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Brewing Prosperity

An Analysis of Living Income Gaps Among Coffee Smallholders in Central Kenya

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Abstract

This study investigates the living income gap among coffee smallholders in central Kenya. It uses detailed survey data collected from coffee farmers organized in cooperatives and from coffee farm workers in Nyeri and Murang'a counties. Our analysis finds that coffee smallholders earn an average of only 109 KSh per day, just 35 percent of the 312 KSh living income benchmark, with the gap being particularly severe in Murang'a and among those with smaller landholdings. Sensitivity analyses show that enhancing prices paid to farmers and improving yields can partially reduce the income shortfall. For instance, doubling both parameters, especially when coupled with a 50 percent increase in farmers' non-coffee income, lowers the incidence of households below the benchmark from more than 90 percent to about 67 percent. Yet, even under these relatively optimal conditions, the persistence of a significant gap underscores deep structural constraints in the local economy. Policy recommendations therefore call for a multidimensional approach that improves production efficiency, improves and stabilizes prices, promotes income diversification, and strengthens institutional support.

Keywords: Coffee smallholder, diversification, living income gap, poverty, productivity.

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1 Introduction

Despite the high value of global coffee markets and the growing demand, smallholder farmers in Central Kenya continue to struggle with low income levels. In Kenya, coffee production has long been a cornerstone of economic development, with cultivation beginning in the late 19th century in Taita Hills and later expanding to regions such as Kibwezi and Kikuyu. Over time, the sector evolved from informal practices to a structured system, marked by the establishment of regulatory bodies, from the Coffee Board formed in the 1930s to the modern Coffee Directorate under the Agriculture and Food Authority, which have aimed to standardize quality, streamline marketing, and boost export potential.[1]

Today's coffee industry in Kenya is built upon two production systems. Approximately 800,000 smallholder farmers, largely organized into cooperative societies, share the landscape with estate farmers who, by adopting relatively more advanced practices and technology, often secure higher yields. Although smallholders cultivate a significant portion of the overall coffee acreage, estates contribute a disproportionately larger share of production (AFA 2021). This dual structure supports not only foreign exchange earnings, where coffee contributes billions of Kenyan shillings annually and ranks as a key commodity behind sectors like tourism, tea, and horticulture, but also the livelihoods of nearly five million people across the entire value chain (ICO 2019, KALRO 2019). Moreover, while Kenya's Arabica coffee production currently represents roughly 0.4 percent of the global market, reflecting a notable decline from the output levels of previous decades,[2] the crop remains a favored choice among coffee consumers both locally and internationally, being exported to countries such as Germany, the United States, Belgium, the Republic of Korea, and Sweden (ICO 2019).

While Kenyan coffee is often perceived as a lucrative export crop, our study reveals a persistent living income gap (LIG) that prevents many smallholders from achieving financial stability and enjoy adequate standards of living. Living income is the net annual income required for a household in a specific location to afford a decent standard of living for all its members. This includes essential needs such as food, water, housing, healthcare, education, transportation, and clothing, as well as provisions for unexpected events. Living income goes beyond the level of earnings needed to overcome poverty and aims to ensure long-term financial stability and the ability of individuals to participate fully in society. It is particularly relevant for self-employed individuals, such as smallholder farmers, whose incomes may vary due to market fluctuations and seasonal production cycles (ISEAL and LICP 2018).

The disconnect of globally valuable commodities failing to translate into sustainable farmer livelihoods is not unique to coffee in Kenya. Similar challenges have been observed in the cocoa sector in West Africa, where producers face comparable income shortfalls despite policy interventions aimed at improving farmer earnings (Hütz-Adams et al. 2016, 2018). In Ghana and Côte d'Ivoire, the recent introduction of the Living Income Differential (LID) policy sought to address cocoa farmer poverty by mandating higher prices for cocoa beans. However, studies have shown that while price increases can provide short-term income boosts, their effectiveness could be undermined by broader market forces, the diversity of farmer circumstances, and unintended consequences such as deforestation,

[1] https://www.afa.go.ke/history-coffee-directorate/
[2] https://www.fas.usda.gov/data/production/commodity/0711100

child labor, and oversupply (Adams and Carodenuto 2023; Boysen et al. 2023). These findings highlight a critical lesson: Raising prices alone is not enough to close the LIG. Instead, holistic, context-specific interventions are needed to address the structural factors that keep smallholders in poverty.

This study provides a detailed examination of the income dynamics of 181 coffee farmers in Central Kenya. By using microdata on production costs, farm revenues, and producer prices, we assess the structure of smallholder income and the extent of the LIG. Furthermore, we conduct sensitivity analyses to explore how changes in price, yield scenarios, and the extent of income diversification impact farmer earnings, offering a nuanced perspective on the challenges of achieving a living income in coffee farming in the region.

Drawing parallels with the cocoa sector, we argue that policy responses must go beyond price-based solutions to incorporate tailored strategies that account for farm size, cost structures, risk exposure and overcoming through diversification, and management of market volatility. This paper contributes to the broader discourse on sustainable livelihoods in commodity agriculture by highlighting the urgent need for policies and interventions that effectively translate global market value into tangible improvements in smallholder incomes. Ultimately, our findings call for a reevaluation of how commodity markets are structured to ensure that farmers receive fair and sustainable returns for their labor.

This paper is structured as follows. Section 2 presents the conceptual framework and a review of the relevant empirical studies. Section 3 formalizes the analytical approach to analyzing LIGs. Section 4 analyzes the data used and summarizes the key descriptive statistics. Section 5 looks closely at the empirical findings, including the assessment of the living income-gap status and magnitude among coffee smallholders, and the scenario analysis that looks at the sensitivity of the results to alternative yields, production scale, and the degree of off-farm diversification. The final section presents the conclusions and policy implications.

2 Conceptual framework and empirical studies

Poverty remains a persistent challenge in rural Kenya. Recent analyses highlight that although national poverty rates had been declining before the COVID-19 pandemic, progress has slowed down considerably. Structural disparities, particularly in arid regions, point to underinvestment in rural areas, low agricultural productivity, and heightened vulnerability to climate shocks as key drivers that leave many households struggling to meet their basic needs (KNBS 2023; The World Bank 2024).

While those findings are based on traditional poverty lines approaches, they may understate the true extent of the country's economic hardship. Indeed, traditional poverty measures, such as the World Bank Poverty Line (WB-PL), focus primarily on the cost of basic needs, usually emphasizing food and minimal non-food expenditures that define the poverty line as the minimum expenditure required for an individual to meet basic consumption needs. It begins by specifying a consumption bundle that includes both a food component anchored in nutritional requirements and a non-food component. A crude way to set the non-food component of an absolute poverty line (APL) is to assume a fixed

budget share, for example, stipulating that households spend 70 percent on food and 30 percent on non-food items, and then applying that share to the cost of a minimum-calorie food basket. The more widely accepted cost of basic needs approach instead derives the allowance empirically: Price a food basket that meets the calorie norm, identify households whose food spending hovers around that cost, and then take their average expenditure on all other goods (housing, fuel, clothing, health, education, transport, etc.) as the non-food share. Adding this observed allowance to the food-basket cost produces a poverty line that is grounded in local spending patterns. However, this step tends to be somewhat ad hoc and may not fully capture the costs of essential items (Ravallion 1998; Ravallion and Bidani 1994; World Bank 2014), as Ravallion (1998: 17) aptly noted: "Of all the data that go into measuring poverty, setting the non-food component of the poverty line is probably the most contentious." Consequently, while widely adopted,[3] the cost of basic needs approach for determining national poverty lines is beset by significant limitations (Arndt and Tarp 2017; Jolliffe and Tetteh Baah 2022) and has been shown to not necessarily perform better than other methods at identifying the poor (Decerf et al. 2023). These shortfalls have led researchers to increasingly consider alternative poverty metrics, and especially multidimensional poverty measurement (Alkire and Foster 2011; Alkire and Santos 2014; Atkinson 2003; Bourguignon and Chakravarty 2003; Ravallion 2011).

In this search for more comprehensive gauges of well-being, attention has also turned to the concept of living income. Unlike traditional poverty metrics, a living income reflects the net household earnings required not only to cover essential needs, such as food, housing, healthcare, education, transportation, and clothing, but also to provide long-term financial stability in the face of income variability due to predicted volatility and unexpected events.[4]

Historically, the living income concept was preceded by the living wage concept. Underpinned by the Anker methodology, this concept refers to the remuneration necessary for a full-time wage earner to secure a basic but decent standard of living. This widely adopted methodology, proposed by Richard and Martha Anker, calculates a living wage by accounting for the cost of essential items, along with an allowance for unexpected expenses and deductions like taxes, and is used by the Global Living Wage Coalition[5] to calculate living wage benchmarks (Anker 2011; Anker and Anker 2017a). Accounting for the income of a household unit composed of one or more individuals, a similar approach can also be applied to living income estimates.

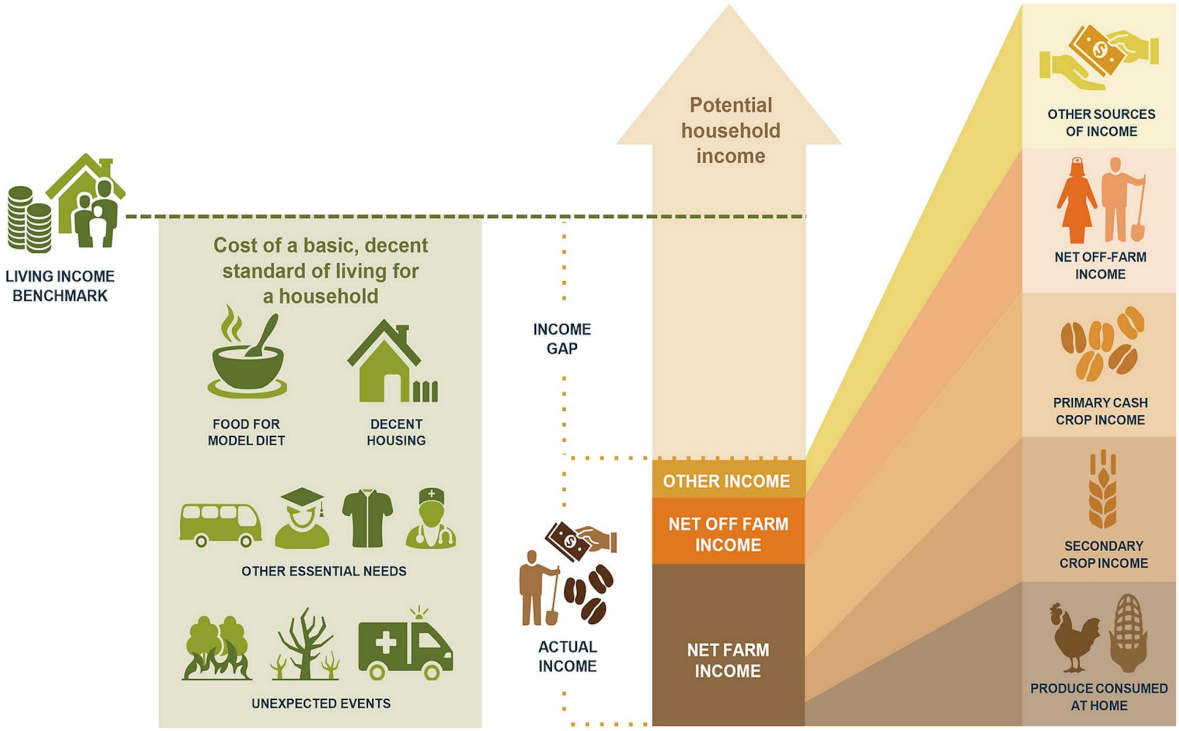
The estimation approach consists of two components. First, it estimates the cost of a basic but decent lifestyle for a worker and their family in a specific location. Second, it assesses whether workers are receiving that wage. The methodology is innovative in its emphasis on local stakeholder participation and rigorous estimation of housing costs using international and national standards. By combining locally collected data with existing secondary sources, it ensures that all necessary costs, such as food, housing, healthcare, education, and transportation, are accurately reflected (Anker 2011; Anker and Anker 2017a; ISEAL and LICP 2018). In practice, this involves a detailed itemization of costs, ranging

[3] https://datatopics.worldbank.org/world-development-indicators/themes/poverty-and-inequality.html
[4] https://www.living-income.com/the-concept/
[5] https://www.globallivingwage.org/

from nutritious food and adequate housing to healthcare and education, tailored to the local context. However, while the living wage concept was designed for salaried workers, the living income framework extends these principles to self-employed individuals such as smallholder farmers, who face unique challenges, including seasonal production cycles and market volatility (ISEAL and LICP 2018; Komives et al. 2015), and typically draw income from multiple sources.

Figure 1 illustrates the conceptual framework related to the living income analysis. On the left, essential cost components estimated for a household's decent standard of living—such as food, housing, and other basic needs (education, transportation, clothing, and health), along with a buffer for unforeseen expenses (weather related, safety hazards, and other covariant or individual level shocks)—establish the living income benchmark (LIB), which serves as a reference point for evaluating whether the smallholder income level is sufficient (LICP 2020). On the right side are the elements that build up household income, including farm income, off-farm self- and wage employment, and other revenue streams. When a household's actual income falls below the LIB threshold, an income gap emerges (center up arrow in the figure). Overcoming the income shortfall to reach and enjoy a decent living standard will require a sustainable and resilient enhancement of income levels.

Figure 1. Conceptual framework for living income analysis



Source: Living Income Community of Practice (www.living-income.com).

Drawing on the concepts of living wage and living income, empirical research paints a stark picture of the income challenges faced by smallholder farmers in Kenya. Studies focusing on rural wage

benchmarks reveal that in sectors such as tea and horticulture, the estimated living wage line is substantially higher than the thresholds suggested by traditional poverty measures. For example, a report on the rural Mount Kenya area, deemed representative of diverse agricultural sectors, estimated a total cost per month for a decent living standard for a reference family of five individuals to be at the level of KSh 20,412, equivalent to KSh 4,082 per month per capita in 2015 (Anker and Anker 2017b), compared to a conventional rural poverty line of just KSh 3,252 per month per adult equivalent, estimated based on the 2015/16 Kenya Integrated Household Budget survey (KNBS 2018).

In the tea sector, a critical export industry that accounted for 25 percent of total foreign exchange earnings in 2019, the Living Wage Report for the main tea-growing region of rural Kericho estimated KSh 44,068 total living costs per month for a basic but decent living standard for a reference family of five in 2022 (Blackmore et al. 2022). This is equivalent to KSh 8,816 per month per capita updated to KSh 9,508 per month per capita in 2023 (Medinaceli et al. 2023), compared to a 2021 rural poverty line of KSh 3,947 per month per adult equivalent computed through traditional approaches (KNBS 2023). Although these figures are in no way directly comparable, owing to important differences in methodology, geographic focus, unit observed (per capita vs. per adult equivalent), and wealth indicator considered (income aggregate vs. consumption aggregate), the difference between the two approaches remains staggering. This underscores a significant gap between what is deemed appropriate to reach a decent standard of living, highlighting the potential limitations of conventional poverty metrics in capturing the true extent of economic hardship in Kenya's rural communities.

Focusing on the coffee sector, Fobelets et al. (2017) present a grim scenario for Kenyan coffee smallholders, indicating that they generally incur losses from coffee production and are in a much worse position than their counterparts in countries such as Indonesia, Vietnam, and India, with 100 percent of Kenyan farmers failing to earn a living income. This analysis revisits the LIG status of coffee smallholders in Kenya.

3 Analytical approach to living income analysis

This section describes and formalizes the analytical approach used to examine the overall income structure of coffee smallholders in Central Kenya and to understand the extent to which its level meets the required benchmark for a decent standard of living.

We start by computing the smallholder's total income (SI). In this study, SI considers income from coffee activities; other on-farm activities, including livestock; and non-farm activities.

Coffee smallholder income (Y^{Coffee}) is expressed by considering the area planted, the yield per acre, and the price per kilogram, with production costs deducted from the product as follows:

$$Y^{Coffee} = [Price \times (Area \times Yield)]^{Coffee} - Costs^{Coffee} \quad (1)$$

However, coffee income is rarely the sole source of on-farm revenue. Many smallholders also derive income from other farm activities ($Y^{Other\ farm}$). This other farm income considers income generated

from other crops and livestock activities by summing the contributions from each crop, $j = [1 \dots n]$, and income from livestock, simply computed as the difference between the revenue and costs:

$$Y^{Other\ farm} = \left(\sum_{j=1}^{n}\left[price_j \times \left(Area_j \times Yield_j\right)\right] - Costs_j\right)^{Other} + (Revenue - Costs)^{Livestock} \quad (2)$$

Beyond these farm-based earnings, many households also supplement their income through non-farm activities ($Y^{non\ farm}$) such as wage labor, self-employment in the form of business enterprises, transfer payments, and other income sources. Thus, the overall non-farm income available to a coffee smallholder can be expressed as the sum of these various components:

$$Y^{non\ farm} = Y^{wage} + Y^{business} + Y^{non-activity/transfers} \quad (3)$$

Next step is to assess whether the SI derived from the sum of Equations (1), (2), and (3) is adequate for a decent standard of living:

$$\text{SI} = Y^{Coffee} + Y^{Other\ farm} + Y^{non\ farm} \quad (4)$$

Once the SI is determined, it is compared against the LIB to reveal any discrepancies. This comparison is quantified as the LIS:

$$\text{LIS} = \text{SI} - \text{LIB} \begin{cases} \geq 0\text{: Decent standard of living} \\ < 0\text{: Living income gap (LIG)} \end{cases} \quad (5)$$

A negative LIS indicates an LIG, meaning that the SI falls short of what is required for a decent standard of living, whereas a positive value suggests that the household generates income that provides a decent standard of living and possibly also the ability to allocate income to savings and/or investment.

The LIG is routinely expressed as the difference between the benchmark and the mean income—either as an absolute shortfall in monetary terms or as a percentage, by comparing the shortfall to the benchmark itself to show how large the gap is relative to the benchmark level.

This method is relatively simple, quick to execute, and easy to explain to different audiences. However, it can be affected by outliers in the sample. Despite this limitation, it remains a useful high-level tool for highlighting whether, and by how much, the typical household income lags behind the benchmark (LICP 2021).[6]

In addition to the assessment of the LIS of coffee growers, we add further nuance to the analysis by incorporating key scenario parameters that influence income levels. In that context, we consider three key scenarios: First, the *coffee farmgate price* plays a significant role, as fluctuations in market prices can substantially alter revenue from coffee sales. Second, variations in coffee yields or *changes in the area*

[6] The more sophisticated analytical framework used in traditional poverty measurement derived from the Foster-Greer-Thorbecke class of decomposable poverty measures (Foster, Greer, and Thorbecke 1984) can also be applied to assess the average shortfall from the LIB in percentage. In this context, the poverty gap measure (H1) quantifies the average distance by which the incomes of those below the threshold miss the benchmark.

under cultivation potentially driven by technological improvements, climatic factors, or shifts in land use directly impact income. Finally, the *growth of non-coffee sectors* provides alternative income opportunities, diversifying household earnings and mitigating risks associated with dependence on a single commodity.

Our sensitivity analysis is structured around two primary dimensions. First, we examine alternative coffee farmgate price and yield scenarios. For coffee prices, we consider three distinct levels: a base price; a true price, obtained using True Cost Accounting (TCA) methodology as part of the True Costing and Pricing Mechanisms of Agricultural Commodities research project (Impact Institute and IFPRI 2023);[7] and a doubled price (a 100 percent increase). The true price of a commodity represents not only its market price but also the social and environmental costs incurred during production. This approach uses a well-established methodology outlined in the Principles for True Pricing (True Price 2020), which combines life cycle assessment with quantitative social indicators related to environmental impact, labor conditions, and human rights and quantifies the externalities of production, monetizing the resulting environmental and social footprints using standardized valuation models. Regarding coffee yield scenarios, we consider three different levels: the base yield, a 25 percent yield growth, and a doubling of the yield (a 100 percent increase).

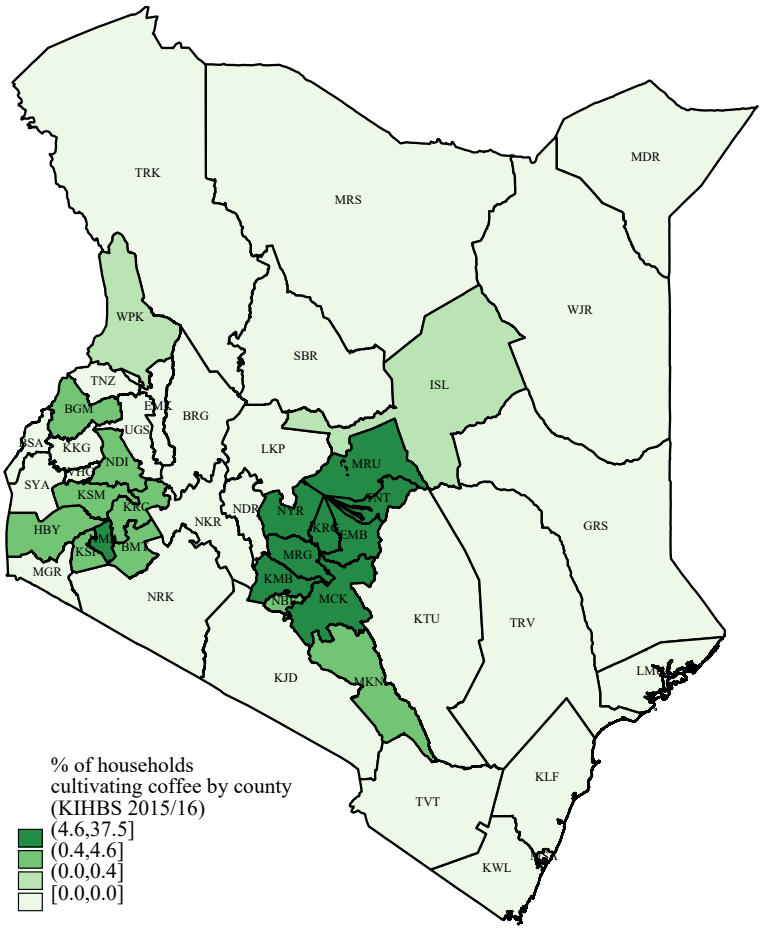
Second, the analysis evaluates alternative assumptions for the local non-coffee sector by comparing a scenario with no change in non-coffee income growth with one assuming a 50 percent increase. We also examine variations by county and differences in the coffee area planted, providing a comprehensive view of the factors shaping income outcomes.

4 Data and descriptive statistics

The study's data collection was designed to capture the complex nature of coffee production and labor in Central Kenya's Mount Kenya region, focusing on two key counties, Nyeri and Murang'a (Figure 2, circled in red), that together with Kirinyaga and Kiambu counties account for approximately 60 percent of the country's overall coffee production. The survey targeted three distinct groups along the coffee value chain: coffee growers' cooperatives, small-scale coffee growers, and workers employed on small-scale coffee farms.

[7] Note that the true price estimated in the study (Impact Institute and IFPRI 2023) refers to the coffee retail price per kilogram. In this study, for the sensitivity analysis, we consider a corresponding producer price differential, assuming the same proportion of the true price gap in the true price of coffee per kilogram found at the retail level.

Figure 2. Coffee-producing areas in Kenya: Nyeri (NYR) and Murang'a (MRG)



Source: Authors' elaboration based on the 2015/16 Kenya Integrated Household Budget survey (KIHBs).

The survey design was developed in close collaboration with the Kenya Coffee Research Institute and was informed by data from the Kenya Coffee Directorate. It was conceived by IFPRI and the Impact Institute and subsequently approved by IFPRI's Institutional Review Board, ensuring adherence to high ethical and methodological standards. Data collection was carried out by Laterite using electronic data capture via SurveyCTO. While in-person interviews were conducted for the cooperatives and coffee growers, the worker survey was administered through phone interviews, allowing for flexibility and broader reach across the study area. Using these two different interview modes may influence how respondents interpret questions or convey nuance, and we acknowledge this as a potential source of measurement bias.

In terms of sample coverage, for the cooperative survey, the primary sample size was initially set at 40 cooperatives (24 in Nyeri and 16 in Murang'a), determined by weighing each county's share of total coffee cherry production by smallholder farmers. However, updated figures revealed that only 23 cooperatives remained active in Nyeri in 2023, leading to a census of all 23 in that county, while a

probability-proportional-to-size sampling approach was employed to select 17 out of 48 cooperatives in Murang'a.

For the farmer survey, the aim was to draw samples from 11 cooperatives in Nyeri and 7 cooperatives in Murang'a. From these 18 sampled cooperatives, 10 farmers were randomly selected, ultimately resulting in a total sample size of 181 farmers (111 in Nyeri and 70 in Murang'a). We acknowledge that the small sample size limits statistical precision and recommend caution in generalizing our results.

The worker survey was initially aimed to include the number of respondents based on contacts obtained through the farmer survey. However, only 141 worker contacts were initially available. To address this shortfall, we implemented a snowball sampling approach, whereby interviewed workers provided referrals for additional coffee workers. This strategy yielded additional contacts, and further outreach to non-interviewed farmers from the sampled cooperatives resulted in more worker contacts, bringing the final worker sample to 241. Although data from the worker survey are not used to compute the living income in this study, it was crucial for computing the social costs used to estimate the TCA price (Impact Institute and IFPRI 2023) used in the sensitivity analysis.

Data collection was conducted over a one-month period from February 9 to March 7, 2023. The farmer survey questionnaire was designed to capture detailed information on smallholder coffee production in the study areas during the 2021/22 season. It covered a wide range of topics, including household demographics, and an extensive section on coffee production practices, ranging from input usage (fertilizers, pesticides, herbicides) and cultivation details to harvesting and sales. In addition, the questionnaire gathered data on off-farm income, production of other crops, livestock activities, and the use of resources such as water, electricity, and fuel.

Building on the results of the survey, Table 1 presents an overview of coffee production characteristics and income levels in our sample across four land-size quartiles (Q1 = smallest, Q4 = largest). The descriptive statistics reveal that the typical smallholder cultivates just under half an acre and harvests about 540 kg of cherries, roughly 1.5 t per acre (column 1), but this average masks sharp scale effects. First, yield falls as farms expand, and while larger producers harvest higher total volumes, their yields per acre tend to be lower than those achieved on smaller plots because output does not rise proportionately with land (columns 2 to 5). Second, coffee revenues and net income rise with acreage; the average gross revenue is KSh 50,733, with the top quartile (Q4) earning revenues 6 times higher than the lowest quartile (Q1). After accounting for production costs, we find that the average net income from coffee production is KSh 38,522, with Q4 growers earning over 6.3 times more than Q1 growers. Unit costs average KSh 22.6 per acre and decline with larger areas, as Q1 smallholders incur costs 1.2 times higher per acre compared to Q4. Third, coffee income translates into stark welfare differences. The average household income per adult equivalent per day is estimated at KSh 109, with disparities across production scales (Q1 smallholders earn around KSh 72 per day vs. KSh 173 for those in Q4) and significant regional differences (farmers in Nyeri county earn about KSh 131 daily compared to KSh 74 in Murang'a). Last, coffee's contribution to household income shows huge variation with respect to area quartiles, ranging from 22 percent to 60 percent, and on average contributes to 45 percent of total household income.

Figure 3 visualizes how coffee smallholder households progress from gross coffee revenue to total income by capturing both the main sources of earnings and the key cost involved in the net income buildup. Naturally, coffee constitutes the primary revenue stream, averaging KSh 50,733, yet substantial portions of this amount are allocated to inputs (e.g., fertilizers and pesticides) and labor, which together represent the largest cost categories, leading to a net coffee income of KSh 38,522 on average, as shown in Table 1.

Table 1. Overview of production characteristics and income levels of coffee smallholders

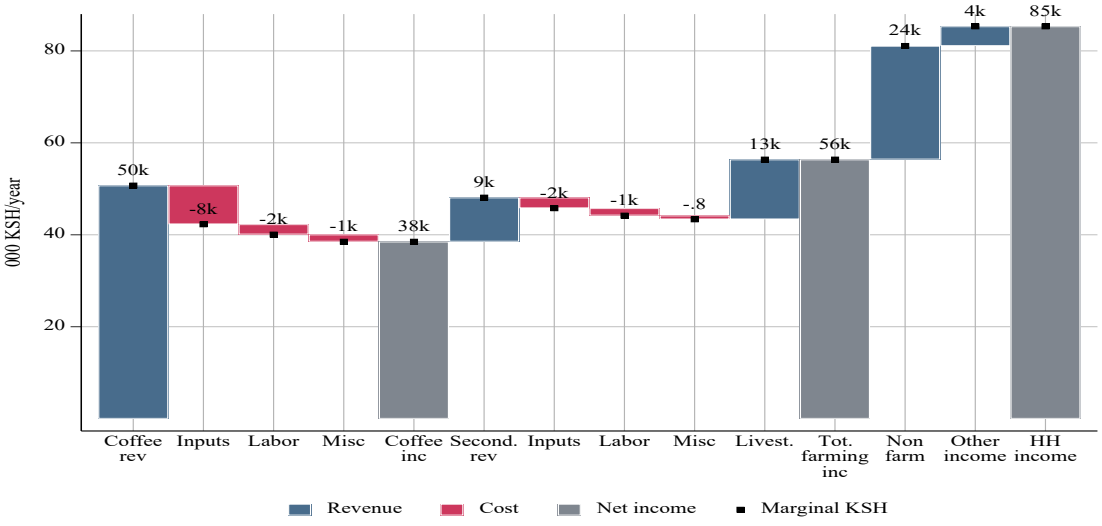
	Overall	Coffee area quartiles				Counties	
		Q1	Q2	Q3	Q4	Murang'a	Nyeri
Sociodemographic characteristics							
HH size	3.3	3.5	3	3.2	3.5	3.7	3.1
HH size in adult equivalent	2.4	2.6	2.2	2.4	2.5	2.7	2.3
Female-headed HH (%)	29.1	31.7	36.6	23.8	22.2	30.4	28.2
Age of head	61	60	64	64	58	60	62
Education of HH head (%)							
Never attended school	7.8	5	12.2	11.9	2.8	7.2	8.2
Primary	51.4	53.3	58.5	47.6	44.4	49.3	52.7
Secondary	31.3	35	24.4	31	33.3	34.8	29.1
Tertiary	9.5	6.7	4.9	9.5	19.4	8.7	10
Coffee production, area, and yields							
Harvest (kg)	541	219	371	629	1162	501	567
Area (acre)	0.46	0.14	0.25	0.45	1.23	0.55	0.41
Yield (kg/acre)	1,497	1,763	1,482	1,360	1,231	1,229	1,667
Coffee sales, cost of production, net income							
Gross revenue (KSh)	50,733	19,292	34,446	60,845	109,136	42,086	56,185
Production costs (KSh)	12,211	6,276	8,672	10,713	27,617	13,105	11,647
Unit costs (KSh/kg)	*22.6*	*28.7*	*23.4*	*17.0*	*23.8*	*26.2*	*20.5*
Net coffee income (KSh)	38,522	13,016	25,774	50,133	81,519	28,981	44,538
Unit net income (KSh/kg)	*71.2*	*59.4*	*69.5*	*79.7*	*70.2*	*57.8*	*78.6*
Coffee price (KSh/kg)	89.2	86.6	88.3	92.6	90.4	79.9	95
Other farm income							
Levels of net income, total and per capita							
Total household income	85,339	58,436	75,895	89,386	135,562	65,681	97,735
Total household income per AE	39,886	26,301	36,581	42,254	63,260	27,132	47,930
Income per AE/per day	109.3	72.1	100.2	115.8	173.3	74.3	131.3
# of observations	181	61	41	42	37	70	111

Source: Survey of coffee-producing smallholders in Kenya (IFPRI 2023).
Note: AE =Adult Equivalent; HH = household; Q = quartile.

The figure also highlights secondary on-farm revenue sources (such as livestock or other crops) that lift net farming income to KSh 56,383, underscoring the importance of agricultural diversification in mitigating potential losses from coffee. Finally, non-farm income pushes total household income to KSh 85,339 on average, demonstrating how off-farm activities can serve as an additional buffer against agricultural risks. Overall, coffee contributes 69 percent of farming income, and livestock contributes

23 percent, while secondary crops contribute less than 10 percent. From the data, we also find that despite 11 percent of smallholders reporting a negative net coffee income, only 1 percent experience negative net farming income, indicating that additional on-farm activities play a critical role in stabilizing overall agricultural earnings.

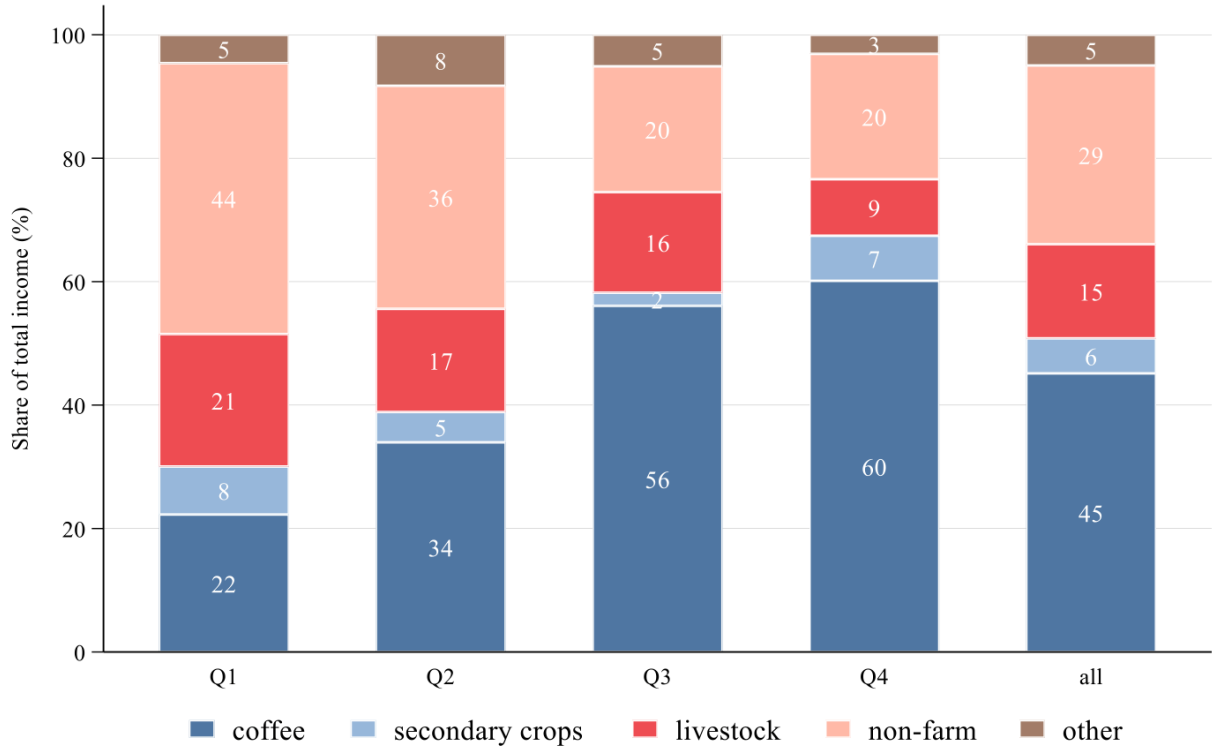
Figure 3. Building up of coffee smallholder net income



Source: Survey of coffee-producing smallholders in Kenya (IFPRI 2023).
Note: HH = household.

Figure 4 provides a breakdown of households' income structure across different quartiles of coffee area. For smaller coffee growers (Q1), coffee represents a comparatively modest share of total income (22 percent), with livestock (21 percent) and non-farm activities (44 percent) jointly playing a more significant role. As we move toward larger coffee growers (Q4), coffee's contribution rises sharply, reaching about 60 percent of total income, while reliance on livestock and off-farm sources declines. This pattern shows that farm size is a key determinant of income structure: Households with limited coffee acreage tend to diversify more intensively into livestock and non-farm activities, whereas those with larger coffee areas place greater emphasis on coffee production. It also suggests that while larger coffee growers can benefit directly from interventions that boost coffee productivity or improve market access, smaller producers may need a broader approach that recognizes the importance of multiple income streams, already underscoring the dual importance of coffee-focused policies and diversification efforts, as both are likely to play a role in achieving sustainable livelihoods across different farm sizes. Additional statistics on the structure and components of costs and income by quartiles of area are available in the Appendix (Figure A 1–4).

Figure 4. Full structure of coffee smallholder income, by quartiles of area



Source: Survey of coffee-producing smallholders in Kenya (IFPRI 2023).

5 Empirical findings

5.1. An assessment of the living income gap among coffee smallholders

The analysis now turns to the question of whether smallholder coffee farmers in our sample earn enough income to secure a decent standard of living. In this process, we rely on three benchmarks. First, we use an LIB of KSH 312 per person per day, derived from recent Anker (2023) estimates that factor in the full cost of a dignified livelihood standard in rural Kenya. Second, we consider the absolute poverty line at KSH 184, established by the World Bank (2023) as the threshold below which individuals do not meet basic daily consumption needs. Third, we include the extreme poverty line at KSH 107, also defined by the World Bank (2023), indicating a severe level of deprivation in which households often face acute food insecurity (Table 2).

Table 2. Living income benchmark and poverty lines

	Living income benchmark (*) (Anker 2023)		Rural absolute poverty line (**) (World Bank 2023)		Rural extreme poverty line (**) (World Bank 2023)	
	Month	Day	Month	Day	Month	Day
Income per capita per day	9,508	**312**	5,506	**184**	3,252	**107**

Source: Survey of coffee-producing smallholders in Kenya (IFPRI 2023).
Note: (*) Medinaceli et al. (2023), Living Wage Update Report (Kenya): KSH 47,541 (cost of decent standard of living for a family of five). (**) World Bank (2023) 2021 poverty lines temporally deflated for 2023.

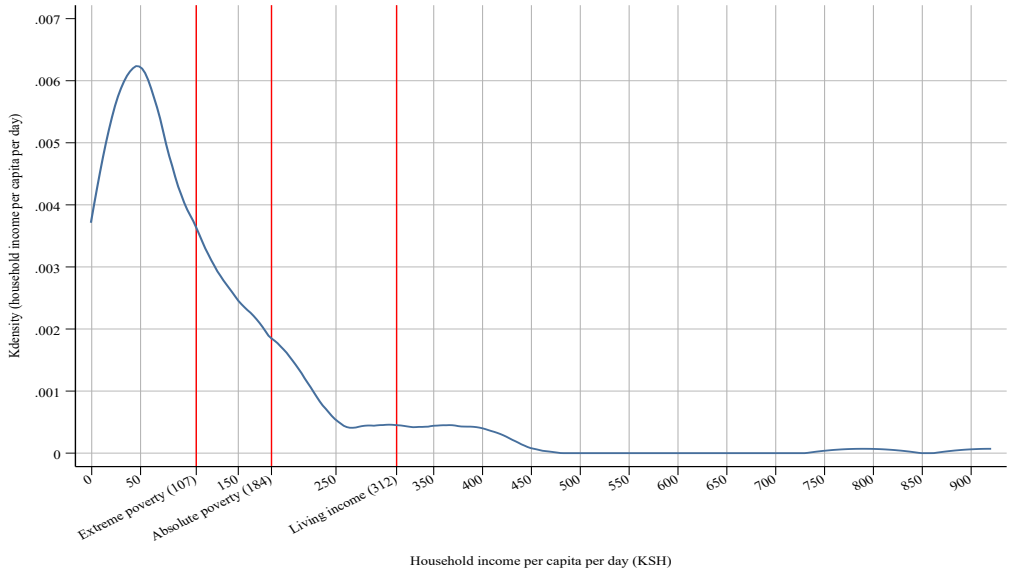
Figures 5a, and 5b illustrate the distribution of per capita household income relative to these three benchmarks. Figure 5a presents the kernel density function, with the horizontal axis representing daily household income per capita (in KSh) and the red vertical lines marking the EPL (KSh 107), APL (KSh 184), and LIB (KSh 312). The distribution peaks sharply below the APL, revealing a substantial concentration of households earning very low incomes.

Figure 5b shows the corresponding empirical cumulative distribution function (ECDF), which is a non-parametric statistical tool that represents the cumulative probability distribution of a dataset. It describes the proportion of observations that fall at or below a given value and is commonly used in analyzing income distribution. Indeed, for a given welfare benchmark or threshold, the function indicates what proportion of individuals earn up to this level.

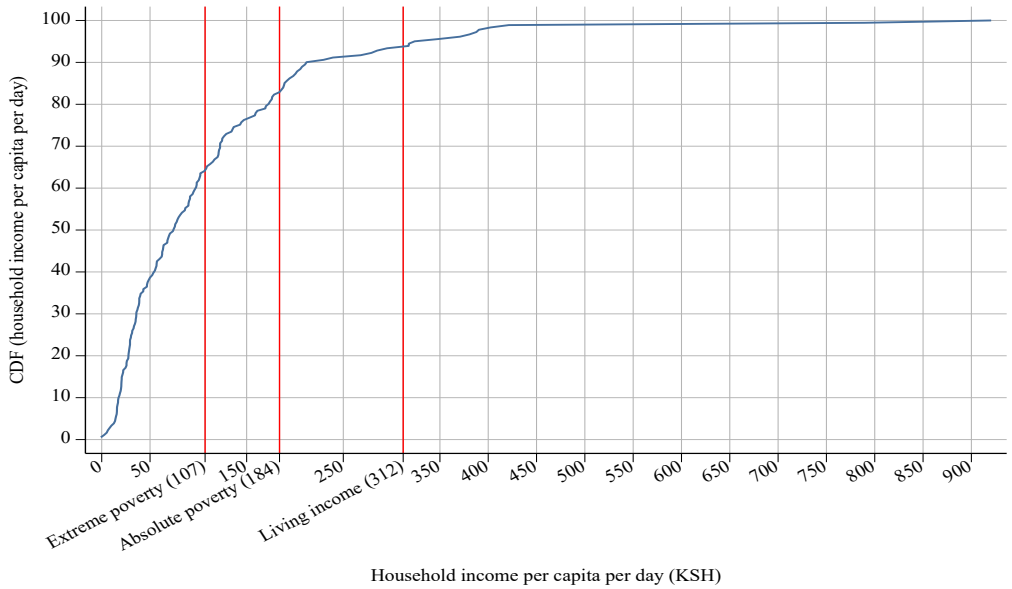
Figure 5b shows that it is even more evident that a significant share of households falls below the EPL, an even larger share remains under the APL, and a majority do not reach the LIB of KSh 312. These results underscore the persistent challenges coffee smallholders face in achieving an income that covers basic needs, let alone the more comprehensive expenses encompassed by a living income standard of living.

Figure 5. Coffee farmers' income distribution

(a) Coffee farmers' income distribution (with benchmarks), household income per capita per day



(b) Empirical cumulative distribution function (with benchmarks), smallholder income per capita per day



Sources: Survey of coffee-producing smallholders in Kenya (IFPRI 2023). Medinaceli et al. (2023), Living Wage Update Report (Kenya): World Bank (2023).

We now examine the LIS associated with those welfare benchmarks. Results presented in the first part of Table 3, focusing on the percentage of households that fall below the three benchmarks, show that overall, while 64 percent of households fall below the extreme poverty line (EPL), an even larger proportion (93 percent) do not reach the LIB, indicating that most coffee smallholders are struggling to achieve a decent standard of living.

The situation varies by region and by quartile of coffee land area. In Murang'a County, the challenges are particularly severe, with nearly 99 percent of smallholders living below the LIB and more than 74 percent classified as being in extreme poverty. In comparison, smallholders in Nyeri, although facing significant hardships, show somewhat lower incidence rates, with approximately 90 percent below the LIB and only about 58 percent in extreme poverty. The breakdown by quartiles reveals a correlation between land area and living income status. Households in the smallest land quartile (Q1) experience the highest rates, with over 97 percent failing to achieve a living income and roughly 77 percent in extreme poverty. As the size of the coffee area increases, both rates tend to decline. For instance, while 87 percent of the largest holders (Q4) still live below the LIB, their EPL is only about 43 percent.

Table 3. Living income status of coffee smallholders

	Overall	Coffee area quartiles				Counties	
		Q1	Q2	Q3	Q4	Murang'a	Nyeri
% Below benchmark (coffee farmers)							
Living income benchmark (Anker 2023)	93.4	96.7	97.6	90.5	86.5	98.6	90.1
Rural absolute poverty line (World Bank 2023)	82.9	95.1	85.4	78.6	64.9	88.6	79.3
Rural extreme poverty line (World Bank 2023)	64.1	77.0	58.5	69.0	43.2	74.3	57.7
% Living income gap (shortfall portion)							
Living income benchmark (Anker 2023)	65.0	76.9	67.9	62.9	44.5	76.2	57.9
Rural absolute poverty line (World Bank 2023)	40.6	60.8	45.5	37.1	5.8	59.6	28.6
Rural extreme poverty line (World Bank 2023)	-2.1	32.7	6.3	-8.2	-62.0	30.5	-22.7
# of observations	181	61	41	42	37	70	111

Source: Survey of coffee-producing smallholders in Kenya (IFPRI 2023).

The second part of the table presents the magnitude of the LIG, which quantifies the average shortfall of smallholders' incomes from the respective benchmarks, computed based on the gap of the mean income. Overall, smallholders fall short of the LIB by an average of 65 percent, indicating a substantial gap between actual earnings and the income required for a decent standard of living. Similarly, the gaps for the rural absolute and EPLs are 41 percent and -2.1 percent, respectively. A negative percentage gap in this context (observed among the larger coffee land holders) means that, on average, smallholders' incomes for those groups exceed the benchmark, in this case, the EPL. Essentially, this negative gap shows that, on average, smallholder incomes are not falling below the threshold of extreme poverty, even though they remain far from reaching higher standards of living as defined by the LIB. Disaggregated by coffee area quartiles, the smallest holders (Q1) exhibit once again the largest gaps, while the largest holders (Q4) show the smallest gaps. Overall, these dual measures not only

reveal the high incidence of income inadequacy among coffee smallholders but also underscore the significant depth of the shortfalls.

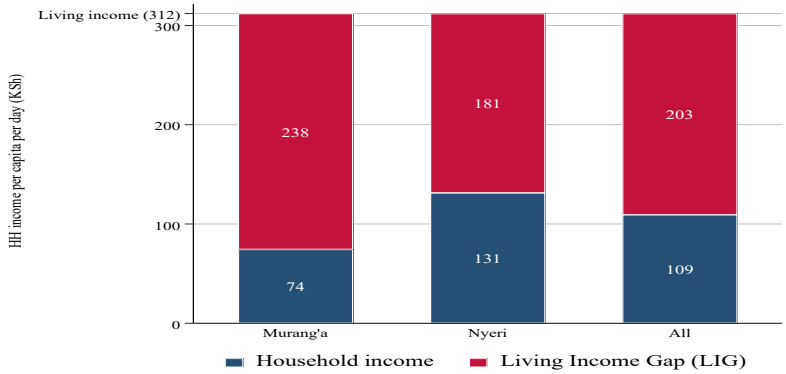
Focusing on the LIB and the gap in levels, Figure 6a to 6c illustrate the shortfall in KSh from the LIB of 312 (in red) and the actual income earned on average (in blue) for all households and by coffee area quartiles (Figure 6a), counties (6b), and non-farm diversification status (6c).

Overall, households earn an average of 109 KSh per day, meaning they fall short by 203 KSh. This gap is not just an abstract figure; it represents the tangible daily deficit that prevents households from covering essential needs to be able to enjoy a decent standard of living. The disparity becomes even more pronounced when examining land size: Figure 6a shows that households in the smallest quartile (Q1) earn only 72 KSh per day, resulting in a 240 KSh gap, while those in the largest quartile (Q4) manage 173 KSh per day, narrowing the gap to 139 KSh. Further analysis by county (Figure 6b) reveals regional differences. In Murang'a, households earn an average of 74 KSh per day, which translates to a 238 KSh shortfall, whereas in Nyeri, the average income is higher at 131 KSh per day, reducing the gap to 181 KSh. Although Nyeri performs better, both counties remain significantly below the benchmark, highlighting persistent challenges that cut across regions. Figure 6c also focuses on the effect of income diversification. Households that do not engage at all in non-farm activities earn about 79 KSh per day, creating a gap of 233 KSh, while those that diversify into non-farm work earn 163 KSh, thereby reducing the deficit to 149 KSh. This suggests that diversification offers a meaningful boost, but currently, it is insufficient on its own to achieve a living income. Overall, while increased land holdings, regional advantages, and income diversification all contribute to narrowing the income gap, none of these factors singularly bridges the deficit.

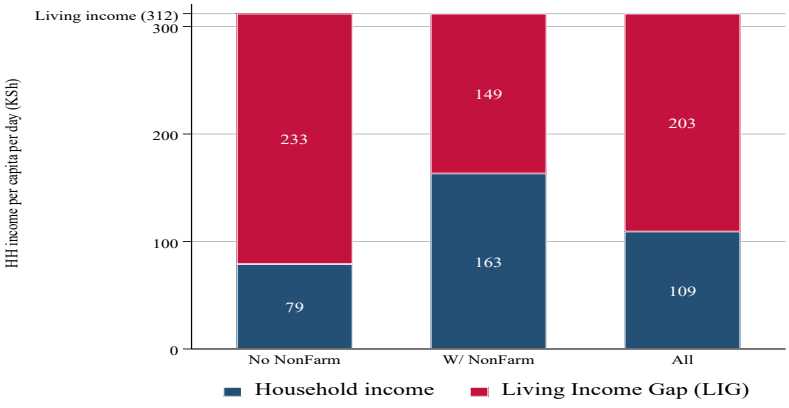
Figure 6. Income earned and living income gaps (KSh)

(a) By quartiles of coffee area

(b) By county



(c) By non-farm status



Source: Survey of coffee-producing smallholders in Kenya (IFPRI 2023).

5.2. Sensitivity Analysis

In this section, we examine how the LIS responds to changes in key parameters related to coffee production and household income, providing a more nuanced understanding of the factors that could potentially narrow or widen the percentage of households below the welfare benchmarks. Specifically, we evaluate alternative farmgate coffee prices, including a derived "true producer price" that incorporates environmental and social externalities, a doubling farm gate price, and different yield growth scenarios, ranging from modest increases to a full doubling yield. The level that defines the "true price scenario" is a 60 percent increase over the baseline producer price.[8]

Those parameters are analyzed under two alternative diversification scenarios: one in which non-coffee income remains unchanged, versus one in which it increases by 50 percent, thereby offering a comprehensive view of how shifts in both on-farm and off-farm conditions might influence smallholders' ability to achieve a living income. Maintaining the same levels of disaggregation, the analysis also explores whether these results vary by county and by area of land devoted to coffee.

Results reported in Table 4 show that under diversification scenario 1, in which non-coffee income remains constant at the baseline coffee farmgate price, approximately 93 percent of households fall below the LIB (reference point). When the price is adjusted upward to the "true price" level, this proportion drops to around 88 percent, and with a doubling of the price, decreases further to about 85 percent. A similar trend is observed when examining yield improvements: *Ceteris paribus*, moving from the base yield to a 25 percent increase, reduces the proportion of households below the LIB from 93 percent to roughly 92 percent, while a 100 percent increase (doubling) in yield lowers it to around 86 percent. Combining enhancements in coffee prices and yields, with no growth in non-coffee income, the best-case scenario of doubling both prices and yields leads to a drop in the incidence of smallholders below the LIB to 72 percent, a proportion that is still relatively high. And while better farmgate prices and yield growth lead to the drop in smallholders living below the LIB threshold, the effects remain relatively small for smallholders cultivating small areas of coffee (Q1) and even nonexistent if yields increase but farmgate prices remain unchanged. However, at a higher production scale (Q4), the combined effects of prices and yields are significantly stronger. At the county level, the effects are much stronger in Nyeri overall when compared to Murang'a. For instance, under the double farmgate price and alternative yield growth scenario, the proportions of smallholders below LIB levels fall 8 percentage points (from 91 percent to 83 percent) in Muranga, and 17 percentage points (from 82 percent to 65 percent) in Nyeri.

Under diversification scenario 2, in which non-coffee income is assumed to increase by 50 percent, the improvements are even more pronounced. In this case, the true price scenario sees the proportion of households below the LIB falling to 85 percent compared to the baseline price, and to 72 percent

[8] This level is used because we assume the same proportion of the "true price gap" (social and environmental costs) as a share of "true price" ("retail price" + "true price gap") of coffee per kilogram found at the retail level in the study by Impact Institute (2023). While this may be a strong assumption, it serves to set an intermediary level in the range of price scenarios being considered.

if yields are doubled. Doubling prices and yields leads to an incidence of smallholders below the LIB at 67 percent, which is relatively lower than without growth in non-coffee income. This result underscores the importance of income diversification, in addition to higher productivity and prices to improve the living standards of coffee smallholders. Similar conclusions can be reached when considering the percentage of households under the APL (Appendix Table A1) and the EPL (Appendix Table A2) under those different scenarios.

Table 4. Sensitivity analysis: LIS of coffee smallholders (% below LIB)

	Overall	Coffee area quartiles				Counties	
		Q1	Q2	Q3	Q4	Murang'a	Nyeri
% Below LIB / Scenario 1: No growth in non-coffee income							
Farmgate base price							
Baseline yield	93.4	96.7	97.6	90.5	86.5	98.6	90.1
10% increase yield	93.4	96.7	97.6	90.5	86.5	98.6	90.1
25% increase yield	91.7	96.7	97.6	85.7	83.8	98.6	87.4
50% increase yield	89.5	96.7	97.6	83.3	75.7	95.7	85.6
Double yield	85.6	96.7	90.2	81.0	67.6	91.4	82.0
Farmgate TCA price (60%) (*)							
Baseline yield	88.4	96.7	97.6	83.3	70.3	94.3	84.7
10% increase yield	86.7	96.7	92.7	81.0	70.3	92.9	82.9
25% increase yield	85.6	96.7	90.2	81.0	67.6	91.4	82.0
50% increase yield	83.4	95.1	87.8	81.0	62.2	88.6	80.2
Double yield	77.9	93.4	85.4	69.0	54.1	85.7	73.0
Farmgate double price							
Baseline yield	85.6	96.7	90.2	81.0	67.6	91.4	82.0
10% increase yield	84.0	95.1	87.8	81.0	64.9	88.6	81.1
25% increase yield	82.9	95.1	85.4	81.0	62.2	88.6	79.3
50% increase yield	79.6	95.1	85.4	71.4	56.8	88.6	73.9
Double yield	71.8	90.2	78.0	61.9	45.9	82.9	64.9
% Below LIB / Scenario 2: 50% growth in non-coffee income							
Farmgate base price							
Baseline yield	91.2	95.1	92.7	88.1	86.5	97.1	87.4
10% increase yield	90.1	95.1	92.7	85.7	83.8	97.1	85.6
25% increase yield	89.5	95.1	92.7	85.7	81.1	97.1	84.7
50% increase yield	86.2	95.1	92.7	83.3	67.6	91.4	82.9
Double yield	81.2	93.4	85.4	78.6	59.5	85.7	78.4
Farmgate TCA price (60%) (*)							
Baseline yield	85.1	95.1	87.8	83.3	67.6	91.4	81.1
10% increase yield	84.5	95.1	87.8	81.0	67.6	90.0	81.1
25% increase yield	81.2	93.4	85.4	78.6	59.5	85.7	78.4
50% increase yield	79.6	91.8	82.9	78.6	56.8	85.7	75.7
Double yield	72.4	88.5	75.6	69.0	45.9	84.3	64.9
Farmgate double price							
Baseline yield	81.2	93.4	85.4	78.6	59.5	85.7	78.4
10% increase yield	79.6	91.8	82.9	78.6	56.8	85.7	75.7
25% increase yield	77.9	90.2	80.5	76.2	56.8	85.7	73.0
50% increase yield	73.5	88.5	75.6	69.0	51.4	84.3	66.7
Double yield	66.9	86.9	70.7	59.5	37.8	77.1	60.4
# of observations	181	61	41	42	37	70	111

Source: Survey of coffee-producing smallholders in Kenya (IFPRI 2023).
Note: LIB = living income benchmark; LIS = living income status; TCA = True Cost Accounting.

6 Conclusions and policy implications

Coffee plays a significant role in Kenya's agricultural sector, contributing to export earnings, employment, and rural livelihoods. It accounts for approximately 1 percent of the country's GDP and 8 percent of total agricultural export earnings and employs up to 30 percent of the agricultural labor force. Production is concentrated in Central Kenya. The two counties selected for this analysis, Nyeri and Murang'a, rank among the top three in production volume, number of coffee cooperatives, and processing factories. This study provides a comprehensive assessment of the LIS of smallholder coffee farmers in Central Kenya, based on survey data collected from 181 coffee farmers, 41 cooperatives, and 181 farm workers in Nyeri and Murang'a counties. It examines the extent to which smallholders' incomes align with defined LIBs and poverty thresholds, while also exploring how different farmgate price and yield scenarios, as well as different degrees of income diversification, affect these outcomes.

Findings reveal that about 93 percent of the coffee farmers earn a living below the LIB. The average smallholder income remains significantly below the LIB of 312 KSh per day, with farmers earning only 109 KSh on average, just 35 percent of what is required for a decent standard of living (or a 65 percent LIG). The LIG is particularly pronounced in Murang'a, where virtually all households (99 percent) are below the LIB, and smallholders earn only 74 KSh per day (24 percent of the LIB, or a 76 percent LIG), compared to Nyeri, where 90 percent of coffee smallholders are below the LIB, and average earnings reach 131 KSh per day (42 percent of the LIB, or a 58 percent LIG).

Land size emerges as a key factor associated with income levels, with farmers in the smallest coffee landholding quartile (Q1) earning an average of 72 KSh per day, compared to 173 KSh for those in the largest quartile (Q4). However, even among the largest landholders, over 87 percent still fall below the LIB. Similarly, diversification into non-farm activities appears to improve incomes but remains insufficient to bridge the gap fully. When considering alternative benchmarks, such as the APL and EPL, the prevalence of poverty among coffee-growing households remains high, with 64 percent of farmers earning below the EPL. Again, the situation is more severe in Murang'a, where over 74 percent of smallholders live in extreme poverty, compared to Nyeri, where 58 percent fall below this threshold. While larger landholders tend to have higher incomes, 43 percent of those in the highest quartile still live in extreme poverty, highlighting structural constraints beyond land size.

Overall, these findings underscore the significant challenges faced by coffee smallholders in attaining a living income. Despite coffee's economic importance, the current production and price structures leave most farmers struggling to meet basic needs. Addressing this gap will require a multifaceted approach that includes higher farmgate prices, improved productivity, income diversification, and broader structural interventions within the coffee sector and beyond.

The sensitivity analysis reveals that the LIS is highly responsive to improvements in coffee farmgate prices and yield levels, though even the best-case scenarios leave a significant LIG. Under the baseline price, doubling yields reduces the percentage of smallholders below the LIB, from 93 percent to 87 percent. At the "true price" scenario level, doubling yields further lowers it to approximately 78 percent. In the optimal scenario, in which both prices and yields are doubled, the incidence of

smallholders below the LIB drops to 72 percent. Notably, when non-coffee income grows by 50 percent, the impact of these on-farm improvements is amplified: At baseline prices, doubling yields reduces the share from 91 percent to 81 percent, and at the "true price," the proportion falls to 72 percent when yields are doubled. With both prices and yields doubled under this scenario, the percentage of smallholders below the LIB declines further, to 67 percent. These findings indicate that while improvements in prices and yields can significantly narrow the LIG, especially among larger landholders, their effect is greatly enhanced when combined with non-coffee income growth, underscoring the importance of a diversified strategy to lift smallholder living standards.

The policy recommendations emerging from this study advocate for a comprehensive, layered strategy to sustainably close the LIG among coffee smallholders. First, there is a clear call to strengthen coffee production and stabilize prices and improve yields through policies and program initiatives that improve access to resources, reduce production costs, and support productivity-enhancing measures such as sustainable input supply, agricultural extension and training, and climate change adaptation measures. Second, the development of robust coffee markets and value chains should be emphasized, with a focus on risk minimization and sharing in the value chain, aimed at reducing transaction costs, enhancing traceability, and establishing long-term trade relationships that reward quality and sustainability through fair pricing and trading practices—that is, premiums for quality/certification, and acknowledgment of compliance with sustainability standards.

Third, because for many smallholders it is virtually impossible to reach a living income standard through coffee alone, there is an urgent need to enable both agricultural and non-agricultural diversification. This involves supporting livelihood transitions, whether through value addition, crop diversification, or enhanced non-farm opportunities, and reinforcing job creation strategies through targeted public sector interventions such as educational and vocational training. Finally, it is important to stress the significance of fostering institutional coordination and improving the regulatory framework aimed at creating an enabling business environment, empowering farmer organizations, and investing in critical infrastructure.

When compared with analyses from the cocoa sector in West Africa, specifically the work by Adams et al. (2023) and Boysen et al. (2023), several insights emerge. Adams et al. highlight that while measures like the LID in Ghana can raise producer prices, their effectiveness is limited if they overlook the diversity of farmers and the broader sustainability trade-offs, such as increased deforestation. Similarly, Boysen et al. caution that without complementary supply management and strong backing from chocolate manufacturers, price-based interventions in Côte d'Ivoire and Ghana might not deliver sustainable income improvements. In contrast, our coffee study not only acknowledges the importance of improved pricing and productivity but also places a stronger emphasis on income diversification and tailored support based on farmer typology. This nuanced approach suggests that interventions must go beyond price adjustments to include strategies that address structural differences in land holdings and socioeconomic characteristics.

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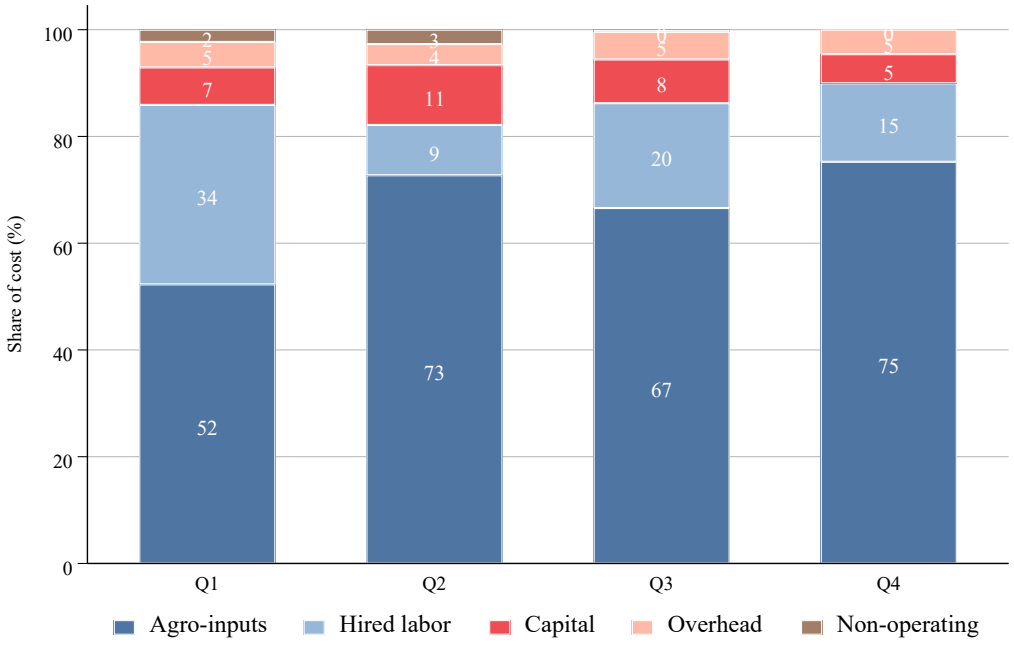
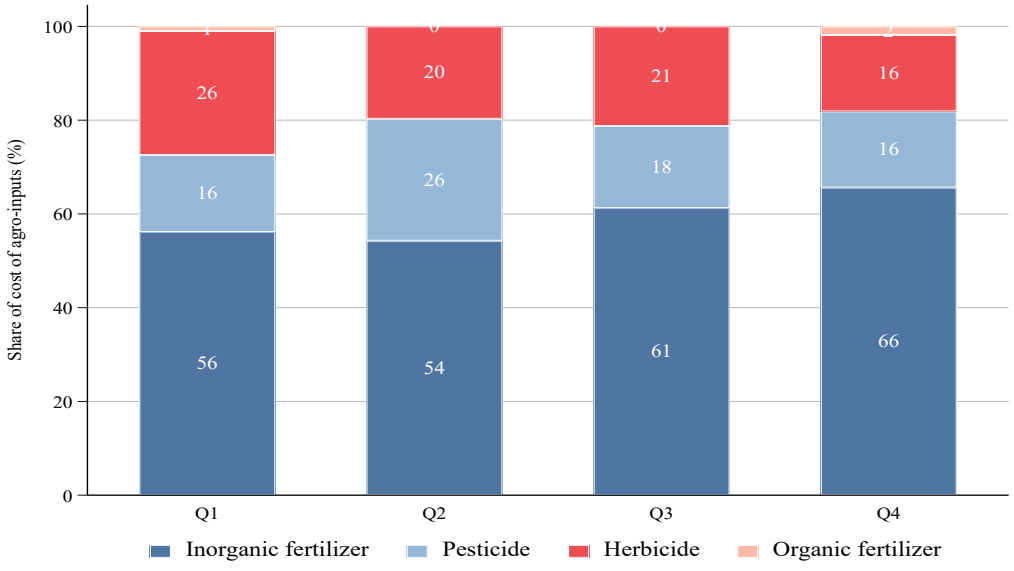
Appendix

Figure A1. Structure of costs (coffee), by quartiles of area



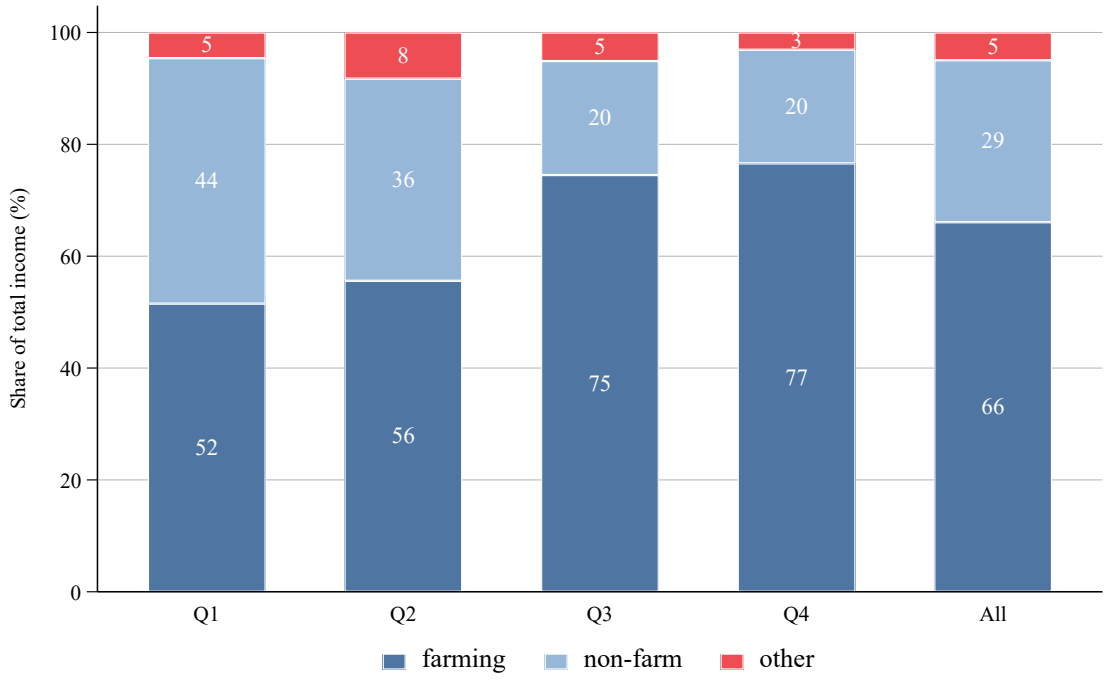
Source: Survey of coffee-producing smallholders in Kenya (IFPRI 2023).

Figure A2. Components of cost of agro-inputs (coffee), by quartiles of area



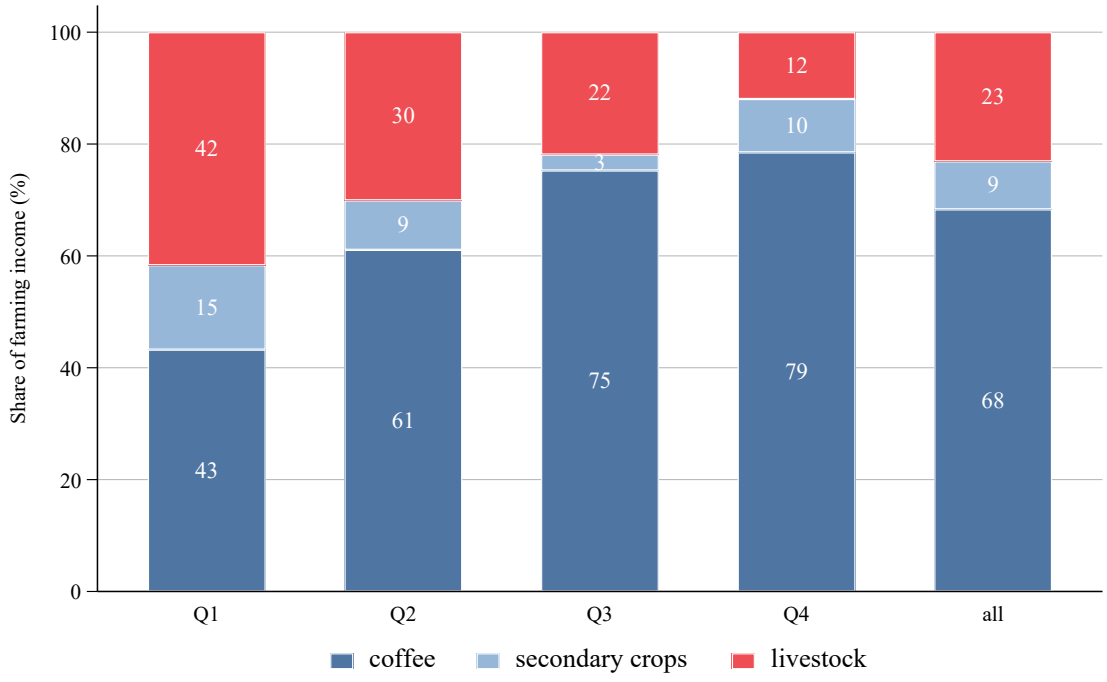
Source: Survey of coffee-producing smallholders in Kenya (IFPRI 2023).

Figure A3. Structure of total income, by quartiles of area



Source: Survey of coffee producing smallholders in Kenya, IFPRI (2023)

Figure A4. Composition of total farming income, by quartiles of area



Source: Survey of coffee producing smallholders in Kenya, IFPRI (2023)

Table A1. Sensitivity analysis: LIS of coffee smallholders (% below APL)

	Overall	Coffee area quartiles				Counties	
		Q1	Q2	Q3	Q4	Murang'a	Nyeri
% Below APL / SCENARIO 1: No growth in non-coffee income							
Farmgate base price							
Baseline yield	82.3	93.4	85.4	78.6	64.9	88.6	78.4
10% increase yield	80.7	91.8	82.9	78.6	62.2	88.6	75.7
25% increase yield	79.0	90.2	82.9	78.6	56.8	85.7	74.8
50% increase yield	76.2	88.5	78.0	76.2	54.1	85.7	70.3
Double yield	70.7	88.5	68.3	69.0	45.9	84.3	62.2
Farmgate TCA price (60%) (*)							
Baseline yield	75.7	88.5	78.0	73.8	54.1	85.7	69.4
10% increase yield	73.5	88.5	73.2	71.4	51.4	84.3	66.7
25% increase yield	70.7	88.5	68.3	69.0	45.9	84.3	62.2
50% increase yield	64.1	83.6	61.0	59.5	40.5	77.1	55.9
Double yield	53.6	72.1	53.7	50.0	27.0	67.1	45.0
Farmgate double price							
Baseline yield	70.7	88.5	68.3	69.0	45.9	84.3	62.2
10% increase yield	66.9	85.2	65.9	64.3	40.5	80.0	58.6
25% increase yield	61.9	82.0	61.0	57.1	35.1	74.3	54.1
50% increase yield	55.2	72.1	58.5	52.4	27.0	68.6	46.8
Double yield	48.6	70.5	41.5	42.9	27.0	67.1	36.9
% Below APL / SCENARIO 2: 50% growth in non-coffee income							
Farmgate base price							
Baseline yield	74.6	80.3	75.6	78.6	59.5	81.4	70.3
10% increase yield	74.0	80.3	73.2	78.6	59.5	81.4	69.4
25% increase yield	72.9	80.3	73.2	78.6	54.1	80.0	68.5
50% increase yield	66.3	80.3	58.5	71.4	45.9	75.7	60.4
Double yield	60.8	78.7	58.5	57.1	37.8	71.4	54.1
Farmgate TCA price (60%) (*)							
Baseline yield	66.3	80.3	58.5	71.4	45.9	75.7	60.4
10% increase yield	65.2	80.3	58.5	69.0	43.2	74.3	59.5
25% increase yield	60.8	78.7	58.5	57.1	37.8	71.4	54.1
50% increase yield	56.4	75.4	56.1	52.4	29.7	70.0	47.7
Double yield	46.4	63.9	39.0	45.2	27.0	64.3	35.1
Farmgate double price							
Baseline yield	60.8	78.7	58.5	57.1	37.8	71.4	54.1
10% increase yield	58.0	78.7	56.1	52.4	32.4	71.4	49.5
25% increase yield	55.2	73.8	53.7	52.4	29.7	70.0	45.9
50% increase yield	49.2	67.2	46.3	45.2	27.0	65.7	38.7
Double yield	43.6	63.9	34.1	40.5	24.3	61.4	32.4
# of observations	181	61	41	42	37	70	111

Source: Survey of coffee producing smallholders in Kenya (IFPRI 2023).
Note: APL = absolute poverty line; LIB = living income benchmark; LIS = living income status; TCA = True Cost Accounting.

Table A2. Sensitivity analysis: LIS of coffee smallholders (% below EPL)

	Overall	Coffee area quartiles				Counties	
		Q1	Q2	Q3	Q4	Murang'a	Nyeri
% Below EPL / SCENARIO 1: No growth in non-coffee income							
Farmgate base price							
Baseline yield	64.1	77.0	58.5	69.0	43.2	74.3	57.7
10% increase yield	62.4	75.4	58.5	64.3	43.2	74.3	55.0
25% increase yield	57.5	73.8	56.1	52.4	37.8	72.9	47.7
50% increase yield	53.6	68.9	53.7	52.4	29.7	68.6	44.1
Double yield	46.4	63.9	39.0	45.2	27.0	64.3	35.1
Farmgate TCA price (60%) (*)							
Baseline yield	53.0	67.2	53.7	52.4	29.7	68.6	43.2
10% increase yield	49.2	63.9	46.3	47.6	29.7	65.7	38.7
25% increase yield	46.4	63.9	39.0	45.2	27.0	64.3	35.1
50% increase yield	43.1	62.3	31.7	40.5	27.0	61.4	31.5
Double yield	33.7	50.8	24.4	31.0	18.9	51.4	22.5
Farmgate double price							
Baseline yield	46.4	63.9	39.0	45.2	27.0	64.3	35.1
10% increase yield	44.8	63.9	34.1	42.9	27.0	62.9	33.3
25% increase yield	42.5	62.3	29.3	40.5	27.0	61.4	30.6
50% increase yield	35.4	55.7	24.4	31.0	18.9	54.3	23.4
Double yield	29.8	49.2	17.1	28.6	13.5	47.1	18.9
% Below EPL / SCENARIO 2: 50% growth in non-coffee							
Farmgate base price							
Baseline yield	56.9	72.1	46.3	61.9	37.8	72.9	46.8
10% increase yield	53.6	68.9	46.3	54.8	35.1	70.0	43.2
25% increase yield	50.3	67.2	43.9	50.0	29.7	67.1	39.6
50% increase yield	47.5	63.9	39.0	50.0	27.0	65.7	36.0
Double yield	43.1	60.7	34.1	42.9	24.3	60.0	32.4
Farmgate TCA price (60%) (*)							
Baseline yield	44.2	60.7	36.6	42.9	27.0	60.0	34.2
10% increase yield	44.2	60.7	36.6	42.9	27.0	60.0	34.2
25% increase yield	43.1	60.7	34.1	42.9	24.3	60.0	32.4
50% increase yield	37.0	57.4	24.4	35.7	18.9	55.7	25.2
Double yield	31.5	49.2	24.4	26.2	16.2	47.1	21.6
Farmgate double price							
Baseline yield	43.1	60.7	34.1	42.9	24.3	60.0	32.4
10% increase yield	39.8	59.0	31.7	38.1	18.9	57.1	28.8
25% increase yield	35.9	55.7	24.4	33.3	18.9	52.9	25.2
50% increase yield	32.6	50.8	24.4	26.2	18.9	48.6	22.5
Double yield	26.5	44.3	17.1	23.8	10.8	41.4	17.1
# of observations	181	61	41	42	37	70	111

Source: Survey of coffee-producing smallholders in Kenya (IFPRI 2023).
Note: EPL = extreme poverty line; LIB = living income benchmark; LIS = living income status; TCA = True Cost Accounting.

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