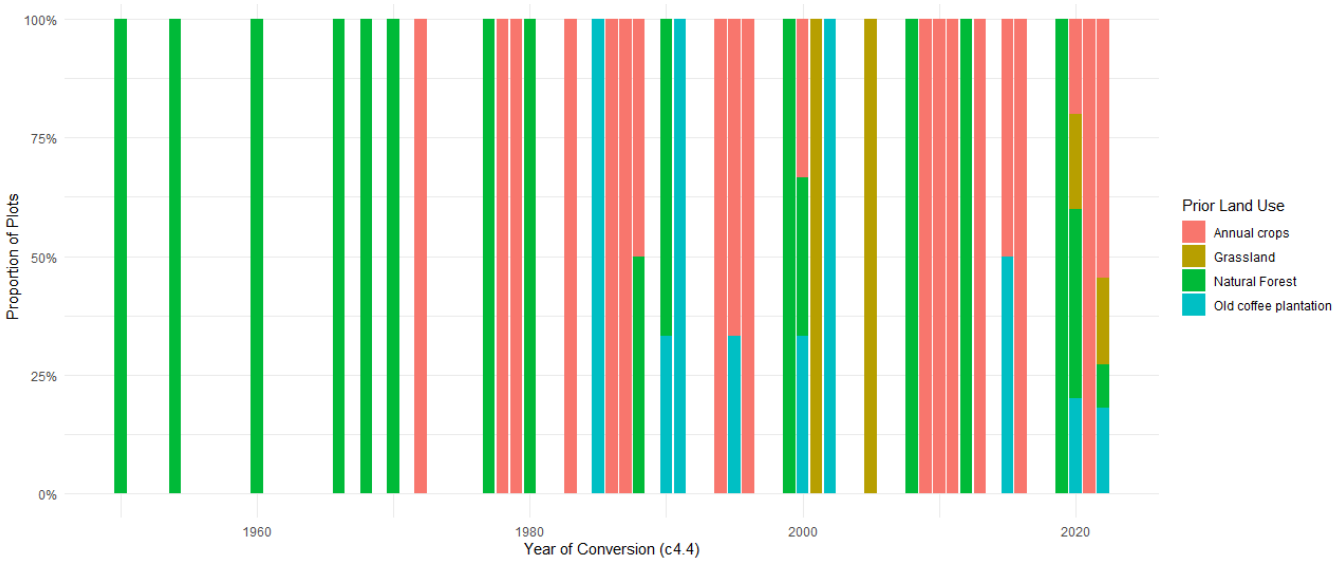

FIGURE S5: PROPORTION OF PLOTS CONVERTED YEARLY FROM A CERTAIN LAND USE TO COFFEE IN MBINGA, RUVUMA (1950 – 2022) (N = 71 FARMERS)

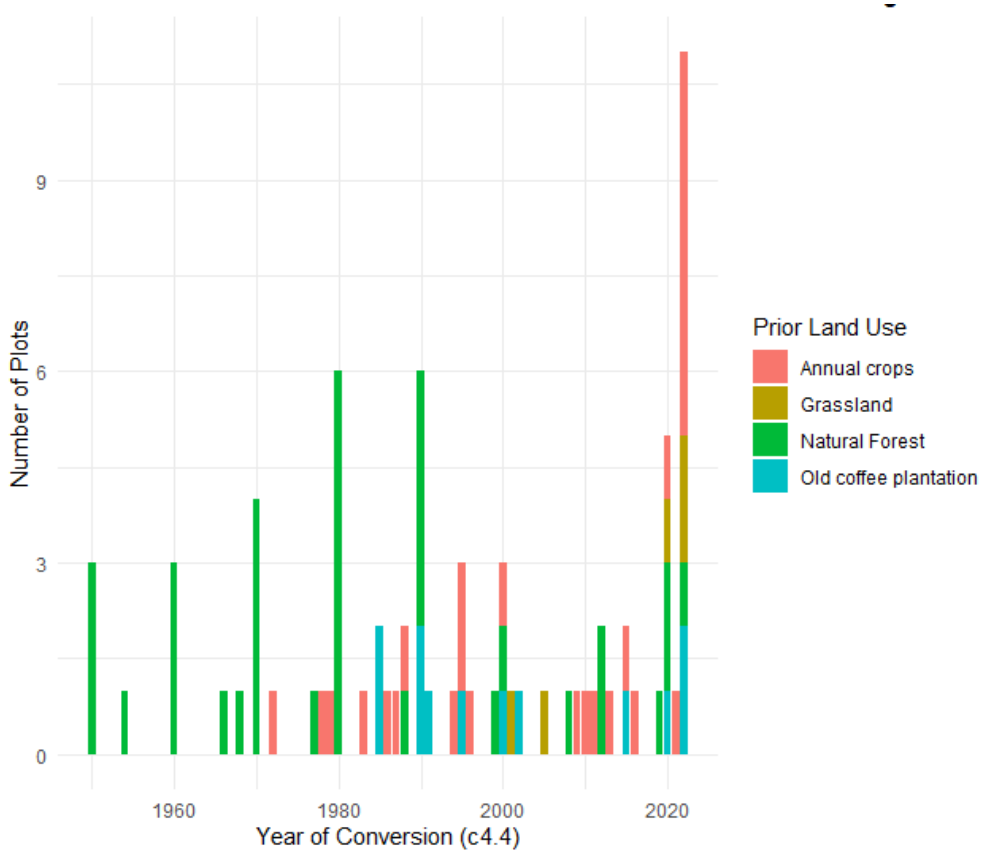

FIGURE S6: NUMBER OF PLOTS CONVERTED YEARLY FROM A CERTAIN LAND USE TO COFFEE IN MBINGA, RUVUMA (1950 – 2022) (N = 71 FARMERS)

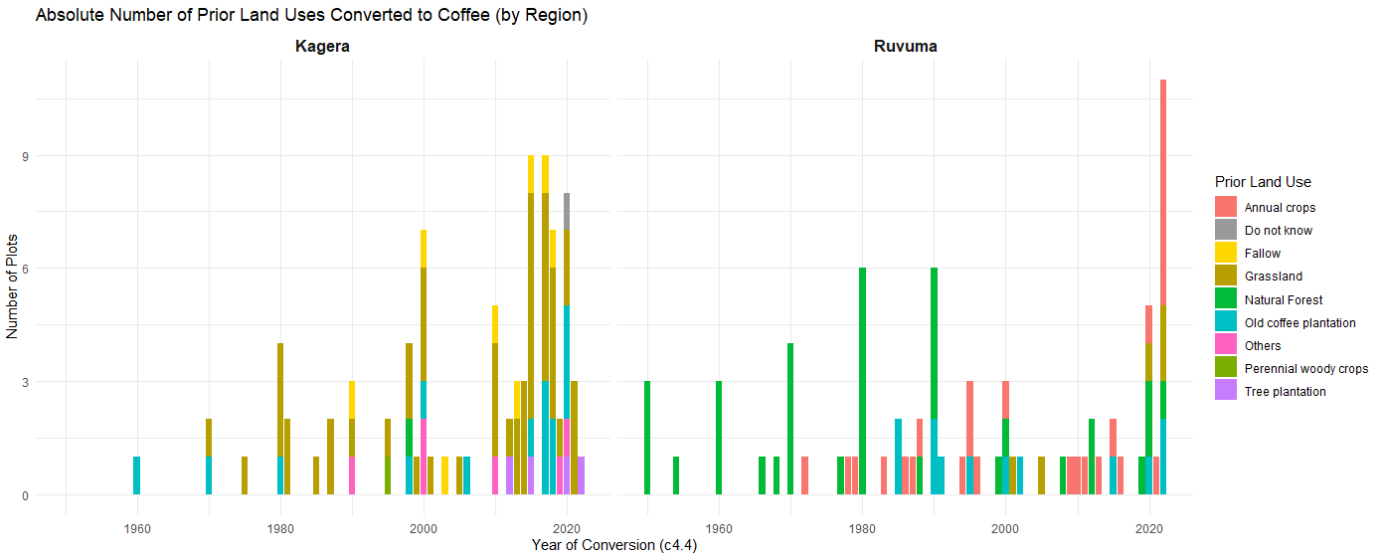

FIGURE S7: NUMBER OF PLOTS CONVERTED YEARLY FROM A CERTAIN LAND USE TO COFFEE, FACETED BY REGION (1950 – 2022) (N = 137 FARMERS)

FIGURE S8: PROPORTION OF PLOTS CONVERTED YEARLY FROM A CERTAIN LAND USE TO COFFEE, FACETED BY REGION (1950 – 2022) (N = 137 FARMERS)