



Impact evaluation: Pathways Out of Poverty program

Baseline Report

February 2025

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Executive Summary

This baseline report outlines the state of play on key outcome indicators for the Pathways Out of Poverty (POP) program, implemented by Raising the Village (RTV) between 2024 and 2026 in Uganda's Kitagwenda and Rakai districts. The POP program seeks to improve the economic well-being of ultra-poor coffee farming communities in these districts through a comprehensive graduation approach. The program focuses on increasing agricultural productivity, addressing barriers to development by unlocking time and resources, and creating opportunities to access resources and affordable credit for agriculture/livestock and small businesses, and strengthening local capacities and structures. This baseline report marks the first step in a broader impact evaluation that aims to assess the causal effects of the program on coffee farming households' income, poverty reduction, and quality of life.

The evaluation of the POP program uses a stepped-wedge cluster-randomized controlled trial (RCT) to assess the causal impact of the program on participating coffee-farming households.

Key features of the evaluation's design:

Stepped-Wedge Approach:

- Parishes are organized into 6 cohorts of coffee-farming households, each comprising 7 parishes.
- Cohorts begin the program in staggered intervals every 6 months between July 2024 (Cohort 1) and July 2026 (Cohort 6).
- Future cohorts serve as comparison groups for earlier cohorts, ensuring rigorous causal analysis.

Random Assignment:

- The 42 parishes targeted by the program are randomly assigned to one of the 6 cohorts, determining their start date for the intervention.
- Cohort 6 remains a pure control cohort throughout the study, providing a baseline comparison group.

Implementation Timeline:

- Initially, all cohorts begin in the control condition.
- Over time, cohorts are transitioned ("crossed over") from control to intervention according to their assigned start date.

Key findings

Cohort-Level Differences

- **Female-headed households:** Higher proportion in cohorts 1 and 2 (22%) compared to cohorts 5 and 6 (11%).

- **Literacy rates:** Lower in cohort 1 (73%) but higher in cohort 5 (88%).
- **Consumption per day:**
 - Lowest in cohorts 3 and 4 (2.63 and 2.53 USD per capita, respectively).
 - Highest in cohorts 2 and 5 (3.52 and 3.08 USD per capita, respectively).
 - Differences are statistically significant.
- **Water access:** Use of improved water sources varies by cohort, from 37% in cohort 6 to 65% in cohort 2, though differences are not statistically significant.
- **Round-trip walking time to water source:** Significant differences by cohort and district, averaging 35 minutes.

Overall Findings

- **Household poverty, savings and debt:**
 - Mean household daily per capita consumption is 2.87 2017 PPP USD/day, with Kitagwenda and Rakai showing similar averages. Median consumption is 2.17 2017 PPP USD/day.
 - Income distribution is right-skewed, with more low-income households and fewer high-income ones.
 - 49.6% of households live below the poverty line (USD 2.15 per capita/day, 2017 PPP).
 - Cohort 2 and 5 report higher consumption and lower poverty depth relative to other cohorts. Poverty headcount is not statistically significant between cohorts.
 - Using Poverty Probability Index (PPI) to estimate poverty yields 24% prevalence which is substantially lower than 49.6% from consumption-based estimates. The lower estimate relative to the consumption-based poverty estimates can be explained by differences in:
 - *Measurement approach* – PPI uses predictive indicators (location, assets, education, housing material) that might underestimate transient poverty while consumption-based estimates measures household consumption directly.
 - *Recall period* – PPI uses fixed household characteristics which are less sensitive to short or medium-term economic changes. Consumption based estimates rely on clearly defined weekly, monthly and yearly timeframes.
 - *Under/over-reporting* - PPI might underreport poverty by missing informal economies or seasonal income variability. Consumption based poverty using the rapid consumption approach likely overestimates poverty (by underestimating consumption).

- Male-headed households report higher savings and debt levels than female-headed ones.
- **Agricultural Production and Income:**
 - Average farm size: 3.47 acres, allocated to coffee (1.3 acres), non-coffee crops (1.74 acres), livestock (0.16 acres), and other activities (0.33 acres).
 - Female and younger farmers manage smaller farms than male and older farmers.
 - Coffee generates higher revenues than other crops, contributing the majority of the average annual farming income (5.6 million UGX) even though non-coffee crops occupy larger farm land in acres.
 - Larger farms have higher total income but lower per-acre income due to reduced coffee productivity.
- **Quality of Life and Health:**
 - Average quality of life score: 4.42 on the Cantrill Ladder, with male heads rating higher than females.
 - Wealthier and younger households report a better quality of life.
 - Farm managers' health is generally reported as "Good" to "Fair," with wealthier households faring better.
 - Diarrhea prevalence:
 - Adults: 9% to 17% in the previous two weeks.
 - Children: 19% on average, varying by consumption quintile but not by cohort.
- **Water Access:**
 - 55% of households use improved water sources.
 - The round-trip walking time to access water sources varies significantly across cohorts and districts, averaging 35 minutes.
- **Methodological Insight:**
 - Consumption and poverty: Item-level imputation proves superior to aggregate-level imputation, particularly with limited observations per module.

Recommendations

The potential to lift coffee-farming households out of extreme poverty is 50% of participants measured using the 2.15 2017 USD PPP poverty thresholds. This figure reduces to 24% when using asset-based poverty measurements. Tracking both indicators, and not relying solely on PPI, is an important way of measuring changes in poverty given the disadvantages of asset-based measures.

Female-headed households face persistent disadvantages, highlighting the need for targeted support for this vulnerable group.

VSLA participation varies (37-59%), with a target of 60% – focused efforts are needed to boost engagement in lagging cohorts.

Inverse relationship between farm size and productivity presents an opportunity to incorporate intensive farming techniques, particularly for larger farms.

Successful randomization provides a solid foundation for measuring program impact, with attention to existing imbalances needed in midline and endline analyses.

1. Introduction

1.1 Objectives of this baseline report

The key objectives of this baseline report are as follows:

1. *Assess the state of play of key outcome indicators:* At baseline, we measure outcome indicators identified in the POP's theory of change (TOC), such as income levels, poverty rates, quality of life, and scarcity barriers.
2. *Provide formative insights for program improvement:* Offer guidance on how the POP program could better enhance the economic status of households in Rakai and Kitagwenda districts.
3. *Examine the role of coffee:* Since coffee production is a central focus of the intervention, we investigate the significance of coffee-related income and production for the targeted population.
4. *Validate the research design:* Assess whether the experimental design and randomization strategy successfully created balanced cohorts.

The evaluation of the POP program is structured as a stepped-wedge design. In this approach, clusters of villages (cohorts) are randomly assigned different enrollment dates. This design compares outcomes between those who have already received the intervention and those still waiting to participate (serving as a comparison group), while ensuring that all targeted communities benefit from the program by the end of the study period. Primary data collection for the evaluation includes planned large-scale household surveys at baseline (September 2024, this report), midline (September 2026), and endline (September 2028).

1.2 The POP program

Pathways Out of Poverty (POP) is a graduation program implemented by Raising the Village (RTV) to improve the livelihoods of the coffee farming communities through various strategies including access to inputs, capacity building, and activities to enable further income growth and diversification. Graduation programs provide an integrated, holistic approach by addressing multiple challenges simultaneously, such as skills training, asset transfer, and ongoing support, aimed at helping the poor escape the poverty trap.

According to RTV's logic model, the ultimate outcome of the program is to “*Enhance the economic well-being of last-mile, subsistence farmers living in ultra-poverty in Sub-Saharan Africa (SSA) by increasing household income and earnings to \$2 USD/day within 24 months*”

– with prioritization of the most vulnerable households, particularly those headed by women and youth.”¹

The program aims to reach 138,000 people (27,600 households) living in Kitagwenda and Rakai districts by 2026. The POP program is designed to be implemented from 2024 to 2026 using a cohort approach. Each cohort begins with the program in either January or July each year, with an average of 26,000 people. However, the inaugural Cohort 0, introduced in January 2024 (see **Table 1**), included 6,000 people. The RTV program targets all the households in the selected intervention villages with additional support for vulnerable households (women- and youth-led households).

Through the 24-month program, RTV will address the people living in these communities through three program pillars: (1) increasing agriculture productivity; (2) addressing barriers to development by unlocking time and resources, and creating opportunities to access resources and affordable credit for agriculture/livestock and small businesses; and (3) building local capacities and structures.

Some of the activities include agriculture training, access to inputs, establishing village savings and loans associations (VSLAs), and creating market linkage guidelines among others. The program is delivered in clusters of neighboring villages (typically 5-8 villages consisting of 4,000-5,000 program participants) that share social networks, resources, and infrastructure such as water sources and markets that help RTV build area-wide community cooperation while maximizing program resources. Each cluster usually represents a parish (the smallest administrative unit of Ugandan government). Field staff typically visit the clusters in the program four days per week during the implementation period, including at least one check-in with every household within the first six months.

To address the key objective of improvement in income through the three pillars, the POP program has identified indicators and targets that will be measured over the 24-months period. The primary objectives include:

1. Raising household income and production to at least USD 2.00 per day (2017 PPP).
2. Achieving a Poverty Probability Index (PPI) score of 22 or higher.
3. Ensuring that 60% of households report an improved quality of life after 24 months of intervention exposure

Annex 1 Table 1 lists the ultimate, intermediate and immediate outcomes, and outputs.

¹ Raising The Village. *Logframe Matrix*. 2023.

1.2.1 Building on evidence from graduation programs

The POP program's design builds on a robust body of evidence. The evidence from multiple rigorous evaluations of similar programs across different contexts yields promising results. Graduation programs, first pioneered by BRAC in Bangladesh in 2002, provide an integrated, holistic approach to helping escape poverty. Unlike traditional livelihood development programs, these initiatives combine multiple interventions—including cash transfers, asset transfers, skills development, and financial services—tailored to address the complex challenges faced by ultra-poor households. Graduation programs focus on addressing multiple barriers simultaneously to help individuals escape the poverty trap. By contrast, livelihood development programs primarily aim to enable households to acquire productive assets and develop specific skills for long-term income growth. However, livelihood programs are not typically targeted exclusively at ultra-poor populations².

A 2016 meta-analysis developed by Sulaiman (2016)³ compares the relative effectiveness of graduation programs against livelihood development programs and cash transfers as poverty reduction strategies. The authors include seven locations where a graduation program has been implemented and evaluated rigorously as part of their meta-analysis. The study finds that livelihood programs vary widely in their per-beneficiary cost. Graduation programs are the most expensive per beneficiary, while cash transfers are the least costly.

However, graduation programs consistently deliver the most significant positive impact, whereas livelihood programs struggle to make a sustainable impact. In this meta-analysis, cash transfers yield the highest annual household consumption gain relative to total program cost (0.27), followed by the graduation approach (0.11) and livelihood programs (0.09). The ranking of these approaches changes depending on factors such as targeting criteria, follow-up duration, and whether the analysis includes only randomized or quasi-experimental evaluations.

One of the seminal studies on graduation programs is a multi-site randomized controlled trial (RCT) conducted between 2007 and 2014 (Banerjee et al., 2015)⁴. The program implemented by Ethiopia, Ghana, Honduras, India, Pakistan and Peru, included (one-time) productive asset transfer, consumption support, technical skills training, high-frequency home visits, savings and some health/life skill training. The program showed substantial impacts across a range of livelihood indicators. The program led to a 5.8% increase in per-capita consumption, along with increases of 0.38 standard deviations in household income, 0.26 in assets, 0.10 in time spent on earning activities, 0.11 in food security, and 0.21 in financial inclusion relative to the control group (Banerjee et al., 2015)⁵. Notably, most of these impacts persisted or grew a year after the program ended, showcasing the long-term benefits of the graduation approach. Additionally, there were positive, though smaller, impacts on health, political involvement, and women's empowerment.

² Sulaiman, M., Goldberg, N., Karlan, D., & De Montesquiou, A. (2016). Making sustainable reduction in extreme poverty: A comparative meta-analysis of livelihood, cash transfer and graduation approaches. Washington, DC: CGAP, 5, 35-37.

³ Idem.

⁴ Banerjee, A., Duflo, E., Goldberg, N., Karlan, D., Osei, R., Parienté, W. & Udry, C. (2015). A multifaceted program causes lasting progress for the very poor: Evidence from six countries. *Science*, 348(6236), 1260799.

⁵ Ibid

Another influential study evaluated a large-scale implementation of a graduation approach implemented by BRAC in Bangladesh (Bandiera et al, 2013).⁶ Spanning 1,409 communities across 40 rural regions in Bangladesh, this initiative, conducted between 2007 and 2011, targeted women and emphasized entrepreneurship. Women could choose an asset transfer from a menu of activities that included livestock/vegetable cultivation, small-scale retail and crafts like weaving. The study found sustained positive impacts even two years after the intervention ended. Four years after the program began, women's earnings increased by 38%, reflecting substantial long-term gains.

More recently, Bedoya et al (2019)⁷ investigated the impact of an intervention targeting the ultra-poor in a conflict-affected region of Afghanistan. The study included 1,219 households in 80 conflict-affected villages. Women participating received a 'big-push intervention' including livestock asset transfer, cash consumption stipend, skills training and coaching. They found that one year after the end of the program (three years after asset transfer) per capita consumption increased by 30% (or by USD 24 PPP) relative to the control group, and the share of households below the national poverty line decreased from 82% in the control group to 62% in the treatment group. They estimate an internal rate of return of 26%, in addition to improvements in psychological well-being, women's empowerment and child health.

In India, Banerjee, Duflo and Sharma (2021)⁸ investigated the long-run impact of a 'big push' graduation program which consisted of a large asset transfer to the poorest households in West Bengal. They found an increase in average household consumption from USD 1.35 (2018 PPP) to USD 2.90 ten years later (equivalent to a 0.6 SD improvement over the control group). They also found increases in food security (0.1 SD), income (0.3 SD) and health (0.2 SD). In this long-term study, they showed that income continued to grow up to seven years post-intervention and then stayed high. This pattern is consistent with the alleviation of a poverty trap: households receiving the asset transfer and accompanying consumption and savings support were able to sustain and improve investments, earnings, consumption, and their health over time. Interestingly, Banerjee et al., 2021, note that recipients took greater advantage of opportunities for income gains that arise naturally over the course of time, most notably through migration. Households in the treatment group migrated further away, for longer, and earned more than other households. By year 10, income from remittances had become twice as large as earnings from livestock for program recipients.

In addition to this body of evidence across the globe, RTV has conducted extensive testing and evaluation of the POP program approach both internally⁹ and externally¹⁰. The evidence shows impacts on households, creating sustained income growth, improved livelihoods, and economic resilience. The RTV evaluations indicated an increase in average household income

⁶ Bandiera, O., Burgess, R., Das, N., Gulesci, S., Rasul, I., & Sulaiman, M. (2013). Can basic entrepreneurship transform the economic lives of the poor?

⁷ Bedoya, G., Coville, A., Haushofer, J., Isaqzadeh, M., & Shapiro, J. P. (2019). No household left behind: Afghanistan targeting the ultra poor impact evaluation (No. w25981). National Bureau of Economic Research.

⁸ Banerjee, A., Duflo, E., & Sharma, G. (2021). Long-term effects of the targeting the ultra poor program. *American Economic Review: Insights*, 3(4), 471-486

⁹ Raising The Village. *2023 Impact Report*. 2023.

¹⁰ Mahmud, M., & Riley, E. *Impact of a village-based livelihoods programme in rural Uganda on household economic outcomes*. University of Exeter & University of Michigan.

to \$2.23/day after 24 months up from \$0.84/day at baseline.¹¹ There is also an indication of a high return on investment (ROI) whereby a \$114 investment per household generated \$697 in value over 24 months with an ROI of 514%.¹² Regarding income sources, agricultural income accounted for 70% of income growth through increases in farming of seasonal and perennial crops.¹³ The households sold their crops at higher market value and sold significantly more crops. Based on the Grameen Poverty Probability Index, the households showed a 9.1-point improvement in their quality of life.¹⁴

1.3 Baseline report structure

The following chapter (2) of this baseline report provides an overview of the evaluation methodology, sampling approach and survey instruments. This is followed by a summary of the baseline data collection approach and study limitations.

The findings chapter (3) in the report are organized as follows:

- Section 3.1: Discusses household demographics and presents balance tables showing differences in demographic characteristics across cohorts.
- Section 3.2: Presents daily consumption estimates calculated using the Rapid Consumption Module and related poverty headcounts and gap indices.
- Section 3.3: Examines poverty indicators, including figures on the Poverty Probability Index (PPI) as a key outcome measure.
- Section 3.4: Highlights key statistics on agricultural activities, productivity, and income.
- Section 3.5: Explores data on health, quality of life, and other scarcity-related barriers.

The findings section is followed by a chapter on conclusions and recommendations (4).

¹¹ Raising the Village. Impact Report - 2023

¹² Ibid.

¹³ Ibid.

¹⁴ Ibid.

2. Methodology

2.1 Evaluation design

The evaluation of the POP program is designed as a stepped-wedge cluster-randomized controlled trial (RCT). This design capitalizes on the program's staggered entry into the graduation program, where the six cohorts of coffee-farming households begin the graduation programme every six months between January 2024 and July 2026 (Table 1). Each cohort is randomly assigned to different start dates. Unlike traditional randomized trials where control groups never participate, this approach allows for the possibility of using the cohorts waiting to be onboarded into the program as comparison groups. This allows us to rigorously assess the program's causal impacts while ensuring all communities ultimately benefit from the intervention.

This study includes cohorts 1-6. Note that the very first cohort that enrolled in January of 2024 is excluded from the study. We refer to the excluded cohort as Cohort 0. Cohort 1 started in July of 2024. Cohort 6 will remain a pure control cohort for the duration of this study.

Table 1: Treatment status by cohort and time

Cohorts	2024		2025		2026		2027	
	January	July	January	July	January	July	January	July
0	Treatment	Treatment	Treatment	Treatment	Completed	Completed	Completed	Completed
1	Control	Treatment	Treatment	Treatment	Treatment	Completed	Completed	Completed
2	Control	Control	Treatment	Treatment	Treatment	Treatment	Completed	Completed
3	Control	Control	Control	Treatment	Treatment	Treatment	Treatment	Completed
4	Control	Control	Control	Control	Treatment	Treatment	Treatment	Treatment
5	Control	Control	Control	Control	Control	Treatment	Treatment	Treatment
6	Control	Control	Control	Control	Control	Control	Control	Control

2.1.1 Randomization strategy

Randomization was conducted at parish level. Based on a list provided by Raising the Village, of the 42 parishes involved in the intervention, we randomly allocated each parish to a cohort slated to start implementation in six-month intervals between January 2024 and July 2026. Figures 1 and 2 illustrate the geographical distribution of the 42 selected parishes by district. See [Annex 2](#) Table 1 for a list of parishes. After initial randomization, some parishes were replaced as they did not meet RTV's ultra-poverty criteria for program inclusion.

Figure 1: Parishes by cohort and district (Rakai)

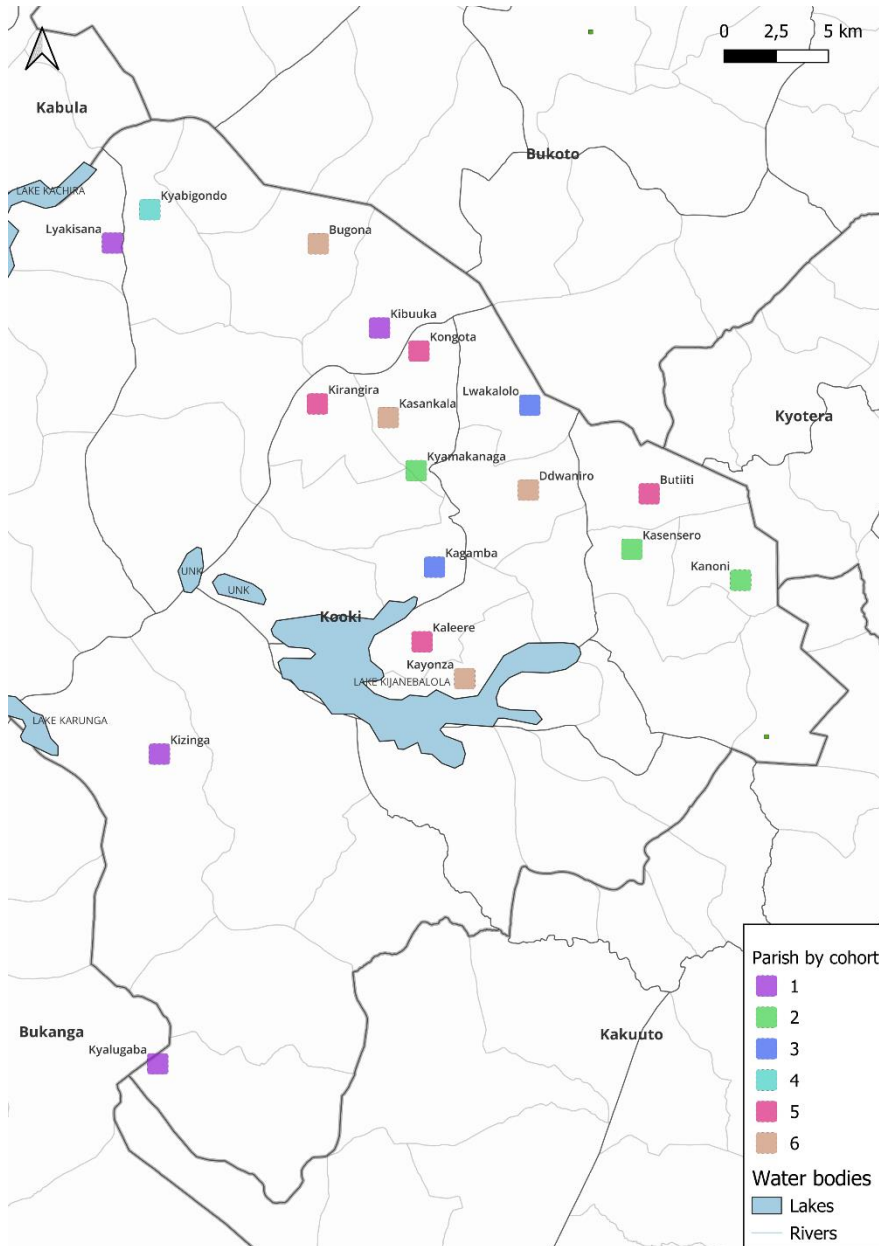
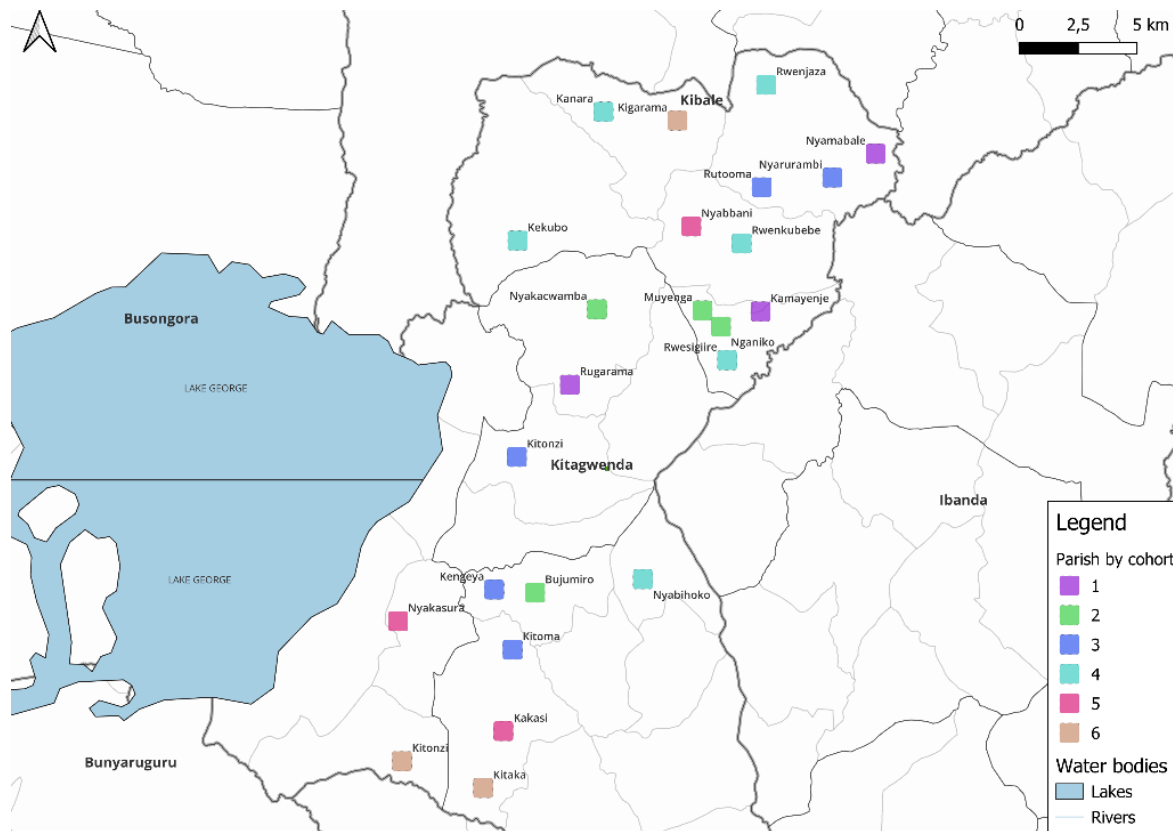


Figure 2: Parishes by cohort and district (Kitagwenda)



2.1.2 Data collection

Sampling strategy

The POP program’s population of interest is coffee-farming households who reside within the program parishes. We employed a three-staged cluster sampling strategy to select households for the study. Starting at the parish level, we narrow our focus to villages and finally to individual households, ensuring a representative sample of coffee farmers across the program area.

Stage 1: Parish selection

All 42 parishes (randomized into 6 cohorts) serve as our parish level sampling frame. We selected all 42 parishes in our sample.

Stage 2: Village selection

In each parish first we randomly draw 1 village per parish. Then we sampled 1 additional village for the 18 parishes with the highest population. This results in a total of 60 villages in our sample. This means that 24 parishes have 1 village sampled, and 18 parishes have 2

villages (the ones with highest total population). RTV provided the village sampling frame used in the village level sampling, as well as the total population data.

Stage 3: Household selection

To select the households, we implemented a listing survey in each selected village. This listing survey aims to create an up-to-date list of all coffee farming households living in a village.

Listing

The listing survey was a crucial part of baseline data collection, conducted to identify eligible households, i.e., households that harvested and sold coffee in the past 12 months.

The listing protocol differs for cohort 1 and cohorts 2-6:

- For Cohort 1, enumerators received a list with 21 households and 3 replacements per village. This list was created by randomly sampling from the program participant sampling frame shared by RTV. They visited these households to verify coffee farming status, collect contact details, and gather demographic information (age and gender) for the household head, spouse, and coffee farm manager. Enumerators also informed households about the baseline and ensure participation, completing the process once the target of 21 households plus 3 replacements is verified.
- For Cohorts 2-6, where no pre-existing list exists, enumerators worked with village leaders to create or update a list of resident coffee farming households. From this list, 40 households were randomly selected, their data entered into SurveyCTO and marked on the physical list. During household visits, enumerators verified coffee farming status, collected demographic information, and informed households about the baseline. The process continued until 21 households plus 3 replacements were confirmed; remaining pre-listed households were disregarded once the target was met.

Combining the 24 households per village(s) per parish obtained through the processes described above, we obtained our sample size of 1260 households in 42 parishes and in 60 villages. Since we selected the same number of households per village, this results in a self-weighting cluster sample.

Weighting

To ensure our survey results are representative of the target population, we apply **survey weights** that account for the multi-stage sampling design. At each stage—**parish, village, and individual**—selection probabilities are calculated, and the weights are derived as the inverse of these probabilities. By combining these weights across all stages, we adjust for unequal probabilities of selection and account for variations in sampling intensity across districts and cohorts. This ensures that when we generate tables, the **counts represent the population, not** just the sample.

In practical terms, the data is weighted so that all tables report **weighted counts**, which reflect the true distribution of the population across key dimensions such as district, cohort, gender, female headship, age groups, and wealth quintiles. This adjustment helps correct any

oversampling or under sampling during data collection. For transparency, [Annex 3 Table 1](#) provides the raw (unweighted) counts for these key disaggregations, allowing to compare sample sizes across different categories. **The summary statistics and count presented in this report use these weights.**

2.2 Research instruments

Quantitative research instruments

To meet budget targets, we conducted one visit to each household at each time point aiming for a 90-minute interview. The structure of this research instrument is described in Table 2. The various modules have been selected to address the core learning objectives for this evaluation and have been discussed with the HWG and RTV teams. The learning objectives (LOs) include:

1. **Assessing the achievement of objectives:** the evaluation aims to assess whether POP's objectives are achieved, including increasing household income and production to \$2/day, reducing the average household PPI score to 22 or less, and ensuring that 60% of households feel their quality of life has improved within 24 months of each cohort's initiation
2. **Estimating causal impact:** including household income, household asset endowment, coffee revenue and profits, best practice adoption and yield - goal is to establish causal inference on the effects of the program on these variables
3. **Conducting heterogeneous treatment analysis:** the evaluation will analyze variances in the estimated treatment effects across different demographic groups, with a focus on geographic, economic, social and gender factors
4. **Understanding pathways of change:** identifying which project components are vital for driving primary outcomes. The evaluation will aim to dissect the project's multifaceted initiatives to delineate the most impactful pathways tied to changes to income and agricultural productivity
5. **Determining the importance of coffee:** the evaluation will focus on measuring how coffee-centered interventions contribute to the broader project outcomes, tying coffee profit and revenue analyses to holistic changes in income
6. **Identifying unintended consequences:** the evaluation should also scrutinize potential negative impacts on the environment, health, human rights, community dynamics, gender equity, such as the effects of agrochemical use, deforestation, community conflicts, labor issues, and changes in household dynamics and resource control.
7. **Suggesting operational improvements:** the evaluation should provide actionable insights and recommendations during the implementation period, to increase the efficacy of POP.

The average duration was 92 minutes for the survey.

Table 2: Structure of quantitative research instruments

Modules	Objective	Description
1. Intro/consent		Respondent identification and consent
2. Demographic / Wellbeing / Health	LO3	Household roster - including demographics, casual labor and formal employment participation, income from casual labor and formal employment
	LO6	Life satisfaction using the Cantrill ladder
	LO6	Respondent's health and children < 5 years old
3. House / Water access	LO1	Housing conditions to measure of PPI
	LO6	Access to water
4. Consumption	LO2	Consumption of food and beverages - proxy for measuring income
		Consumption of non-durable goods - proxy for measuring income
5. Assets and land ownership	LO2	Asset ownership - important to measure if an increase in income leads to an increase in asset ownership instead of consumption
		Land ownership and use
6. Business ownership, saving and borrowing, and livestock ownership	LO4	Business ownership - to evaluate the change in income from other income-generating activities
		Saving/Borrowing - use of income
		VSLA participation - use of income
	LO2 and LO4	Livestock ownership and animal products - a measure of HH asset and income from sales
7. Agriculture production and consumption	LO2	Information on crops by cycle (planted, yield, sold, cost)
		Perennial crops (planted, yield, sold, cost)
8. Coffee production	LO5	Number of trees
		Coffee species
		Coffee sales
		GAP: Coffee nutrition (use of inorganic and organic fertilizers) and soil cover
		GAP: Rejuvenation and pruning
		GAP: Irrigation and shade trees
		GAP: Weeding
		GAP: IPDM and Safe use of pesticides
		GAP: Coffee harvesting and drying practices
		Coffee farming challenges

3. Findings

3.1 Demographics

Understanding the distribution of the sample in terms of socio-demographic variables, as well as differences between districts and cohorts, it is important to assess the extent to which the randomization strategy resulted in cohorts that are comparable to each other.

To do this, this section assesses the socio-demographic composition of the households surveyed, focusing on 1) district distribution (Kitagwenda vs. Rakai), 2) gender of the household head, and 3) age of the household head.

Key findings:



Household Characteristics

- 17% of households are female-headed.
- The average age of the household head is around 50 years.
- 80% of household heads are literate.
- Households have an average size of 5.4 members.
- Kitagwenda has higher levels of educational attainment, although both districts predominantly report some primary education (40% in Kitagwenda and 52% in Rakai).



Cohort Comparisons:

- Overall, randomization resulted in comparable cohorts of coffee-farmers, with some differences to be taken into account in subsequent analysis.
- Cohorts 1 and 2 have a higher proportion of female-headed households (22%). Cohort 1 shows lower literacy rates for household heads (73%), whereas cohort 5 has higher literacy rates (88%).



Disadvantaged female household heads:

- Female household heads are, on average, 10 years older than male household heads.
- Female household heads have 29 percentage point lower literacy rates than their male counterparts.
- Male-led households are mostly in married monogamous relationships (80%), while female-led households are predominantly widowed (64%) or divorced (21%).

- Female household heads have lower levels of education, with 50% having some primary education and 30% having no education, while male household heads attain higher education levels more frequently.



Age comparisons:

- Younger household heads show markedly better educational outcomes and higher literacy rates, but manage smaller households compared households with older household heads.

Kitagwenda and Rakai have a similar proportion of female headed households, comparable household sizes, equivalent literacy rates and the average age of the head of the household is 50 years old in both districts (see Table 3). However, households in Rakai have a higher number of dependents than Kitagwenda. Kitagwenda also observes higher educational attainment across all levels, particularly in TVET/TTC (7.4% vs 2.9%), and with a higher proportion of respondents having only completed primary education (21.9% vs 17.4%). Rakai has a notably higher divorce rate (9.9% vs 3.1%) despite both districts being predominantly monogamous.

Table 3: Household socio-demographic composition for the whole sample and by district. p-value: test of difference between districts.

	Overall (n=1260)	Kitagwenda (n=710)	Rakai (n=550)	p-value
Proportion of female-headed households	0.17 (0.14, 0.20)	0.16 (0.12, 0.20)	0.19 (0.15, 0.23)	p=0.27
Average age of the HH-head in years	50.04 (48.2, 51.8)	49.86 (47.17, 52.56)	50.26 (47.75, 52.77)	p=0.82
Average HH size	5.40 (5.19, 5.61)	5.35 (5.04, 5.67)	5.46 (5.19, 5.73)	p=0.60
HH dependency ratio ((number of dependents aged < 5 or > 65)/number of people in the working age (15-95))	1.28 (1.19, 1.38)	1.11 (0.99, 1.23)	1.51 (1.39, 1.63)	p=0.00
Proportion of household heads that is literate.	0.80 (0.76, 0.83)	0.81 (0.76, 0.86)	0.77 (0.73, 0.82)	p=0.25
HH head marital status				p=0.00
Married Monogamous	862(68.40%)	515 (72.51%)	347 (63.10%)	
Married Polygamous	155 (12.34%)	80 (11.22%)	76 (13.78%)	
Widowed	155 (12.31%)	88 (12.37%)	67 (12.22%)	

Separated/Divorced	76 (6.06%)	22 (3.10%)	54 (9.88%)	
Never married/Single	8 (0.64%)	4 (0.58%)	4 (0.71%)	
Other	3 (0.25%)	1 (0.21%)	2 (0.31%)	
<i>Education of the household head</i>				p=0.00
None	148 (11.76%)	86 (12.11%)	62 (11.30%)	
Some primary	568 (45.08%)	283 (39.87%)	285 (51.80%)	
Primary completed	251 (19.94%)	156 (21.94%)	95 (17.35%)	
Some secondary	158 (12.53%)	85 (12.00%)	73 (13.21%)	
Secondary completed	51 (4.08%)	36 (5.02%)	16 (2.86%)	
TVET/TTC	68 (5.43%)	53 (7.40%)	16 (2.89%)	
Some university	5 (0.38%)	4 (0.60%)	1 (0.10%)	
Completed university	10 (0.81%)	8 (1.06%)	3 (0.48%)	

Table 4 shows a comparison by cohort of relevant socio-demographic variables, which is important to assess, given that the stepped-wedge design relies on the assumption that cohorts are comparable at baseline. Randomization into cohorts was largely successful in the sense that it resulted in comparable cohorts: most socio-demographic characteristics show balance across cohorts, though some differences in household head literacy and female headship do warrant attention in subsequent analyses.

Household size, dependency ratios, household head's age, marital status and educational attainment are equivalent across all cohorts. However, cohorts 1 and 2 have a higher share of female-led households (22%) than cohorts 5 and 6 (11%). We also find significant differences in the proportion of household heads that can read and write. Notably, cohort 1 has the lowest household-head literacy (73%), while cohort 5 has the highest level of literacy of the household head (88%).

All in all, the balance on most characteristics strengthens the internal validity of the study design. The observed imbalances in literacy and female headship will need to be addressed in subsequent analysis of program impacts.

Table 4: Socio-demographic variable summary statistics (means, proportions and 95% CIs) by cohort. p-value: test of difference between cohorts.

	Overall N=1260	Cohort 1 N=318	Cohort 2 N=146	Cohort 3 N=189	Cohort 4 N=232	Cohort 5 N=251	Cohort 6 N=125	p-value
Proportion of Female-headed households	0.17 (0.14, 0.20)	0.22 (0.18, 0.27)	0.22 (0.17, 0.26)	0.19 (0.14, 0.24)	0.16 (0.12, 0.20)	0.11 (0.06, 0.17)	0.11 (0.08, 0.14)	p=0.00
Average age of household head, years	50.04 (48.22, 51.85)	48.33 (45.77, 50.90)	52.03 (50.16, 53.90)	51.29 (47.98, 54.59)	52.91 (50.24, 55.57)	46.43 (41.99, 50.87)	52.08 (50.28, 53.89)	p=0.06
Average size of household	5.40 (5.19, 5.61)	5.25 (4.93, 5.57)	5.12 (4.69, 5.55)	5.41 (5.08, 5.73)	5.86 (5.45, 6.27)	5.10 (4.69, 5.51)	5.82 (5.13, 6.51)	p=0.09
HH dependency ratio ((number of dependents aged < 15 or > 65)/number of people in the working age (15-65))	1.28 (1.19, 1.38)	1.38 (1.12, 1.63)	1.24 (0.98, 1.50)	1.34 (1.10, 1.58)	1.29 (1.11, 1.47)	1.07 (0.90, 1.24)	1.43 (1.18, 1.68)	p=0.25
Proportion of household heads that are literate	0.80 (0.76, 0.83)	0.73 (0.69, 0.77)	0.78 (0.72, 0.85)	0.78 (0.73, 0.83)	0.80 (0.75, 0.85)	0.88 (0.81, 0.95)	0.83 (0.77, 0.88)	p=0.01
HH head marital status								p=0.60
Married Monogamous	862 (68.40%)	191 (60.15%)	103 (70.66%)	127 (67.39%)	161 (69.15%)	194 (77.26%)	86 (69.14%)	
Married Polygamous	155 (12.34%)	48 (15.03%)	5 (3.69%)	23 (12.34%)	34 (14.76%)	22 (8.95%)	22 (17.93%)	
Widowed	155 (12.31%)	53 (16.56%)	18 (12.04%)	26 (13.90%)	27 (11.80%)	21 (8.28%)	10 (8.40%)	
Separated/Divorced	76 (6.06%)	24 (7.58%)	16 (10.78%)	11 (6.04%)	8 (3.49%)	13 (5.00%)	4 (3.60%)	
Never married/Single	8 (0.64%)	2 (0.68%)	2 (1.64%)	1 (0.32%)	1 (0.46%)	1 (0.26%)	1 (0.93%)	
Other	3 (0.25%)	0 (na)	2 (1.19%)	0 (na)	1 (0.35%)	1 (0.26%)	0 (na)	

<i>HH head highest level of education</i>								p=0.44
None	148 (11.76%)	42 (13.20%)	21 (14.59%)	26 (13.73%)	29 (12.42%)	17 (6.91%)	13 (10.29%)	
Some primary	568 (45.08%)	162 (51.04%)	61 (42.09%)	94 (49.53%)	106 (45.84%)	80 (31.87%)	64 (51.78%)	
Primary completed	251 (19.94%)	62 (19.35%)	30 (20.40%)	32 (17.02%)	43 (18.50%)	63 (25.00%)	22 (17.80%)	
Some secondary	158 (12.53%)	28 (8.86%)	20 (13.39%)	23 (12.20%)	26 (11.05%)	45 (17.86%)	17 (13.44%)	
Secondary completed	51 (4.08%)	7 (2.20%)	6 (3.99%)	3 (1.64%)	10 (4.39%)	21 (8.26%)	5 (3.66%)	
TVET/TTC	68 (5.43%)	13 (3.96%)	7 (4.79%)	11 (5.56%)	15 (6.40%)	23 (9.04%)	1 (0.67%)	
Some university	5 (0.38%)	0 (na)	0 (na)	1 (0.32%)	2 (0.69%)	2 (0.80%)	1 (0.44%)	
Completed university	10 (0.81%)	4 (1.38%)	1 (0.74%)	0 (na)	2 (0.72%)	1 (0.26%)	2 (1.92%)	

Table 5 shows the socio-demographic variables of interest by gender of the household head. Female-headed households face substantial socioeconomic disadvantages compared to male-headed households. Women-led households are mostly widowed (64%) or divorced (21%) while male-led households are predominantly married (81%). Female household heads are typically 10 years older than male heads. They are lower educated and show 29 percentage point lower literacy rates compared to male headed households.

An analysis by age category of the head of the household is shown in [Annex 4 Table 1](#). Younger household heads show markedly better educational outcomes and higher literacy rates, and manage smaller households. Younger households are most likely to have a male as head of the household, and this decreases over time, as households experience events like widowhood, separation, which account for most of the female-led households as we saw in the previous disaggregated analysis by gender of household head. Similarly, household size and dependency ratio increase as households age, since they experience childbirth over time, as well as household members reaching old age. Younger household heads are more likely to be able to read and write than older household heads (96% for youngest and 60% for oldest). Younger households are less likely to be engaged in polygamous marriages, as well as less likely to have experienced widowhood or divorce. The age group 30-44 has the highest levels of education with most having completed secondary and studied onwards, while the oldest age group is the most likely to have no or little educational attainment.

Table 5: Socio-demographic summary statistics (means, proportions, 95% CIs) by gender of household head. p-value: test of difference between genders.

	Male (N=1043)	Female (N=217)	p-value
Average age of Household head, years***	48.39 (46.48, 50.30)	57.93 (56.03, 59.83)	p=0.00
Average size of household***	5.60 (5.35, 5.84)	4.44 (4.15, 4.73)	p=0.00
Household dependency ratio ((number of dependents aged < 15 or > 65)/number of people in the working age (15-65))	1.25 (1.17, 1.34)	1.45 (1.17, 1.73)	p=0.15
Household head is able to read and write in any language***	0.85 (0.82, 0.87)	0.56 (0.48, 0.64)	p=0.00
Household head marital status			p=0.00
Married Monogamous	840 (80.53%)	22 (10.21%)	
Married Polygamous	147 (14.10%)	8 (3.90%)	
Widowed	16 (1.55%)	139 (63.89%)	
Separated/Divorced	32 (3.02%)	45 (20.63%)	

Never married/Single	6 (0.56%)	2 (1.00%)	
Other	2 (0.23%)	1 (0.37%)	
Household head highest level of education			p=0.00
None	84 (8.04%)	64 (29.62%)	
Some primary	460 (44.15%)	108 (49.52%)	
Primary completed	225 (21.54%)	27 (12.24%)	
Some secondary	146 (14.01%)	12 (5.41%)	
Secondary completed	48 (4.56%)	4 (1.76%)	
TVET/TTC	65 (6.26%)	3 (1.46%)	
Some university	5 (0.46%)	0 (na)	
Completed university	10 (0.97%)	0 (na)	

3.2 Household consumption and poverty

Key findings:



- Mean per capita household consumption is an estimated 2.87 PPP USD/day. Median per capita consumption was estimated at 2.17 PPP USD.
- Kitagwenda and Rakai have similar per capita mean consumption per day.
- The income distribution is right skewed; comparatively more households have lower than average incomes, few have higher than average incomes.
- Cohorts 3 and 4 have the lowest per capita consumption per day (2.63 and 2.53 PPP USD) respectively and cohorts 2 and 5 having the highest consumption (3.52 and 3.08 PPP USD).
- The poverty headcount (of living below USD 2.15 2017 PPP per capita) was estimated to be 50% for the whole sample. There are no significant differences between districts and cohorts in poverty headcount.
- The poverty gap index was estimated to be 17% for the whole sample. There are no significant differences between districts. There are significant differences between cohorts, with the highest poverty depth in cohorts 3 and 4 (21%) and the lowest in cohorts 2 and 5 (13%).
- Methodologically, using item level imputation is superior to using aggregate level imputation, especially when we have limited observations per alternative module. Using adult equivalent instead of per capita metrics

decreases the poverty headcount substantially reflecting household demographic composition.

Methodology:

We measured household consumption and poverty using the following indicators:

- **Consumption per day (2017 PPP USD):** We obtained food, non-food, semi durable goods (clothing, education and donations) consumption and their sum from the rapid consumption module¹⁵ for each household expressed in 2017 international USD and 2024 UGX. This includes district level Paasche index deflation, deflation from 2024 UGX to 2017 UGX,¹⁶ per capita adjustment, and conversion using PPP factors for 2017.¹⁷ The survey applied a reduced food and non-food module that applies a core module to all households and 7 alternative modules that are randomized to different households. The items' consumption and expenditure that was not asked to different households are imputed using random forest classifiers and regressor models. Consumption is the gold standard metric to measuring poverty, in contrast with income-based measures. We present per capita estimates in the main analyses (considering the reporting standard used by the World Bank for international comparisons.
- **Poverty headcount:** The percentage of households that falls below the poverty line of per capita consumption of 2.15 in 2017 PPP USD. This is calculated based on per capita consumption /day in 2017 USD.
- **Poverty gap index:** The poverty gap index measures how far, on average, people in poverty are from the poverty line. It shows not just how many people are poor but how poor they are. This could be thought of as the "depth" of poverty—how much money it would take to bring everyone in poverty up to the poverty line.

For the process of estimating income, consumption, poverty headcounts and poverty gap, including imputations methods, see [Annex 5](#): measuring living standards.

- **Consumption quintiles:** We can split the sample into quintiles based on the consumption per day calculated as described above. Here, we first rank all households in the sample based on their consumption from low to high then we make a cutoff at each subsequent 20% in that ranking. The 20% respondents with the lowest consumption a day are quintile 1, and the highest 20% are quintile 5. This is a useful measure to determine how

¹⁵ Pape, U., & Wollburg, P. (2019). *Estimation of Poverty in Somalia Using Innovative Methodologies* (Policy Research Working Paper No. 8735). World Bank. <https://hdl.handle.net/10986/31267>

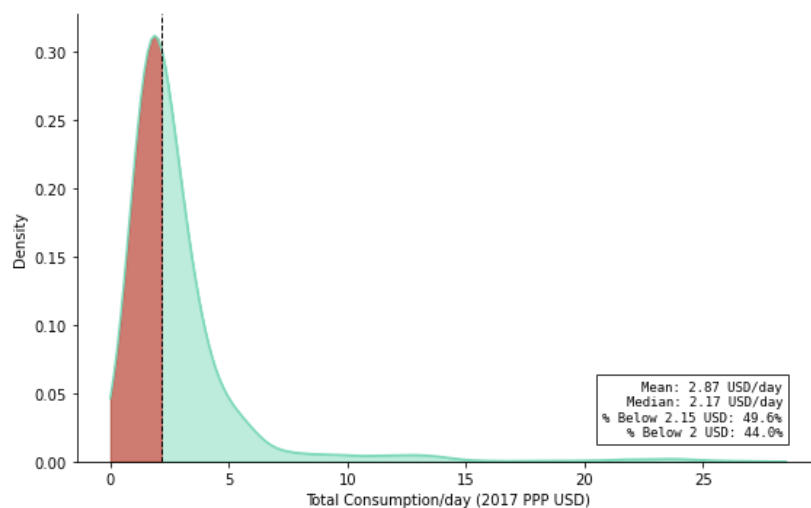
¹⁶ CPI values used were 166.8 for 2017 and 209.9 for 2024. Obtained from: <https://data.worldbank.org/indicator/FP.CPI.TOTL>

¹⁷ The 2017 PPP exchange rate used was 1270.60 UGX to 1 international dollar. Obtained from https://data.un.org/Data.aspx?d=WDI&f=Indicator_Code%3APA.NUS.PPP

different outcome indicators are correlated with overall consumption (preferable to using income or 'wealth'-based measures in low-income settings).

Our estimates show that per capita daily consumption is on average USD 2.87 in 2017 PPP (see Figure 3). This is above the program's stated target to increase overall average household income and production to USD 2.00/day in 24 months from each cohort launch, meaning that the program has the potential to impact 44% of participants. If we cut this distribution at the internationally defined poverty line of USD 2.15 a day, we see that approximately 2 in 4 coffee farming households (49.6%) live below that poverty line. We acknowledge that the income distribution is right-skewed, meaning there is a relatively large share of households who have an income less than two USD a day.

Figure 3: Consumption/capita per day in 2017 PPP USD. Dotted line at 2.15 USD



Using adult equivalent estimates reduces the poverty headcount from 49.6% to 13.3%. This reflects the increased consumption per adult equivalent household member and highlights the incomparability of the two adjusted estimates. Table 6 shows the summary statistics for outcomes of interest, comparing per capita against adult equivalent adjustment. The results vary significantly considering that children form a large number of household members, reducing the adult equivalent adjustment in comparison to considering a child as a full household member from an average of 5.8 members to 3.5 members. Table 6 also shows the consumption disaggregated by its individual components both in 2024 UGX and 2017 PPP USD.

Table 6 Per capita and adult equivalent estimates for consumption/capita per day, poverty headcount and poverty gap summary statistics (means, proportions, 95% Cis). p-value: test of difference between genders.

Per capita (mean HH size= 5.4 members / SD=2.6)	
Poverty headcount at 2.15 USD PPP	
No (n=635)	50.37%
Yes (n=625)	49.63%
Poverty gap index	0.17 (0.15, 0.20)
Daily food consumption/day (2024 UGX)	2,431.98 (2300.58, 2563.37)
Daily non-food consumption/day (2024 UGX)	1,126.86 (1048.99, 1204.73)
Daily consumption: clothing, school fees, donations (2024 UGX)	1,050.57 (892.52, 1208.62)
Total daily consumption (2024 UGX)	4594.63 (4283.93, 4905.33)
Daily food expenditure (2017 PPP USD)	1.52 (1.44, 1.60)
Daily non-food expenditure (2017 PPP USD)	0.70 (0.66, 0.75)
Daily consumption: clothing, school fees, donations (2017 PPP USD)	0.66 (0.56, 0.76)
Total daily consumption (2017 PPP USD)	2.87 (2.68, 3.07)

Adult equivalent (mean HH size=3.5 members / SD=1.5)	
Poverty count at 2.15 USD PPP	
No (n=1092)	86.67%
Yes (n=168)	13.33%
Poverty gap index	0.03 (0.02, 0.04)
Daily food consumption/day (2024 UGX)	3,751.24 (3592.89, 3909.59)
Daily non-food consumption/day (2024 UGX)	1,739.66 (1632.48, 1846.84)
Daily consumption: clothing, school fees, donations (2024 UGX)	1,436.39 (1263.72, 1609.06)
Total daily consumptions (2024 UGX)	6,904.49 (6546.44, 7262.55)
Daily food expenditure (2017 PPP USD)	2.35 (2.25, 2.45)
Daily non-food expenditure (2017 PPP USD)	1.09 (1.02, 1.16)
Daily consumption: clothing, school fees, donations (2017 PPP USD)	0.90 (0.79, 1.01)
Total daily consumptions (2017 PPP USD)	4.32 (4.09, 4.54)

The share of households living below the poverty line is 49.6% at baseline using consumption-based metrics. However, the program's target of reducing poverty to 22% within 24 months relies on PPI scorecard estimates, which may not be directly comparable to consumption-based measures. Additionally, mean and median consumption expenditure are already higher

than the program's objective of 2.00 USD per day, suggesting that, under this metric, the goal has already been achieved. However, examining the distribution is important to determine whether a substantial portion of households still falls below the threshold. RTV's approach of aggregating income streams to estimate total income differs from using consumption expenditure, and in low-income settings, income data can be more volatile and prone to underreporting due to seasonal fluctuations and informal earnings. Consumption expenditure, on the other hand, tends to be smoother and is often considered a more reliable indicator of welfare. To fairly assess progress, it is important to compare like-for-like measures (PPI to PPI or consumption to consumption) and account for how different methodologies may influence the results.

There are statistically significant differences between cohorts in their consumption per day in 2017 PPP USD as evidenced by the p-value reported in Figure 4 (p-val=0.04). Cohort 2 has higher consumption than average. This is also shown in Figure 5, where the red dots represent the mean values per cohort for daily consumption/capita. Figure 6 shows the poverty headcount and Figure 7 shows the poverty gap ratios.

Figure 4: Consumption/capita per day in 2017 PPP USD by cohort. Dotted line at 2.15 USD

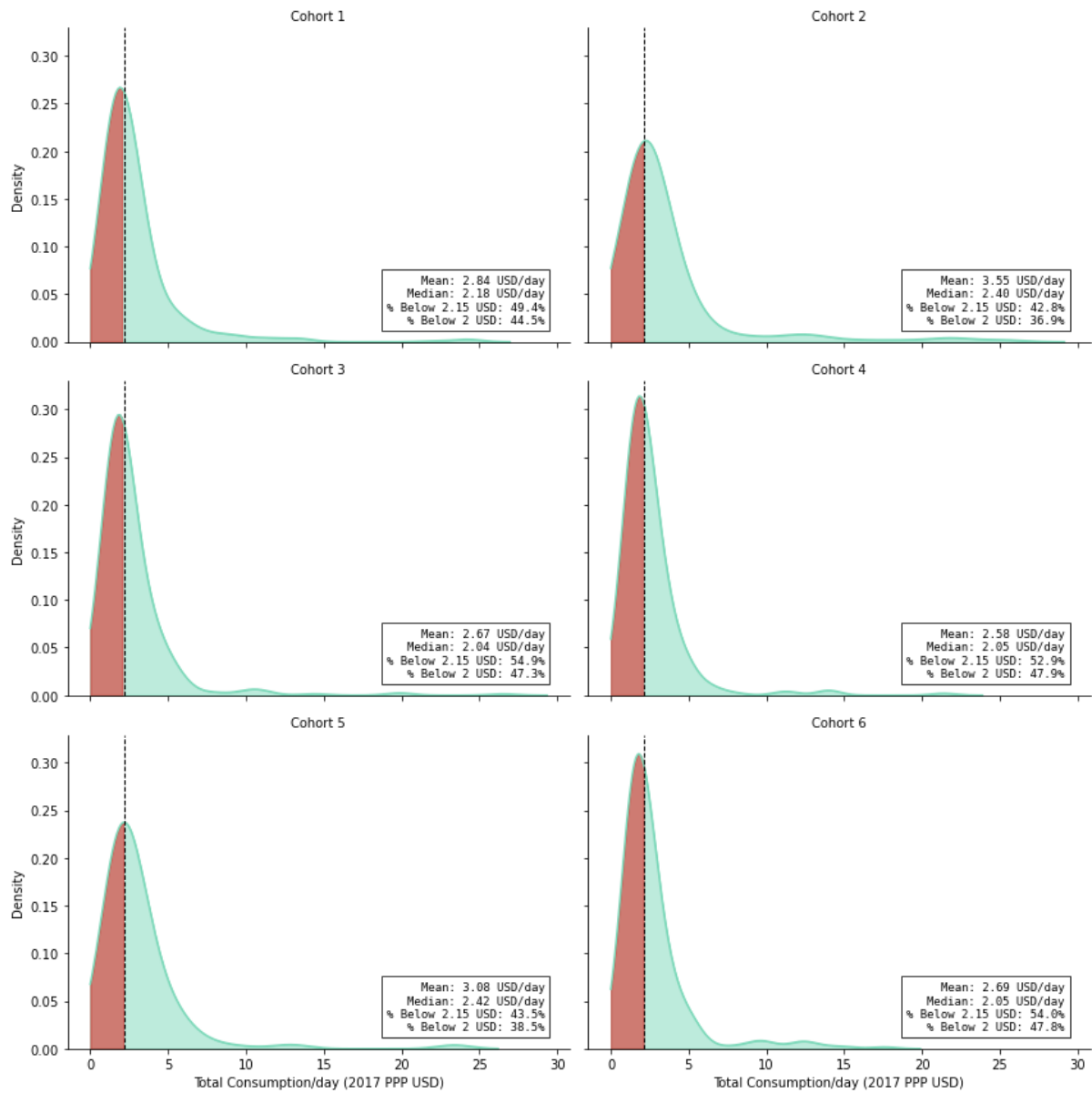


Figure 5: Consumption/capita per day, 95% CIs and test for differences between cohorts p-value. Red dots correspond to mean values for each cohort.

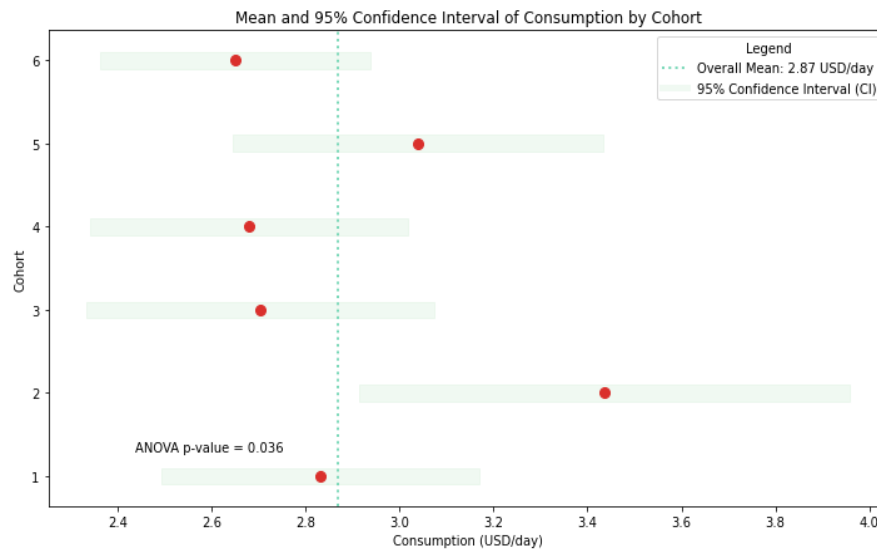
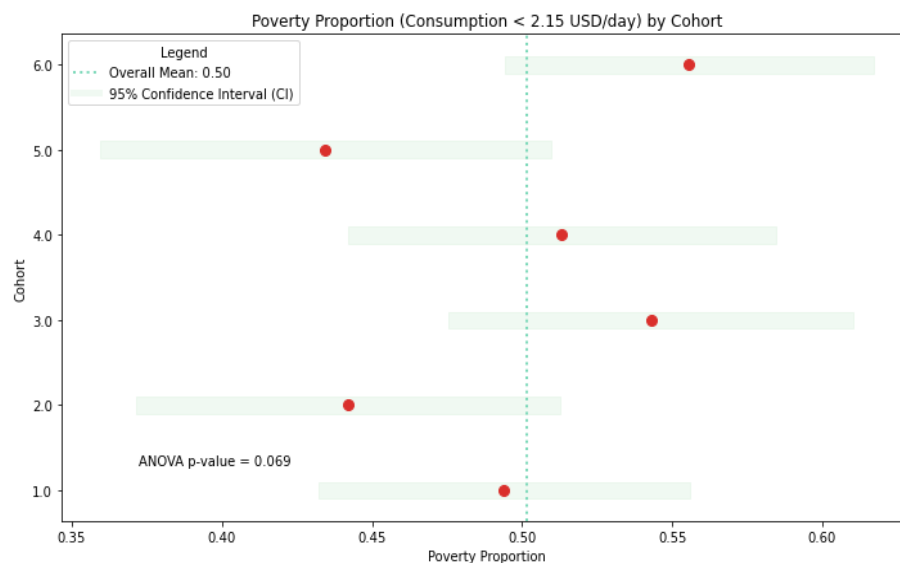


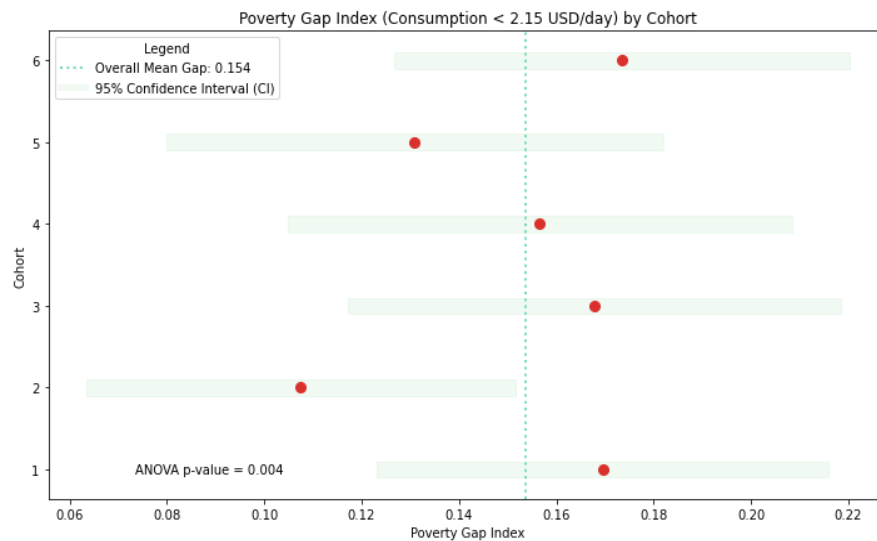
Figure 6 Poverty headcount, 95% CIs and test for differences between cohorts p-value. Red dots correspond to mean values for each cohort.



We investigated the association between the probability of being classified as poor and household size and total land size, while including parish specific fixed effects. The association was negative with a 1.4% decrease in the probability of being poor per one acre increase in land owned, and a 6.6% increase in the probability of being poor per increase in one household member. Both were statistically significant at conventional levels.

The poverty gap reflects how far on average the poor are from the poverty line, thereby capturing the depth of poverty more accurately than other indicators. A value of 0.17 means that, collectively, poor households would need resources equal to 17% of the poverty line to bring them all up to the poverty threshold. Although there are significant differences between cohorts in the average consumption poverty gap index, as shown in Figure 7 below, poverty headcount is not significantly different between cohorts (Figure 6).

Figure 7 Poverty gap index, 95% CIs and test for differences between cohorts p-value. Red dots correspond to mean values for each cohort.



3.3 Poverty probability, assets, debt and savings

Key findings:



- Using the PPI-tool, we observe that households in the sample have an average probability of 24% living below the USD 2.15 (2017 PPP) poverty line, suggesting that the program is already very close to its target of reducing the poverty probability to 22%. The estimate is lower than the 50% estimated in the rapid consumption module, suggesting that this is an underestimation of poverty, and the actual estimate being in between the two.
- Male-headed households report significantly higher savings and debt levels compared to their female counterparts.
- VSLA participation is similar across genders, with 49% of all households participating (48% of male-headed and 51% of female-headed households).

Methodology:

We measured poverty using poverty rates derived from the Poverty Probability Index (PPI). We also report on financial indicators across three domains (debts, savings and VSLA participation)

- **Poverty Rate:** The PPI provides a quick way of measuring the likelihood that a household lives below a given poverty line. This is done by applying a 10-item questionnaire module on household characteristics, asset ownership, and consumption items. Each question has multiple response

options with corresponding point values (resulting in the PPI score). These points are designed to be simple integers that can be added up to generate a total PPI score between 0-100. These scores are then converted to a so-called poverty likelihood which measures the probability that a given household lives below a poverty line. A lower computed PPI score corresponds to a higher poverty likelihood. A household with a higher poverty likelihood is more likely to live below a certain poverty line. The Poverty Rate averages the poverty likelihoods across a group of households (say within in a certain cohort, or age group) so that it represents the share of households that are likely to live below a poverty line. We use the latest edition of the PPI to date, (the PPI-index from 2020) at the internationally defined poverty line of 2.15 USD per day in 2017 PPP. The poverty estimates should not be considered a gold standard, since measuring poverty (and the impact of an intervention on poverty) using score-card methods can present challenges.¹⁸

- **Debt/savings and VSLA participation:** Total current debt/savings measured in 2024 UGX, amount borrowed in last 12 months and current participation in VSLA are included in the study.

Using the PPI tool to calculate the poverty rate, we estimate that 24% of coffee-farming households live below the poverty line, using the USD 2.15 per day poverty line at 2017 purchasing power parity (PPP). The POP program aims to decrease the poverty rate of the target group within 24 months of each cohort launch to 22%. **Notably, with an average poverty likelihood of 24%, this target is very proximate at baseline using the PPI.** The poverty rate derived through the PPI tool is substantially lower than the close to 50% poverty rate in Section 3.2. **This suggests that while consumption-based poverty estimates might be overestimating poverty, PPI based measures could be underestimating it.**

The PPI process works by assigning a poverty probability to households based on a statistical model calibrated with past consumption survey data involving scoring responses to specific questions and summing them to determine the likelihood of a household being poor. While this method appears straightforward and cost-effective, it has inherent shortcomings that can significantly bias results, even after testing and optimization. Two primary concerns are:

1. **Contextual Sensitivity of Indicators:** Some questions may reflect regional or temporal factors more than actual poverty status. For instance, in Kenya, the consumption of ripe bananas varies by location; approximately 75% of households in Mombasa consume ripe bananas, compared to less than 40% in Narok, despite both counties having similar poverty rates of about 17%. This discrepancy suggests that such indicators may not consistently correlate with poverty across different contexts. This could apply to items in our PPI scorecard.

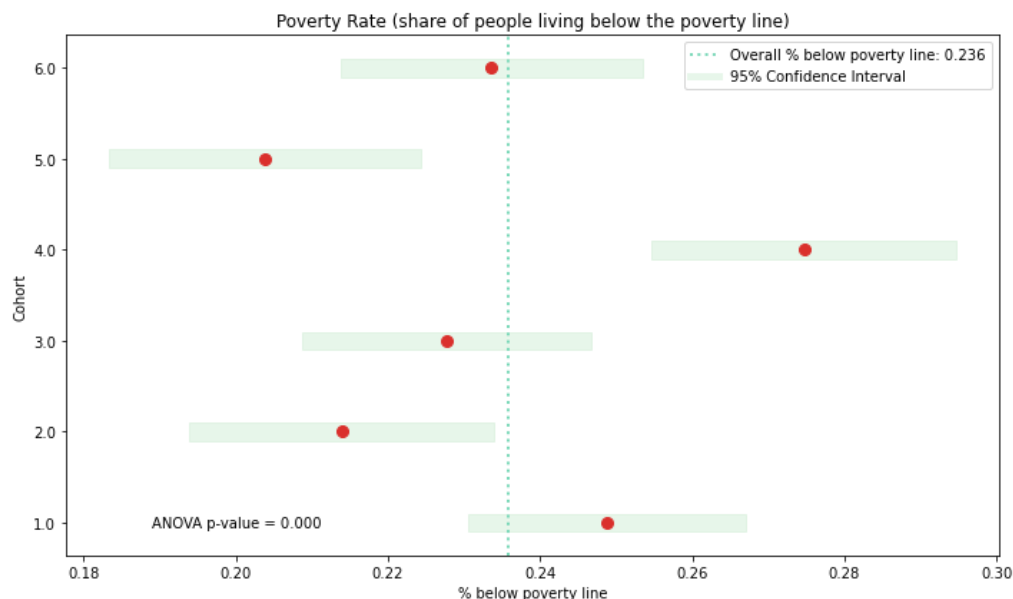
¹⁸ For a discussion see: <https://blogs.worldbank.org/en/developmenttalk/why-measuring-poverty-impacts-more-difficult-simply-using-score-cards>

- Challenges in Universal Applicability:** Developing a concise set of proxy indicators that accurately assess poverty across diverse regions and seasons is challenging. Factors such as local customs, availability of goods, and seasonal variations can influence responses, leading to potential misclassification of households' economic status.

The impact of these biases on poverty is not easy to predict, given that the variation of questions in the spatial-temporal context of our study is unknown. However, if we consider the gold standard to be the rapid consumption module, it is likely that the PPI poverty headcount underestimates poverty.

We investigated whether the cohorts differ in their poverty rate. Poverty rates (the share of people living below the poverty line) vary across cohorts, with Cohort 5 showing the lowest Poverty Rate (20%) and Cohort 4 the highest (27%) – see Figure 8. These differences are statistically significant ($p=0.02$), though the magnitude of that variation is relatively modest. These observations suggest that while randomization may not have achieved perfect balance across cohorts, the practical differences in baseline poverty levels are small enough that they should not substantially compromise the program evaluation. Nevertheless, these small but significant differences should be considered in subsequent impact analysis at the midline and endline.

Figure 8: Poverty Likelihood Rates between cohorts, 95% CI and p-value for equality between cohorts



Financial indicators as measured by savings, debt and loans show consistent patterns across cohorts (See Table 7). The average household savings amount to 314,520 UGX in 2024 (77.37 EUR in 2024), and while nominal values range from 230,930 UGX (56.81 EUR) in Cohort 1 to 375,890 UGX (92.46 EUR) in Cohort 5, these differences are not statistically significant ($p=0.13$).

Current debt levels follow a similar pattern: the average outstanding debt is 141,360 UGX (34,78 EUR), and despite apparent differences between cohorts, these are not statistically

significant ($p=0.07$). Borrowing over the past 12 months averages 275,540 UGX (67,78 EUR) across all households and again shows no significant differences between cohorts ($p=0.06$).

[Annex 5, Figures 3-6](#), indicate that 51.8% of households applied for loans in the past 12 months, with 49.7% successfully receiving them and 2.1% being denied. Among the 48.3% (608 households) that did not apply, the primary reason cited was fear of debt (283 households), followed by a lack of need for loans (203 households), unreliable income for repayment (90 households), high interest rates (58 households), and other reasons. Of the 626 households that received loans, the most common uses were school fees (206 households) and crop production (205 households). The primary source of loans was Village Savings and Loan Associations (VSLAs), used by 330 households, followed by Savings and Credit Cooperative Organizations (SACCOs) (113 households) and banks (91 households).

VSLA participation shows significant variation across cohorts ($p=0.034$). Overall, about half (49%) of households participate in VSLAs, with participation rates ranging from 37% in Cohort 2 to 59% in Cohort 5 – see Figure 9. **With the program's target of achieving 60% VSLA participation by Month 24, Cohort 5's participation rate (59%) is already approaching this goal at baseline, while other cohorts lag.**

Figure 9: Percent of VSLA participation between cohorts, 95% CI and p-value for equality between cohorts

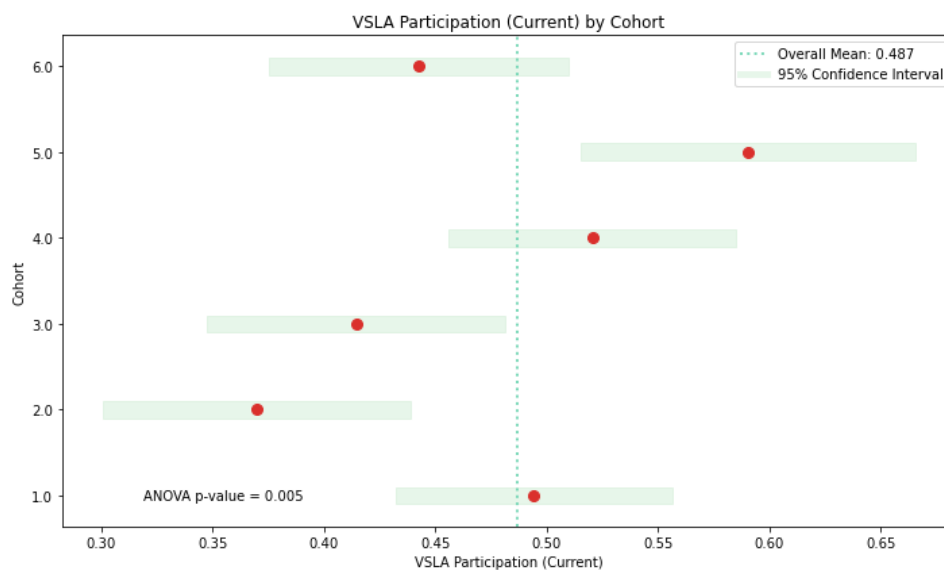


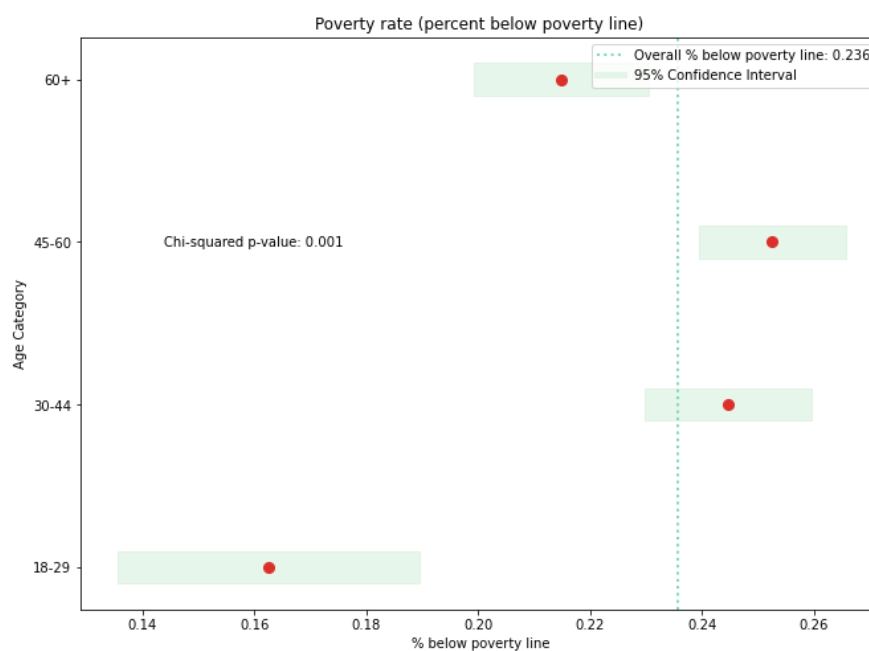
Table 7: PPI, savings, debt and VSLA summary statistics (means, proportions, 95% CIs) by cohort. P-value: Test for difference in means / proportions across cohorts.

	Total (n=1260)	Cohort 1	Cohort 2	Cohort 3	Cohort 4	Cohort 5	Cohort 6	p-value
Poverty rate (proportion of households living below 2.15 USD 2017 PPP)	0.24 (0.22,0.25)	0.25 (0.21, 0.29)	0.21 (0.18, 0.25)	0.23 (0.21, 0.25)	0.27 (0.24, 0.31)	0.20 (0.19, 0.22)	0.23 (0.19, 0.28)	p=0.02
Current household savings (in '000 2024 UGX)	314.52 (272.27, 356.77)	230.93 (153.02, 308.84)	330.42 (266.06, 394.78)	362.09 (262.18, 462.00)	291.86 (170.28, 413.45)	375.89 (297.18, 454.59)	357.85 (311.79, 403.90)	p=0.12
Current debt outstanding (in '000 2024 UGX)	141.36 (120.33, 162.38)	104.38 (71.33, 137.43)	124.09 (68.89, 179.28)	179.68 (122.00, 237.37)	125.26 (85.30, 165.23)	185.87 (148.48, 223.26)	138.31 (120.54, 156.09)	p=0.07
Amount borrowed in past 12 months (in '000 2024 UGX)	275.54 (232.91, 318.17)	218.14 (139.76, 296.52)	253.93 (145.33, 362.54)	329.51 (213.09, 445.94)	218.43 (158.65, 278.20)	375.02 (299.62, 450.42)	271.79 (216.51, 327.08)	p=0.06
Proportion of households currently participating in a VSLA (by saving or borrowing)	0.49 (0.44, 0.53)	0.49 (0.44, 0.55)	0.37 (0.28, 0.45)	0.41 (0.27, 0.56)	0.52 (0.41, 0.63)	0.59 (0.47, 0.71)	0.44 (0.41, 0.47)	p=0.03

Heterogeneity in poverty rates, savings and debt

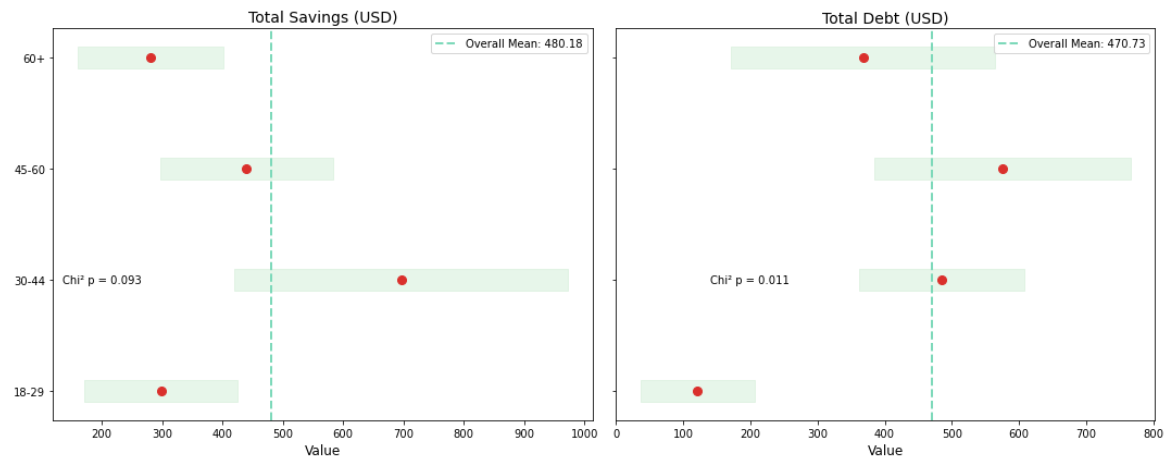
We disaggregated the results further to understand if poverty rates differ by age or gender of the household head. As seen in Figure 10, poverty rates vary significantly across age groups but there is no clear trend. The youngest age group (under 29 years) exhibits the lowest poverty rate (associated with a lower poverty rate of 16.2%), while the 45–60 age group has the highest poverty probability (poverty rate = 24.7%), followed closely by the 30–44 age group (poverty rate = 24.9%). When comparing male- and female-headed households, there is no statistically significant difference in consumption (by quintile) or poverty levels, as measured by both the PPI scores and consumption quintiles. The gender of the household head does not affect the PPI scores and the associated poverty rates.

Figure 10: PPI score over household head age, 95% CI and test p-value for equality between age categories



We find that the oldest and youngest age groups tend to have lower debts compared to those between the ages of 30-60 years old, with statistically significant differences (p-values < 0.05) -see Figure 11. Notably, female-headed households report significantly lower levels of savings and debt than their male counterparts, with male-headed households having on average, twice as much in savings, total debts, and outstanding debts (p-values < 0.01). However, participation in VSLA does not differ significantly across age groups. See [Annex 5 Table 9](#) for summary statistics.

Figure 11: Savings and debt (yearly) over household head age, 95% CI and test p-value for equality between age categories



3.4 Agricultural production and income

Key findings:



- Despite occupying only 37% of agricultural land (compared to 50% for non-coffee crops), coffee generates 54% of agricultural revenue and delivers significantly higher per-acre income (revenue – costs) (2,243,000 UGX/acre vs 1,605,000 UGX/acre for other crops).
- The average farmer in the sample manages 3.47 (median=2.50) acres of agricultural land. Female and younger farmers manage smaller farms than their male and older counterparts.
- 62.5% of farmers grow only Robusta, 4.7% only Arabica, and 29.2% both. The average farmer has 446 trees (median: 250), with Robusta growers averaging 367 Robusta trees (median: 200) and Arabica growers 245 Arabica trees (median: 100), of which on average between 60-70% are productive trees.
- Farmers have 176 trees per acre of total farmland, increasing to 328 trees per acre on predominantly coffee plots.
- While larger farms generate higher total income, they show lower per-acre income from both coffee and non-coffee crops, partly due to reduced coffee productivity
- The average farmer earns 5.6 million UGX annually from farming, with the majority coming from coffee sales. Farmers with more agricultural land have higher total income from farming but lower per-acre income from both coffee and non-coffee crops, partly due to reduced coffee productivity.

Methodology:

- **Farm size and agricultural land use:** The total farm size is calculated by summing the acreage of all plots used for agriculture in a household. The size of agricultural land was aggregated by farm activity categories (assessed with the 'stone method', in which the farmers are asked the fraction of their plots allocated to different uses):
 - coffee production acreage,
 - non-coffee crop production acreage,
 - acreage used for livestock rearing and pasture, and
 - other uses including forestry, forage and fallow land.
- **Coffee yield:** estimated by using farmers' self-reported weights reported in kilograms or bags of cherries by type (dry vs. fresh). As the yield of a coffee tree is seasonally oscillating (one large cycle and one smaller cycle each year), we are interested in the total production of the previous 12 months. Farmers choose to report their yields in fresh or dried cherry,

meaning that to provide comparable figures to estimate yield per acre, we needed to convert fresh into dried cherry. Therefore, in Table 15, coffee reported as dried cherry is aggregated with coffee reported as fresh cherry multiplied by 0.5, since fresh cherries lose half their mass when dried.¹⁹

- **Revenue:** Revenue figures indicate the total sales volume multiplied by the average sales price of the corresponding crop in the previous twelve months.
- **Income:** Income is calculated by subtracting farming category production costs (coffee, non-coffee crop, or livestock) from the corresponding revenue figures.
- **Income per acre:** Income per acre is determined by dividing the income from coffee and non-coffee crop cultivation by the respective acreage used for each activity. For livestock farming, the denominator in the income per acre calculation is the total farmland in acres. This is because farm animals are typically kept in and around crop plantations. While portions of farmland may be specifically allocated to livestock, livestock often roam across larger areas within crop plantations, making it impractical to calculate income per acre based only on land explicitly used for livestock rearing. Using total farmland provides a more consistent basis for comparison. Production costs were calculated at an aggregated level for coffee-related, non-coffee crop-related, and livestock-related practices. As a result, income-per-acre estimates are presented at an aggregate level for coffee, non-coffee crops, and livestock.

RTV's POP program aims to alleviate poverty by boosting agricultural incomes. This is achieved through improved crop quality (primarily coffee), increased agricultural yields, diversification into livestock farming, and enhanced market linkages.

Understanding the impact pathways of this multifaceted intervention requires detailed information on the current farming practices of the target group. To support this goal, we provide an overview of the sample's farming profiles, including land size and use, production volumes, livestock ownership, and income per acre of farmland. We also differentiate between coffee production, non-coffee crop production (crops for human consumption other than coffee), and animal husbandry products.

3.4.1 Farm size and land allocation

The average farm size is 3.47 acres (median = 2.50 acres). Looking at individual farm allocation as shown in Figure 12 and Table 8, farmers dedicate 54% of their land to non-coffee crops (1.74 acres) and 39% to coffee production (1.30 acres). The remaining farmland is distributed between other activities (5%, 0.33 acres) and livestock (2%, 0.16 acres). This

¹⁹ Young, J. M. (2000). *Post-harvest handling and processing of coffee in African countries*. Food and Agriculture Organization of the United Nations (FAO). Retrieved from <http://fao.org/4/x6939e/X6939e00.htm>

means that **on a typical farm, more than half the land is used for crops other than coffee, with coffee occupying just over a third of the total area (39%)**. The farmer was asked to estimate the share of a coffee plot used for a specific crop. Based on this, intercropped plots are divided into area used for coffee and area for non-coffee crops. The 39% therefore refer to pure coffee stands.

Figure 12 Land use as a share of total farm area (A) and average size allocated to land use (in acres) (B)

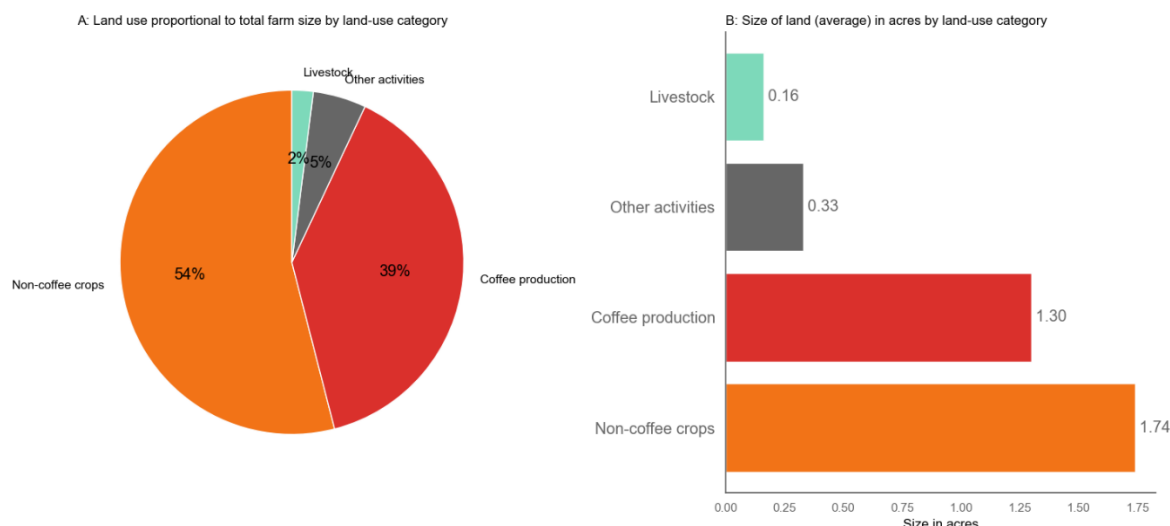


Table 8: Farm size in acres and proportional to total farm size by land-use category (n=1,260).

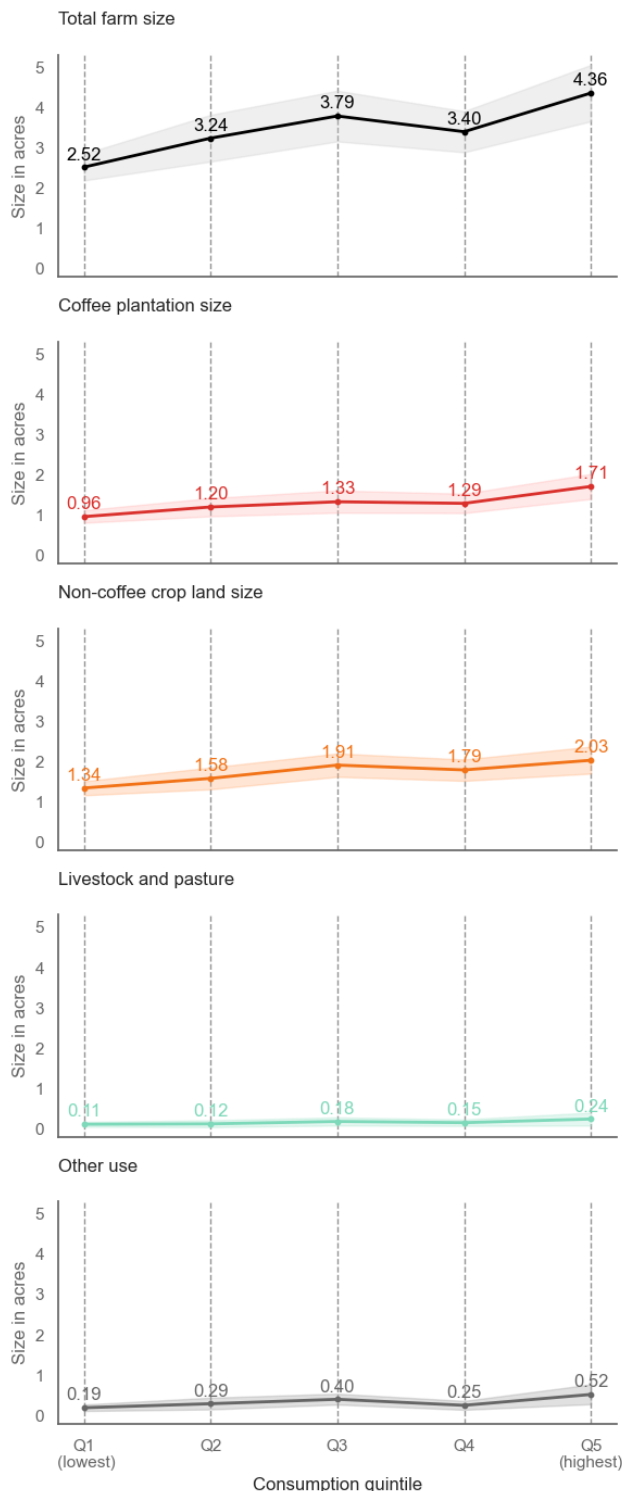
	Mean in acres (95 CI)	Median in acres	Percentage of total farm size allocated to category
Total farm size	3.47 (3.13, 3.82)	2.50	100 %
Coffee plantation size	1.30 (1.15, 1.46)	0.80	39 %
Non-coffee crops area size	1.74 (1.56, 1.91)	1.29	54 %
Livestock pasture and rearing	0.16 (0.10, 0.22)	0.00	2%
Other activities*	0.33 (0.26, 0.41)	0.00	5%

* Other activities include forage production and forestry, and fallow and unused land

Note: The areas allocated to coffee species and non-coffee crop types do not sum exactly to the total farm size acreage. This is because the averages are weighted based on the stratification of household administrative locations.

The total farm size is equal across the various cohorts. Likewise, there are no statistically significant differences between the cohorts shares of land allocated to coffee and its average acreage. In all cohorts, households live on farms that are roughly equal in size and farmers in each cohort divide their farms across coffee, other crops, livestock and other uses. **The share (and acreage) of farms allocated to non-coffee crop production exceeds coffee-production in all cohorts** (see [Annex 6 Table 1](#)).

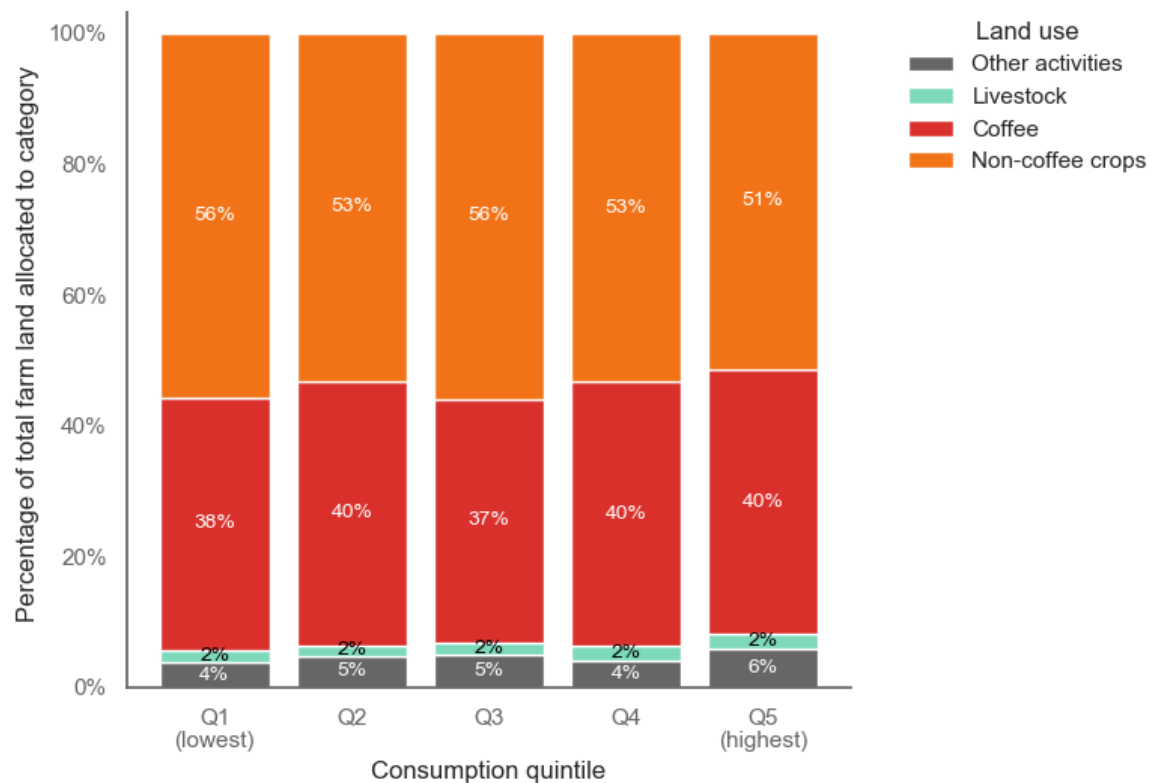
Figure 13 Farm size in acres across consumption quintiles by land use category (shaded areas represent 95% CI)



Farmers in higher consumption quintiles tend to have larger farms and larger coffee plantations, as expected for comparatively well-to-do farmers. Figure 13 shows that all categories show an upward trend with increasing consumption levels, with shaded areas representing 95% confidence intervals. Total farm size increases steadily from 2.52 acres for the lowest consumption quintile to 4.36 acres for the highest quintile. This pattern is reflected in both coffee plantations, which increase from 0.96 to 1.71 acres, and non-coffee cropland, expanding from 1.34 (quintile 1) to 2.03 (in quintile 5)

However, despite these substantial differences in absolute farm sizes, the share of land allocated to coffee versus non-coffee crops remains remarkably similar between relatively poor and comparatively well-to-do farmers (see Figure 14). The proportion of land dedicated to coffee stays consistently around 37-40% across all consumption quintiles (and does not differ significantly), while non-coffee crops consistently take the majority share at approximately 53-56%. **This suggests that as households move up the consumption ladder, they tend to expand all farming activities proportionally rather than specializing in either coffee or non-coffee production.**

Figure 14 Share of total farm size allocated to land-use category by consumption quintile



We find that female headed households manage significantly smaller farms than men (see [Annex 6 Table 2](#)). However, the proportion of land allocated to different farming activities is similar across genders, consistent with the above-mentioned patterns. On average, coffee cultivation occupies approximately 40% of farmland on farms managed by men and 38% on farms managed by women. In contrast, non-coffee crop production accounts for a larger share: 53% for farms managed by men and 57% for farms managed by women.

Older farmers manage significantly larger farms ($p < 0.001$), with average sizes increasing from 2.00 acres for the youngest group (18–29 years) to 4.09 acres for the oldest group (60+ years). Older farmers also allocate a smaller proportion of their land to coffee and a larger share to non-coffee crops compared to younger farmers. These differences in land allocation are statistically significant ($p < 0.05$), but with low magnitudes. For all age groups, the land allocated to coffee is smaller than the land allocated to non-coffee crops (see [Annex 6 Table 3](#)).

3.4.2 Coffee revenue and income

Revenue

While coffee occupies a smaller share of land, coffee sales account for a greater percentage of total agriculture-related revenue than non-coffee crops sales. This is despite that non-coffee crops occupy a larger portion of farmland compared to coffee (see Table 8). On average, farmers in the sample derive 54% of their agricultural revenue from coffee sales and 36% from other crops.

Table 9: Average shares and confidence intervals of revenue generated through different farming activities in average percentages and with confidence intervals. p-value: test of difference between cohorts.

Sales	Total N=1260	Cohort						p-value
		1 (N=318)	2 (N=146)	3 (N=189)	4 (N=232)	5 (N=251)	6 (N=125)	
Coffee sales %	54% (49, 58)	48% (41, 56)	47% (41, 53)	58% (53, 63)	53% (41, 65)	60% (49, 71)	58% (52, 63)	p=0.05
Robusta sales %	42% (37, 48)	45% (38, 52)	37% (27, 46)	47% (38, 56)	45% (34, 57)	33% (16, 51)	47% (35, 59)	p=0.58
Arabica sales %	11% (5, 18)	3% (-1, 7)	10% (3, 18)	11% (1, 21)	7% (3, 12)	27% (3, 51)	10% (-3, 24)	p=0.26
Sales of non-coffee crops %	36% (31, 40)	40% (35, 46)	39% (33, 44)	33% (27, 39)	34% (22, 46)	31% (18, 44)	35% (31, 40)	p=0.48
Sales of livestock and animal products %	11% (9, 12)	11% (8, 14)	15% (12, 18)	9% (5, 13)	13% (9, 17)	9% (5, 12)	7% (6, 8)	p=0.00

To further understand the agricultural revenue, we disaggregate the non-coffee crops into perennial crops and annual crops. About 97% of the farmers are engaged in annual cropping but only 74% of the farmers report selling these annual crops. An even larger gap is seen for perennials whereby 91% of the farmers grow perennials but 32% report sales. In monetary terms, in the prior 12 months, the average farmer sold:

- Coffee for 2,633 thousand UGX,
- Perennials for 253 thousand UGX, and
- Seasonal crops for 2,215 thousand UGX.

Note, when considering the revenue only among farmers who sold the crops (not all farmers), we find that annual crops generate more sales value (3,046 thousand UGX) than coffee (2,791 thousand UGX).

The shares of revenue from coffee significantly differ among cohorts; the share of coffee revenue varies between 47% in cohort 2 to 60% in cohort 5 ($p=0.048$). For the different coffee types, revenue shares from Robusta and Arabica coffee do not differ statistically significantly across cohorts.

Income

The average farming household in the sample earned a gross income of 5,614 thousand UGX in the past twelve months (equivalent to around 1,542 USD unadjusted to PPP). Most of the agricultural income – defined as agricultural revenue minus the associated expenses – is generated through coffee production (2,419 thousand UGX), followed by other crop production (2,118 thousand UGX) and livestock farming (215 thousand UGX).

When income is calculated per acre (see Table 11), the high value of coffee production becomes more evident; coffee generates the average farmer 2,243 thousand UGX per acre, while farmers earn 1,605 thousand UGX per acre by cultivating other crops.

However, it needs to be emphasized that these figures show average incomes of the typical farmer in the sample, which might lower the importance of crops other than coffee. All farmers are considered in calculating the means which reduces the overall value of non-coffee crops. Thereby, non-coffee crops' is a wide category of crops containing everything from non-profitable staple crops to cash crops other than coffee, obscuring the profitability of cash crops.

We explore the relationship between income and farm size with the expectation that larger farms generate more income per acre. **Table 10** and **Table 11** indicate that households with larger farms generate substantially more farm income than smaller farms. However, when adjusting for the farming acreage, farmers with larger farms tend to earn less than farmers with smaller farms. This contradicts scaling theory, which would have suggested that larger farms generate more income per acre. An explanation could be that larger farmers (who tend to be richer according to the data in Table 10) depend less on agriculture for their livelihoods and therefore have lower necessity of high productivity. Another explanation could be that larger farms practice less intensive agriculture. **Annex 6 Table 7** shows that larger farms have higher productivity per tree, suggesting that the intensity of coffee cultivation per acre is less

for larger farms, or large farmers are less able to invest the required level in terms of labor inputs per tree, leaving some trees below their maximum yield capacity.

Table 10 Means and 95% confidence intervals of total income per year per agricultural activity (measured over the previous 12 months) in 1,000UGX by farm size category

Income sources	Total (N=1,260)	Farm size category			
		1.5 acres and smaller (N=437)	Between 1.5 and 3 acres (N=375)	Between 3 and 7 acres (N=286)	Larger than 7 acres (N=163)
Coffee production income	2,419 (2023, 2815)	1,234 (900, 1568)	1,758 (1444, 2072)	3,533 (2706, 4360)	5,157 (3857, 6456)
Non-coffee crop production income	2,118 (1745, 2491)	961.69 (624, 1297)	2,212 (1753, 2671)	2,920 (2199, 3,642)	3,593 (2710, 4,475)
Livestock related income ²⁰	215 (182, 248)	125 (75, 176)	160 (121, 199)	325 (257, 394)	391 (277, 506)
Total agricultural income	5,614 (4888, 6340)	2,654 (2176, 3,131)	4,817 (4193, 5,442)	7,875 (6284, 9466)	11,410 (9,073, 13,747)

Table 11 Means and confidence intervals of income in 1,000UGX per acre by agricultural activity. p-value: test of difference between farm size categories.

Income sources	Total (N=1260)	Farm size category				p-value
		1.5 acres and smaller (N=437)	Between 1.5 and 3 acres (N=375)	Between 3 and 7 acres (N=286)	Larger than 7 acres (N=163)	
Coffee related income per acre	2,243 (1,931, 2,556)	2,828 (2,241, 3,414)	1,851 (1,568, 2,135)	2,023 (1,630, 2,416)	1,935 (1,497, 2,374)	p=0.02
Non-coffee crop related income per acre	1,605 (1313, 1897)	1,538 (1066, 2009)	1,852 (1,433, 2,271)	1,500 (1,028, 1,972)	1,369 (940, 1,799)	p=0.49
Livestock related income per total acreage farmland	82.08 (64.05, 100.11)	100.67 (59.42, 141.93)	67.07 (49.08, 85.07)	83.37 (65.22, 101.52)	61.85 (36.38, 87.32)	p=0.24

Farmers also reported other income-generating activities (IGAs) that contributed to the household's total income. **Error! Reference source not found.** shows the percentage of households that have at least one household member that is engaged in an IGA group. It indicates that about a third of households are engaged in casual labor (32.9%) and self-employed businesses (33.3%). About one in ten households generate income through formal

²⁰ Livestock related income is defined as profit generated through selling livestock products, such as milk, honey and eggs, and animals, minus livestock related costs. It includes cash flow obtained through selling livestock. Even though ad hoc sales of livestock for quick cash is not a structural income generating activity, by excluding animal sales, it is assumed that livestock breeding is not a main income generating activity. Therefore, animal sales are included in the livestock income figures

employment (10.6%) and renting out land that is owned by the household (9.9%). The average income generated through the IGA is calculated by only considering the income figures of households who are engaged in the IGA group and those known by the survey respondents. Formal employment generated the largest average IGA household income with 4,444 thousand UGX, followed by self-employed businesses (2,230 thousand UGX), whereas casual labor and land rent income have averages of 491 and 548 thousand UGX on average in the prior 12 months.

Table 12: Income generating activity group: percentage of households that are engaged in IGA group and the mean (median) income generated in the past 12 months in 1,000UGX

IGA group	Percentage of households engaged	Mean (median) income for households engaged in IGA	Sample size mean
Business/self-employed income	33.3%	2,230 (940)	n=372
Casual labor	32.9%	491 (220)	n=347
Formal (employed) labor	10.6%	4,444 (1,800)	n=110
Land rent income	9.9%	548 (200)	n=97

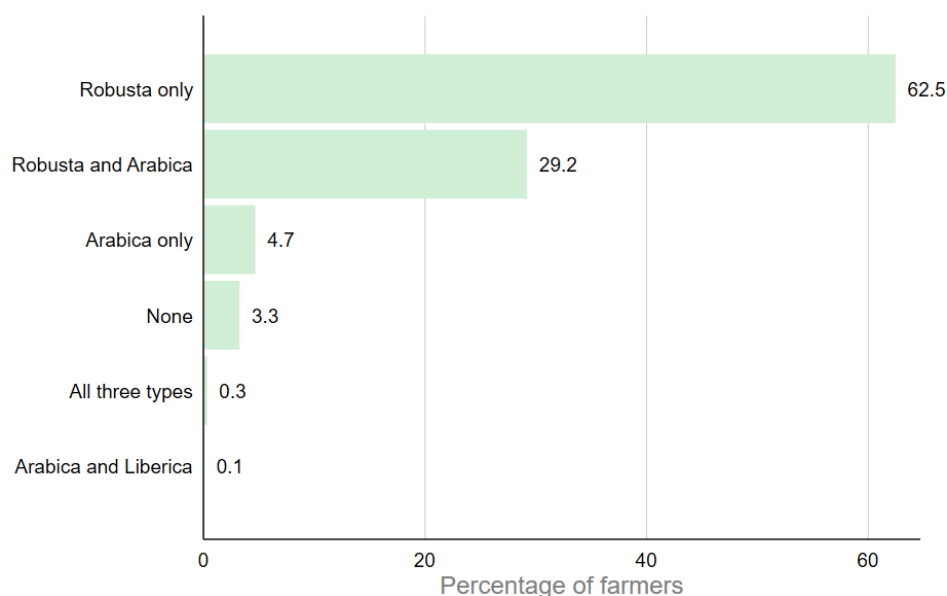
With income figures from non-agricultural IGAs, a total breakdown of household income disaggregated by farm and non-farm income is represented in **Annex 6 Table 11**. The table shows that the average household income is 6,455 thousand UGX in the past 12 months and that there are no statistically significant differences in household income across the cohorts ($p=0.617$). Also, non-agricultural income does not differ significantly with a p-value of 0.131 even though the income ranges from 844 thousand UGX in cohort 1 to 1,757 thousand UGX in cohort 2. Interestingly, wealthier farmers generate substantially more non-agricultural income, but relative to their total household income, non-agricultural income is equal across wealth quintiles at around 20% (**Annex 6 Table 12**). This indicates that farming remains an important source of income for wealthy farmers.

3.4.3 Coffee trees

Farmers in this study report predominantly farming Robusta only or a combination of Robusta and Arabica. Figure 15 shows that in the 12 months prior to the survey, 62.5% of the farmers produced Robusta only, whereas 29.2% produced both Robusta and Arabica. Note that 3.3% of farmers in the sample did not produce or could not recall the amounts produced. The 1,189 Robusta growers have 367 Robusta trees on average (median=200) of which on average 266 are productive trees (median=100). The 468 arabica growers have 245 arabica trees on average (median=100), with 174 productive and 55 unproductive Arabica trees. On average the farmers have 446 coffee trees (median=250) of which 293 are productive and 161 unproductive.

On average, farmers have 228 coffee trees per acre of land on which coffee is grown (median of 140 trees per acre). However, when we consider farmland with a more substantial coffee tree density only (more than 50% coffee trees coverage), the density increased to 328 coffee trees per acre on average (median of 299 coffee trees).

Figure 15: Type of coffee farmer percentage distribution based on the coffee species produced in the past 12 months (n=1,260)



The types of coffee species farmers grow based on actual yield reports in previous 12 months

Table 13: Mean and median number of trees per species and by productivity status

	Total	Productive	Unproductive
	Mean (median)	Mean (median)	Mean (median)
Robusta (n=1,189)	367 (200)	236 (100)	101 (37)
Arabica (n=468)	245 (100)	174 (67.5)	55 (10)
Liberica (n=5)	208 (80)	48 (50)	160 (30)
Total	446 (250)	293 (150)	161 (100)

Table 14: Average and median number of coffee trees per acre of total farmland, per acre of farming area with coffee trees present and per acre of farming area with 50% or more coverage of coffee trees

	Mean (95% CI)	Median
Coffee trees per acre of total farmland (n=1,222)	176 (143, 209)	103
Coffee trees per acre of farmland with coffee trees present (n=1,220)	228 (186, 270)	140
Coffee trees per acre of farmland with more than 50% coffee tree coverage (n=724)	328 (263, 394)	299

3.4.4 Coffee yield, GAPs and marketing

The 1,159 Robusta growers - that were able to recall their yields - produced 546 kg Robusta coffee per acre on average. The 432 farmers who produced Arabica had an average yield of 476 kg of Arabica coffee per acre²¹. Robusta yields do not differ statistically significantly across the six cohorts ($p=0.625$) (**Annex 6 Table 6**). However, Arabica production varies significantly across the cohorts between 364 kg in cohorts 4 and 6 and 585 kg in cohort 5, with a p-value of 0.021 due to a substantially higher number of productive Arabica trees on Arabica farms in cohort 5 (425 on average versus 155 Arabica trees on average across all other cohorts).

Smaller farms tend to have higher yields per acre than larger farms in terms of Robusta, Arabica and aggregated coffee production. The differences are statistically significant with p-values of 0.001 and below. However, **Annex 6 Table 7** shows that the largest farm category has a significantly larger yield per Robusta tree (3.65 kg/tree) than the other farm size categories ($p = 0.032$). With arabica growers, there are no significant differences in yield per tree between the farm size categories ($p = 0.970$). Across the sample, Robusta and Arabica growers have a tree productivity of 3.00 kg per tree and 1.88 kg per tree. **Annex 6 Table 8** shows that Robusta and Arabica productivity per acre and per tree do not differ significantly between Kitagwenda and Rakai.

Table 15: Mean coffee yield in kg dried cherry per acre total sample and by farm size category averages and 95% CIs. p-value: test of difference between farm size categories.

Yields per acre (kg)	Farm size category					p-value
	Total (N=1,201)	Under 1.5 acres (N=437)	1.5 to 3 acres (N=375)	3 to 7 acres (N=286)	Over 7 acres (N=163)	
Robusta yield mean (95% CI)	546 (494, 598)	703 (590, 815)	513 (448, 577)	462 (394, 529)	364 (282, 445)	p=0.00
Median	333	447	333	296	252	
Arabica yield mean (95% CI)	476 (393, 558)	745 (621, 868)	363 (293, 433)	280 (212, 347)	337 (236, 437)	p=0.00
Median	238	405	250	175	200	

The POP program aims to increase the farmers' yield at endline through the adoption of good agricultural practices (GAPs) that participating farmers learn during RTV farmer trainings. The extent to which the untreated farmers currently apply GAPs is shown in **Annex 6 Figures 5 – 11**. Most farmers weeded several times during the prior 12 months - 26% weeded twice, 32% weeded three times and 39% weeded four times or more, whereas 1.7% weeded only once and 1.4% weeded not at all. Furthermore, the majority of farmers (54%) did not use any type of fertilizer at all on their coffee trees. Manure is the most common fertilizer type with 31% followed by NPK with only 6.4% and a list of fertilizer types that are hardly used (including

²¹ The Ugandan Coffee Development Authority ([UCDA, n.d.](#)) reports that the average yield for Robusta and Arabica cultivation ranges between 607-1,215 kg dried cherry per acre for Robusta and 505-1,620 kg dried cherry per acre for Arabica. Note that we can only compare these figures correctly if the same definition for an acre of Robusta/Arabica production is maintained. Currently, the UCDA does not report on that.

compost with only 4.7%). Of the 403 farmers who did use compost or manure, 241 (60%) make their own on their farms. Already 95% of the farmers apply the GAP “selective picking” – meaning that during harvest only the ripe red cherries are picked, and the green cherries are left on the tree to ripen. However, only 21% of farmers sell dried coffee – which is a GAP as the price for dried coffee is usually higher – while 57% only sell fresh coffee and 22% sell both types.

For the coffee yield sold, we evaluated the sales prices that farmers received per kg of coffee. Some prices are strongly right-skewed, suggesting that some farmers were able to sell their coffee against much higher prices than the majority. Another explanation could be that some farmers had difficulties recalling factors such as average weight of a coffee bag and the average sales price per bag over a period of 12 months, resulting in inflated averages. Furthermore, Annex 6 Figure 7 shows to what extent farmers sold dried coffee cherries and Annex 6 Figure 8 shows whether farmers sold their coffee individually (by bringing it to the market themselves or with hired transportation) or jointly (through VSLAs, cooperatives, and other collective bargaining institutions). 97.3% of farmers sell their coffee individually, and only 1.9% were able to sell via collective bargaining institutions.

Table 16: Average and median coffee sales prices per species and selling stage in 1,000UGX in the prior 12 months

Coffee species	Dry cherry		Fresh cherry	
	Mean (95% CI)	Median	Mean (95% CI)	Median
Robusta	7.36 (6.80, 7.93)	6.5	3.23 (2.86, 3.60)	2
Arabica	9.29 (8.51, 10.07)	9.75	3.66 (2.87, 4.45)	1.65

3.4.5 Livestock ownership

93% of the farmers in the sample own livestock. The most common livestock animals are chicken (owned by 76%), goats (60%), pigs (54%) and cows (19%). Livestock liveweight, expressed with the Tropical Livestock Unit (TLU) for Sub-Saharan Africa²², does not statistically significantly differ across the cohorts (**Annex 6 Table 4**).

Higher-consumption households are equally likely to own livestock as lower-consumption households. However, a comparison between the consumption quintiles on mean TLU indicates that higher-consumption households own significantly more livestock liveweight than lower-consumption households ($p=0.046$), with the highest consumption quintile owning 1.26 TLU in average versus 0.65 for the lowest consumption quintile (**Annex 6 Table 5**).

²² The TLU conversion units for Sub-Saharan Africa are taken from *Jahnke (1982)* as commonly used in FAO publications - Jahnke, H.E. 1982. *Livestock Production Systems in Livestock Development in Tropical Africa*. Kiel, FRG: Kieler Wissenschaftsverlag Vauk.

3.5 Quality of life and scarcity barriers

Key findings:



- On average, household heads rated their quality of life at 4.42 on the Cantrill Ladder, with male heads perceiving significantly higher scores than females.
- Wealth and age were key determinants, as higher wealth quintiles and younger age groups reported better quality of life.
- For water access, 55% of households used improved water sources, though this varied by cohort, ranging from 37% in cohort 6 to 65% in cohort 2, though without statistical significance.
- Walking time to water sources averaged 35 minutes but differed significantly by cohort and district.
- Health data indicated farm managers' self-reported health ranged from "Good" to "Fair," with wealthier households reporting better health.
- The prevalence of adult diarrhea ranged from 9% to 17% in the previous two weeks, and child diarrhea prevalence was 19% in the previous two weeks on average, both differing across wealth quintiles but not across cohorts.

Methodology:

Indicators related to quality of life and scarcity barriers:

- **Self-perceived quality of life:** Quality of life is measured using the Cantrill Ladder, in which respondents were asked about their current perceived quality of life, with 0 being their worst possible life and 10 being their best possible life.
- **Main source of drinking water:** A categorical variable indicating which water source is mostly used by the household. The categories can be aggregated into 'improved water sources' (all water source types ensuring health and hygiene) and 'not improved water sources' (any water source with increased risks of infections and diseases).
- **Prevalence of diarrhea among adults:** A dummy variable indicating whether at least one adult in the household has had diarrhea in the previous two weeks.
- **Prevalence of cough among adults:** A dummy variable indicating whether at least one adult in the household has had a cough in the previous two weeks.

- **Prevalence rate of diarrhea among children under 5 years old:** A continuous variable indicating the percentage of children under 5 years old in a household who have had diarrhea in the past two weeks. The variable ranges from 0% (none of the children under 5 have had diarrhea) to 100% (all of the children under 5 have had diarrhea) and yields missing values if there are no children under 5 in the household.
- **Self-perceived health status of farm manager:** The health status of the farm manager is measured as the mean value on a Likert scale indicating self-reported perceived health, where 1 represents "Excellent" and 5 represents "Poor."

3.5.1 Quality of life: Cantrill Ladder

The average household head has a moderate perception of their quality of life with an average of 4.42 on the Cantrill Ladder, ranging from zero to ten. This value is similar to the national average as per the Gallup Poll in 2023 at 4.37 out of 10.²³ Male household heads perceive the quality of their life higher than female household heads ($p=0.001$). The perceived quality of life among the household heads in the different consumption quintiles and age groups appears to be statistically significantly different as well ($p<0.001$ & $p=0.001$, respectively); household heads in wealthier quintiles experience a higher quality of life than in less wealthy quintiles, and older household heads experience a lower quality of life than their younger counterparts. Across the cohorts, there seem to be no significant differences ($p=0.537$).

Table 17 Mean and confidence interval of the Cantrill ladder score by gender, cohort, consumption quintile and age group. p-value: test of difference between specified groups

		Mean Cantrill Ladder score (95% CI)
Total	(N=1,260)	4.42 (4.25, 4.60)
Female	(N=217)	3.89 (3.62, 4.15)
Male	(N=1043)	4.53 (4.33, 4.73)
<i>p-value gender difference</i>		<i>p=0.01</i>
Cohort 1	1 (N=318)	4.19 (3.82, 4.56)
Cohort 2	2 (N=146)	4.57 (4.33, 4.81)

²³ World Happiness Report (2012-2024)

Cohort 3	3 (N=189)	4.35 (3.95, 4.75)
Cohort 4	4 (N=232)	4.59 (4.10, 5.08)
Cohort 5	5 (N=251)	4.59 (4.23, 4.95)
Cohort 6	6 (N=125)	4.30 (3.91, 4.68)
<i>p-value cohort difference</i>		<i>p=0.537</i>
Consumption quintile 1	(N=242)	4.03 (3.76,4.30)
Consumption quintile 2	(N=247)	4.37 (4.07, 4.66)
Consumption quintile 3	(N=257)	4.48 (4.05,4.92)
Consumption quintile 4	(N=266)	4.61 (4.32,4.90)
Consumption quintile 5	(N=248)	4.59 (4.35, 4.83)
<i>p-value consumption quintile difference</i>		<i>p=0.01</i>
Age 18 - 29	(N=73)	4.68 (3.83, 5.52)
Age 30 - 44	(N=391)	4.56 (4.29, 4.82)
Age 45 - 60	(N=489)	4.55 (4.28, 4.82)
Age 60+	(N=305)	3.99 (3.80, 4.18)
<i>p-value age group difference</i>		<i>p=0.00</i>

3.5.2 Water sources and health

Most households (55%) have access to improved water sources such as boreholes and wells. However, this varies strongly across cohorts. In Cohort 6 only 37% of households use improved water sources, while the percentages are as high as 65% and 64% for Cohort 2 and 4 respectively. This results from the differences between parishes in their infrastructure rather than that this reflects imbalances resulting from randomization. Nevertheless, the differences across cohorts do not appear to be statistically significant ($p=0.10$).

Table 18 Main source of drinking water for total sample and by cohort. p-value: test of difference between cohorts.

Source of drinking water	Total N=1,260	Cohort						p-value
		1 (N=318)	2 (N=146)	3 (N=189)	4 (N=232)	5 (N=251)	6 (N=125)	
Main source of drinking water								<i>p=0.68</i>
Improved water source	696 (55.23%)	158 (49.79%)	95 (65.01%)	105 (55.85%)	149 (64.29%)	141 (56.45%)	47 (37.35%)	
Protected Spring	79 (6.29%)	16 (4.95%)	10 (7.15%)	18 (9.66%)	15 (6.46%)	14 (5.65%)	6 (4.58%)	
Borehole	171 (13.59%)	41 (12.98%)	35 (23.78%)	33 (17.47%)	29 (12.61%)	28 (11.35%)	5 (3.63%)	
Gravity Flow	9 (0.71%)	3 (0.92%)	4 (2.46%)	0	2 (1.06%)	0	0	
Tap	118 (9.36%)	11 (3.44%)	7 (4.94%)	15 (7.80%)	39 (16.63%)	44 (17.48%)	3 (2.09%)	
Shallow well/Deep well	283 (22.48%)	78 (24.67%)	37 (25.20%)	34 (18.09%)	60 (25.85%)	49 (19.38%)	25 (20.31%)	
Water Tank/Rainwater	35 (2.80%)	9 (2.83%)	2 (1.48%)	5 (2.83%)	4 (1.68%)	6 (2.59%)	8 (6.74%)	
Non-improved water source	564 (44.77%)	160 (50.21%)	51 (34.99%)	83 (44.15%)	83 (35.71%)	109 (43.55%)	78 (62.65%)	
Pond/Swamp	185 (14.68%)	60 (18.86%)	14 (9.91%)	32 (17.05%)	33 (14.40%)	25 (9.98%)	20 (16.00%)	
Puddles	9 (0.73%)	5 (1.47%)	0	0	3 (1.38%)	1 (0.26%)	1 (0.51%)	
Unprotected Spring/Well	258 (20.50%)	73 (22.86%)	35 (23.88%)	37 (19.65%)	43 (18.40%)	41 (16.36%)	30 (24.05%)	
River/Lake/Stream	108 (8.58%)	20 (6.27%)	2 (1.19%)	14 (7.46%)	4 (1.53%)	42 (16.95%)	26 (21.17%)	
Dam	4 (0.28%)	2 (0.75%)	0	0	0	0	1 (0.93%)	
<i>Uses improved water source (proportion)</i>	0.55 (0.51, 0.60)	0.50 (0.07)	0.65 (0.13)	0.56 (0.09)	0.64 (0.05)	0.56 (0.08)	0.37 (0.07)	<i>p=0.10</i>

The average household takes 34.87 minutes for a roundtrip to access water at the source that they use most often. The walking times do differ among the cohorts, with the differences being statistically significant with a p-value of 0.05. The average walking time in Kitagwenda is lower than in Rakai, but even within the districts, the cohorts differ statistically significantly (p=0.02 for Kitagwenda and p=0.00 for Rakai).

Table 19 Average walking times in minutes to the most often used water sources by cohort and districts

Walking distance in minutes	Total N=1,260	Kitagwenda	Rakai
Overall (N=1269)	34.87 (31.38, 38.35)	32.89 (27.65, 38.13)	37.42 (33.12, 41.72)
Cohort 1 (N=318)	39.73 (34.43, 45.04)	40.71 (31.65, 49.77)	39.09 (31.98, 46.19)
Cohort 2 (N=146)	38.35 (30.86, 45.85)	41.17 (29.64, 52.70)	34.75 (27.09, 42.42)
Cohort 3 (N=189)	39.04 (31.38, 46.69)	38.97 (25.72, 52.22)	39.13 (38.95, 39.32)
Cohort 4 (N=232)	30.06 (24.58, 35.54)	28.00 (23.36, 32.63)	43.17 (43.17, 43.17)
Cohort 5 (N=251)	27.30 (20.14, 34.46)	23.55 (15.81, 31.29)	33.49 (20.83, 46.15)
Cohort 6 (N=125)	36.27 (28.96, 43.59)	35.87 (33.02, 38.72)	36.42 (26.06, 46.77)
<i>p-value cohort differences</i>	p=0.05	p=0.02	p=0.00

Between 9% and 17% of households reported adults experiencing diarrhea in the past two weeks, while the prevalence of cough among adults ranges from 56% to 60%. The average prevalence rate of diarrhea among children under 5 years is 19%, with cohort-specific averages ranging from 15% in cohort 5 to 24% in cohort 2.

Health indicators across the cohorts show no statistically significant differences, with p-values well above common thresholds (Annex 6 Table 13). There are minute differences in self-perceived health across the consumption quintiles, with wealthier households declaring better self-perceived health outcomes. However, perhaps somewhat surprisingly, there were no statistically significant differences between observed health outcomes (diarrhea, cough or diarrhea among children) between those with lower consumption and those with higher consumption (Table 20). In other words, although wealthier households perceive themselves to be less healthy, their prevalence of diarrhea and cough is the same as other quintiles.

Table 20 Health status summary statistics by consumption quintile. p-value for difference between consumption quintiles

Health-related outcomes	Consumption quintile					p-value
	Quintile 1 (lowest) (N=237)	Quintile 2 (N=249)	Quintile 3 (N=257)	Quintile 4 (N=265)	Quintile 5 (highest) (N=251)	
Self-reported health status of farm manager (lower scores represent better perceived health)	3.43 (3.33, 3.54)	3.32 (3.17, 3.47)	3.24 (3.12, 3.36)	3.21 (3.07, 3.34)	3.06 (2.92, 3.20)	p=0.01

Prevalence of diarrhea among adults in the past 2 weeks	0.12 (0.08, 0.17)	0.17 (0.11, 0.22)	0.14 (0.08, 0.20)	0.12 (0.07, 0.17)	0.09 (0.04, 0.13)	p=0.16
Prevalence of cough among adults in the past 12 weeks	0.56 (0.50, 0.62)	0.58 (0.50, 0.66)	0.62 (0.56, 0.68)	0.62 (0.56, 0.68)	0.51 (0.44, 0.58)	p=0.10
Prevalence of diarrhea in the last 2 weeks of children under 5	0.25 (0.13, 0.37)	0.19 (0.10, 0.29)	0.21 (0.12, 0.29)	0.14 (0.08, 0.21)	0.16 (0.08, 0.23)	p=0.45

Assessing the difference between the groups shows that diarrhea occurs slightly less often in households with improved water source access, but the differences are not statistically significant. When assessing the relationship between improved water sources and prevalence of diarrhea among children under 5, we find that of the 564 households that do not have access to improved water sources, the prevalence rate for diarrhea among young children is 20% on average, and 13% of the households' house adults have had diarrhea in the past two weeks. For the group with improved water source access, this is 18% and 12% respectively. Comparing the improved water source group with the no-improved water source group shows that the difference is not statistically significant ($p=0.566$ for diarrhea prevalence rates among children under 5 and $p=0.339$ for adult diarrhea prevalence rate).

Table 21 Diarrhea prevalence rates among young children and prevalence rates among adults by 'improved water source access group'. p-value for difference between water access status.

	No improved water source access (N=564)	Improved water source access (N=696)	p-value
Prevalence of diarrhea in the last 2 weeks of children under 5	0.20 (0.15, 0.25)	0.18 (0.14, 0.23)	$p=0.57$
Prevalence of diarrhea among adults in the past 2 weeks	0.13 (0.11, 0.16)	0.12 (0.10, 0.15)	$p=0.34$

4. Conclusions and recommendations

This baseline report aimed to establish the starting point for the Pathways Out of Poverty (POP) program in Uganda's Kitagwenda and Rakai districts, with four key objectives. First, we sought to assess the current status of key outcome indicators identified in the program's theory of change and logical framework, including income levels, poverty rates, quality of life, and barriers to scarcity. Second, given coffee's centrality to the intervention, we examined its role in household agricultural production and income. Third, we validated whether the stepped-wedge randomization created sufficiently balanced cohorts to enable a rigorous impact evaluation. And fourth we provide recommendations in the next section.

Coffee-farming households in Kitagwenda and Rakai districts face poverty despite some promising indicators. Average daily per capita consumption is estimated at 2.87 USD (2017 PPP), a median of 2.20 USD, with a poverty headcount of 50%, indicating the proportion of households living below the poverty line of 2.15 USD/day. The poverty gap index is 17%, reflecting the average shortfall from the poverty line, with no significant differences between districts. Quality of life scores on average 4.42 out of 10 on the Cantrill Ladder. Access to improved water sources varies considerably (37-65% across cohorts), and health indicators reveal persistent challenges. Female-headed households, comprising 17% of our sample, face particular disadvantages - with lower literacy rates, smaller farms, reduced access to financial resources, and significantly lower reported quality of life compared to male headed households.

The baseline data suggests that the program targets are appropriately ambitious as 50% of program participants still fall below the international poverty line. For VSLA participation in some cohorts (59%) nearly meets the 60% goal before the program has begun.

Coffee emerges as the cornerstone of agricultural income despite occupying less land than other crops. While households dedicate only 37% of their land to coffee (compared to 50% for other crops), coffee generates the highest per-acre income at 2.24 million UGX compared to 1.61 million UGX for other crops. However, the data reveals an intriguing inverse relationship between farm size and productivity - smaller farms achieve higher yields per acre, suggesting potential efficiency advantages in smaller-scale operations.

The stepped-wedge randomization has largely succeeded in creating comparable cohorts, though some differences warrant attention. Most socioeconomic characteristics show balance across cohorts. However, significant variations exist in household head literacy rates (ranging from 73% in Cohort 1 to 88% in Cohort 5) and the proportion of female-headed households (22% in Cohorts 1-2 versus 11% in Cohorts 5-6) and while these differences are statistically significant, their modest magnitude suggests they can be controlled for in subsequent impact analyses without compromising the evaluation's validity. Although cohort 5 has higher consumption (and a lower poverty gap index) than other cohorts, this does not necessarily indicate an issue with balance. In an RCT, statistical significance alone is not an appropriate criterion for assessing balance. What matters is whether the differences are large

enough to materially affect treatment effects on outcomes. Unless there is evidence that the randomization protocol was flawed, observed differences—even if statistically significant—are expected due to chance and do not necessarily indicate imbalance that could bias treatment effect estimates.

Recommendations

Given the baseline data, the program's current poverty reduction targets are ambitious and relevant. The baseline data highlights the critical situation of female-headed households, which face persistent disadvantages. This evidence underscores the necessity for sustained, targeted support aimed at this vulnerable demographic.

VSLA participation varies significantly across cohorts (37-59%). With the program target of 60% participation, focused efforts are needed to boost engagement in lagging cohorts. The inverse relationship between farm size and productivity reveals new opportunities for intervention - the program should consider incorporating intensive farming techniques training, particularly for larger farms where productivity improvements could yield significant gains.

The successful randomization provides a solid foundation for measuring program impact, though careful attention to existing imbalances will be necessary in future analyses. The program's current targets may need upward revision to achieve transformative poverty reduction in these communities.

Limitations

Study design

The possibility of ruling out spatial spillovers of the program implementation is not accounted for in the design. Since we did not have parish and village level administrative unit geodata, it was not possible to determine proximity of parishes and particularly villages. It would have been desirable to create a spatial buffer between selected villages to reduce the possibility of spillovers from program implementation affecting surrounding selected villages. This can be accounted for at the modelling stage by checking the robustness of inference results using spatial econometric methods that account for potential spatial correlation.

It would have been desirable that the cohorts are similar in all assessed characteristics. This report finds that they differ in a few socio-demographic characteristics. We can check the robustness of our impact estimates by including the characteristics where they differ at the analysis stage, once we have collected midline data.

Module specific

Consumption

We used the alternative module approach to model per capita and adult equivalent consumption of food and non-food modules. This means we used an experimental approach to impute missing consumption items. We deviated from the standard aggregated module approach and used item level variation and machine learning methods to predict the missing

consumption due to the experimental core/alternative module design. This improved the predictions substantially relative to the aggregated approach, that yielded high consumption estimates.

To assess whether the consumption-based poverty headcount is overestimated or underestimated there are several factors that need to be considered. First is that there is a trade-off between questionnaire length and accuracy, this underestimation of variance affects poverty estimates. This is likely decreased by the use of World Bank survey data to construct core modules with most consumed items. The underestimation of variance would imply that the consumption distribution is narrower than it otherwise should be and classify more individuals as poor than it should (an overestimation of poverty).

Second, using machine learning and item-level variation might smooth out the data, reducing observed variability. This could lead to underestimated consumption for households with particularly high or low expenditures, resulting in lower average consumption estimates. Considering the 25% poverty rate yielded by the PPI, it is likely that our estimate of 49.6% is an upper bound. The inclusion of semi-durable yearly expenditures (clothing, schooling fees and donations) adds to reducing the underestimation of consumption and the inflation of poverty headcount. The issue of the agreement of these two measurements that in principle aim to measure similar definitions of poverty warrants further investigation.

Third, applying the adult equivalent adjustment yields substantially lower estimates of poverty. The official comparisons are made on a per capita basis, which is what we have shown in the main results of this report.

Finally, there are other assumptions that can be checked for the per capita consumption estimates. This includes revising the price vector of median prices that was used for the Paasche deflation, though a plausibility check has already been conducted as part of the creation of the estimates.

Self-reported and recall data

Many measurements rely on self-reports and recalling by the respondent. To a large extent this refers to the types of crops farmers produce, the farmland acreage dedicated to the crop, the number of bags, kilograms or basins harvested and sold per crop and the average sales price they received per unit for these crops over a period of 12 months or seasons. These are quite a number of values that need to be recalled for which there are no record books. Estimating one or two factors incorrectly could have large consequences for the total sales figures of that farm.

Annex 1: Outcomes and targets of RTV POP Program

Annex 1 Table 1: RTV Pathways out of Poverty Log Frame

Ultimate Outcome	1000 Enhance the economic well-being of last-mile, subsistence farmers living in ultra-poverty in Sub-Saharan Africa (SSA) by increasing household income and earning: to \$2 USD/day within 24 months – with prioritization of the most vulnerable households, particularly those headed by women and youth.													
Intermediate Outcomes	1100 Increased agricultural crop income.				1200 Increased diversified income and productive assets.				1300 Improved participation of community members in economic activities					
Immediate Outcomes	1110 Increased in agricultural crop value.			1120 Improved market linkages for the sale of agricultural produce		1210 Improved livestock care and management practices	1220 Improved access to savings, loans, and income-generating activities		1310 Improved health outcomes and productivity		1320 Increased participation of women and youth in leadership, community and household decision making			
Outputs	1111 Agricultural trainings focused on preparation and replanting, in-season agriculture care and management, and post harvest management.			1112 Agricultural inputs: improved and diversified seeds for seasonal and perennial crops and tools to facilitate the planting and post-harvest seasons provided	1113 Agricultural cooperatives and CATs established and trained for sustainable and community-led support on agricultural initiatives	1121 Mobilization of agriculture committees for collective bargaining through training and coaching.	1122 Market linkages developed and disseminated.	1211 Livestock care and management training	1221 VSLA's established and trained with focus on loans and IGAs	1222 Healthy Household Trainings (HHT 1 & 2) on mindset change, VSLA formation and management & Financial Literacy	1311 Variety of vegetables distributed, planted and sustained for food security and additional income.	1312 Water sources rehabilitated/protected and/or constructed in water stressed communities within 1km distance from households with user committees established for sustainability	1313 Preventative health awareness outreaches and WASH training and compliance	1321 Healthy Household Training (HHT 3) and sensitization on gender equity

Annex 2: Parish Randomization

Annex 2 Table 1: Revised parishes by cohort and status

N.	District	SubCounty	Parish	Cohort	Status
1	Rakai	Kibanda	Kyalugaba	1	Original parish
2	Rakai	Lwamagwa	Kibuuka	1	Original parish
3	Rakai	Kyalulangira	Kizinga	1	Original parish
4	Rakai	Kacheera	Lyakisana	1	Original parish
5	Kitagwenda	Nyabbani	Kamayenje	1	Original parish
6	Kitagwenda	Rwenjaza	Nyamabale	1	Original parish
7	Kitagwenda	Ntara	Rugarama	1	Original parish
8	Kitagwenda	Buhanda	Bujumiro	2	Original parish
9	Kitagwenda	Ntara	Nyakacwamba	2	Replacement parish
10	Kitagwenda	Nyabbani	Nganiko	2	Original parish
11	Rakai	Kasankala	Kyamakanaga	2	Original parish
12	Rakai	Lwanda	Kasensero	2	Replacement parish
13	Kitagwenda	Nyabbani	Muyenga	2	Original parish
14	Rakai	Lwanda	Kanoni	2	Replacement parish
15	Rakai	Ddwaniro	Lwakalolo	3	Replacement parish
16	Kitagwenda	Rwenjaza	Nyarurambi	3	Original parish
17	Kitagwenda	Ntara	Kitonzi	3	Original parish
18	Rakai	Kagamba	Kagamba	3	Original parish
19	Kitagwenda	Kakasi	Kitoma	3	Original parish
20	Kitagwenda	Rwenjaza	Rutooma	3	Original parish
21	Kitagwenda	Buhanda	Kengeya	3	Original parish
22	Kitagwenda	Nyabbani	Rwesigiire	4	Replacement parish
23	Kitagwenda	Nyabbani	Rwenkubeebe	4	Original parish
24	Rakai	Lwamagwa	Kyabigondo	4	Original parish

25	Kitagwenda	Kanara	Kekubo	4	Original parish
26	Kitagwenda	Rwenjaza	Rwenjaza	4	Replacement parish
27	Kitagwenda	Buhanda	Nyabihoko	4	Replacement parish
28	Kitagwenda	Kanara	Kanara	4	Original parish
29	Kitagwenda	Nyabbani	Nyabbani B	5	Original parish
30	Rakai	Ddwaniro	Kaleere	5	Replacement parish
31	Rakai	Kasankala	Kongota	5	Original parish
32	Kitagwenda	Mahyoro	Nyakasura	5	Original parish
33	Rakai	Kasankala	Kirangira	5	Replacement parish
34	Rakai	Lwanda	Butiiti	5	Replacement parish
35	Kitagwenda	Kakasi	Kakasi	5	Replacement parish
36	Rakai	Kasankala	Kasankala	6	Original parish
37	Rakai	Ddwaniro	Ddwaniro	6	Replacement parish
38	Kitagwenda	Kakasi	Kitaka	6	Original parish
39	Kitagwenda	Mahyoro	Kitonzi	6	Original parish
40	Kitagwenda	Kanara	Kigarama	6	Replacement parish
41	Rakai	Lwamagwa	Bugona	6	Original parish
42	Rakai	Ddwaniro	Kayonza	6	Replacement parish

Annex 2 Table 2: Selected villages within each of the 42 parishes.

N	District	SubCounty	Parish	Villages	Cohort
1	Kitagwenda	Ntara	Rugarama	Rugarama_li	1
2	Kitagwenda	Ntara	Rugarama	Rugarama_I_Ntara	1
3	Kitagwenda	Rwenjaza	Kamayenje	Kyembogo_2	1
4	Kitagwenda	Rwenjaza	Kamayenje	Karokarungi_Nyabbani	1
5	Kitagwenda	Rwenjaza	Nyamabale	Bwera	1
6	Rakai	Kacheera	Lyakisana	Kamulaba	1
7	Rakai	Kacheera	Lyakisana	Nakasenyi	1
8	Rakai	Kibanda	Kyalugaba	Kibuliro_A	1

9	Rakai	Kibanda	Kyalugaba	Kyamulengera	1
10	Rakai	Kyalulangira	Kizinga	Kawenda	1
11	Rakai	Lwamagwa	Kibuuka	Sserinya	1
12	Rakai	Lwamagwa	Kibuuka	Kyabanadda	1
13	Kitagwenda	Buhanda	Bujumiro	Bujumiro B	2
14	Kitagwenda	Ntara	Nyakacwamba	Karere	2
15	Kitagwenda	Ntara	Nyakacwamba	Nyakacwamba li	2
16	Kitagwenda	Nyabbani	Muyenga	Muyenga T/C	2
17	Kitagwenda	Nyabbani	Nganiko	Nganiko I	2
18	Rakai	Kasankala	Kyamakanaga	Kyamakanaga A	2
19	Rakai	Lwanda	Kanoni	Kanoni	2
20	Rakai	Lwanda	Kasensero	Nakitokolo	2
21	Rakai	Lwanda	Kasensero	Kitonezi	2
22	Kitagwenda	Buhanda	Kengeya	Kangeya A	3
23	Kitagwenda	Kakasi	Kitoma	Muyenje	3
24	Kitagwenda	Kakasi	Kitoma	Kasisa lii	3
25	Kitagwenda	Ntara	Kitonzi	Nyamizo	3
26	Kitagwenda	Rwenjaza	Nyarurambi	Nyarurambi A	3
27	Kitagwenda	Rwenjaza	Rutooma	Rutooma A	3
28	Rakai	Ddwaniro	Lwakalolo	Kateera B	3
29	Rakai	Ddwaniro	Lwakalolo	Luteete-Ntuntu	3
30	Rakai	Kagamba	Kagamba	Kagamba	3
31	Rakai	Kagamba	Kagamba	Kyakabugema	3
32	Kitagwenda	Buhanda	Nyabihoko	Kanara	4
33	Kitagwenda	Buhanda	Nyabihoko	Mpana	4
34	Kitagwenda	Kanara	Kanara	Kanara I	4
35	Kitagwenda	Kanara	Kekubo	Kabeza	4
36	Kitagwenda	Nyabbani	Rwenkubeebe	Rwenkubeebe A	4

37	Kitagwenda	Nyabbani	Rwesigiire	Rwesigiire Iii A	4
38	Kitagwenda	Rwenjaza	Rwenjaza	Rukinga A	4
39	Rakai	Lwamagwa	Kyabigondo	Lwamagabi	4
40	Rakai	Lwamagwa	Kyabigondo	Kyabigondo	4
41	Kitagwenda	Kakasi	Kakasi	Rugarama	5
42	Kitagwenda	Mahyoro	Nyakasura	Nyakasura I	5
43	Kitagwenda	Nyabbani	Nyabbani	Nyabbani C	5
44	Rakai	Ddwaniro	Kaleere	Kaleere B	5
45	Rakai	Kasankala	Kirangira	Kyabakazi A	5
46	Rakai	Kasankala	Kongota	Nakabazzi	5
47	Rakai	Lwanda	Butiiti	Kabaale-Kooki	5
48	Rakai	Lwanda	Butiiti	Nsimbo	5
49	Kitagwenda	Kanara	Kigarama	Kigarama	6
50	Kitagwenda	Kanara	Kigarama	Kitakama I	6
51	Kitagwenda	Kakasi	Kitaka	Nkingo	6
52	Kitagwenda	Mahyoro	Kitonzi	Kitonzi	6
53	Kitagwenda	Mahyoro	Kitonzi	Kakindo I	6
54	Rakai	Ddwaniro	Ddwaniro	Nsimbo	6
55	Rakai	Ddwaniro	Ddwaniro	Lwabbanda	6
56	Rakai	Ddwaniro	Kayonza	Kyebbumba	6
57	Rakai	Ddwaniro	Kayonza	Kanamuzinzi	6
58	Rakai	Kasankala	Kasankala	Kasankala A	6
59	Rakai	Lwamagwa	Bugona	Kisamba 'B'	6
60	Rakai	Lwamagwa	Bugona	Kyeragongo	6

Annex 3: Unweighted counts

Annex 3 Table 1: Key Disaggregation of the Sample – not using weights

Variable	Levels	Sample Size (N=1260)
District	Kitagwenda	651
	Rakai	609
Cohort	1	251
	2	190
	3	210
	4	231
	5	167
	6	211
Household Head Age Group	18-29	61
	30-44	378
	45-60	470
	60+	348
Female Headship	Male-Headed (0)	1042
	Female-Headed (1)	218
Consumption Quintile	Quintile 1 (Poorest)	254
	Quintile 2	253
	Quintile 3	253
	Quintile 4	253
	Quintile 5 (Richest)	253

Annex 4: Supplementary balance tables - demographics

Annex 4 Table 1: Socio-demographic summary statistics by age of household head. p-value: test of difference between age groups.

	18-29 (N=73)	30-44 (N=391)	45-60 (N=489)	60+ (N=305)	p-value
HH female	0.03 (-0.01, 0.07)	0.07 (0.05, 0.10)	0.19 (0.14, 0.24)	0.31 (0.25, 0.37)	p<0.01
HH size	3.37 (2.99, 3.74)	5.63 (5.31, 5.96)	5.68 (5.40, 5.96)	5.14 (4.80, 5.47)	p<0.01
HH dependency ratio	0.75 (0.51, 0.98)	1.40 (1.30, 1.50)	1.01 (0.90, 1.13)	1.74 (1.55, 1.93)	p<0.01
HH head literacy	0.96 (0.92, 1.01)	0.91 (0.87, 0.94)	0.80 (0.75, 0.85)	0.61 (0.53, 0.68)	p<0.01
HH head marital status					p<0.01
Married Monogamous	65 (89.30%)	319 (81.77%)	315 (64.35%)	162 (52.91%)	
Married Polygamous	3 (4.42%)	32 (8.23%)	80 (16.41%)	39 (12.73%)	
Widowed	0	7 (1.76%)	58 (11.81%)	90 (29.61%)	
Separated/Divorced	2 (2.86%)	27 (6.84%)	35 (7.08%)	13 (4.23%)	
Never married/Single	3 (3.43%)	2 (0.59%)	2 (0.34%)	2 (0.52%)	
Other	0	3 (0.82%)	0	0	
HH head education					p<0.01
None	0	14 (3.54%)	39 (8.03%)	95 (31.12%)	
Some primary	24 (33.06%)	148 (37.94%)	256 (52.35%)	139 (45.51%)	
Primary completed	24 (32.83%)	96 (24.55%)	97 (19.76%)	35 (11.39%)	
Some secondary	19 (26.62%)	58 (14.97%)	59 (12.04%)	21 (6.91%)	
Secondary completed	4 (5.82%)	34 (8.74%)	9 (1.83%)	3 (1.02%)	
TVET/TTC	1 (0.83%)	29 (7.47%)	26 (5.38%)	12 (4.04%)	
Some university	1 (0.83%)	4 (1.07%)	0	0	
Completed university	0	7 (1.72%)	3 (0.62%)	0	

Annex 5: Measuring living standards: the reduced consumption module

Measuring income and consumption

The core of the study is to measure living standards. This is done through metrics like income, consumption and poverty. In this section we introduce how we can measure living standards, the gold standard (consumption), and the advantages and disadvantages of consumption against income-based measures. Then we provide an overview of what a consumption module measures, and the different strategies used to reduce the time it takes and get accurate estimates of consumption. Then we provide an account of the assumptions made to construct RTV's rapid consumption module, and the imputation of aggregates vs item-level estimates on consumption and poverty estimates. First, we provide a comparison between districts, cohorts and gender of the household head in adult equivalent consumption, poverty headcount and gap. For this comparison, we exclude semi-durable expenses (clothing, school fees, donations) from the estimates presented. We show adult equivalent estimates since the process of imputation is the same for per-capita amount.

Annex 5 Table 1 shows that there are significant differences between cohorts in daily consumption with cohorts 3 and 4 having the lowest consumption per day respectively and cohorts 2 and 5 having the highest consumption. There are no significant differences in the poverty headcount ratio between cohorts.

Annex 5 Table 1: Daily consumption per capita, poverty headcount and poverty gap index – summary statistics and 95% CIs by cohort. p-value: test of difference between cohorts.

	1 (N=318)	2 (N=146)	3 (N=189)	4 (N=232)	5 (N=251)	6 (N=125)	p-value
Consumption/day - RF imputation (2017 PPP USD)	2.84 (2.48, 3.19)	3.52 (2.76, 4.29)	2.63 (2.39, 2.86)	2.53 (2.18, 2.87)	3.08 (2.80, 3.36)	2.81 (2.30, 3.32)	p=0.06
Poverty headcount (RF imputation)							p=0.09
No	2.84 (2.48, 3.19)	3.52 (2.76, 4.29)	2.63 (2.39, 2.86)	2.53 (2.18, 2.87)	3.08 (2.80, 3.36)	2.81 (2.30, 3.32)	
Yes	157 (49.49%)	63 (43.24%)	105 (55.65%)	128 (55.23%)	109 (43.47%)	63 (50.25%)	
Poverty gap index (RF imputation)	0.18 (0.16, 0.21)	0.13 (0.11, 0.14)	0.21 (0.17, 0.25)	0.20 (0.16, 0.24)	0.13 (0.09, 0.18)	0.18 (0.13, 0.23)	p=0.01

Annex 5 Table 2 shows that there is no significant difference between men and women led households in consumption, poverty and average income. There are no significant differences between the age category of the household head for any of the variables.

Annex 5 Table 2: Consumption, poverty headcount and poverty gap index by sex of household head. p-value: test of difference between genders

	Male (N=1043)	Female (N=217)	p-val
Consumption/day – RF imputation (2017 PPP USD)	2.85 (2.63, 3.07)	2.98 (2.55, 3.41)	p=0.15
Poverty headcount (RF imputation)			p=0.19
No	513 (49.22%)	122 (55.94%)	
Yes	530 (50.78%)	96 (44.06%)	
Poverty gap index (RF imputation)	0.18 (0.16, 0.20)	0.15 (0.11, 0.18)	p=0.07

Measuring living standards

Increasing household welfare is the goal of most interventions that target the poor. However, poverty is a multidimensional, complex phenomenon, and it is hard to measure. There are several ways to measure household living standards and poverty. This includes measuring household consumption of goods and services, household income streams, household wealth, or multidimensional metrics (which include non-monetary factors like health and education). There is general consensus that measuring poverty through consumption over the period of 1 year is the gold standard (relative to income-based measures), particularly in developing countries (Deaton and Zaidi, 2002). The reasons are that:

- a) **Consumption is not tied to short-term fluctuations in income, and it is smoother and less variable than income.** This implies that ranking households where there is large year to year income fluctuations (like in rural agricultural populations), the ranking of households is less stable when using income-based metrics relative to consumption measurements.
- b) **Observing consumption over a period of two weeks can be substantially more informative** about annual (or even longer) household living standards than a similar observation on income.
- c) **Although consumption has seasonal components (e.g holidays, festivals), these are less extreme than seasonal fluctuations in income** in agricultural societies. It is not possible to get a useful income-based metric of living standards without multiple visits in a year.
- d) **Practically, it is difficult to obtain accurate income data in societies where self-employment (including in agriculture and small businesses) is common.** An argument

for using income-based measures is that it can be attributed to individual household members, which is not the case for consumption-based metrics.

Construction of the (rapid) consumption module

The implementation of a consumption module is not a small task, and the full module is notoriously long, taking well over an hour to conduct. Based on the World Bank's 2019-2020 Ugandan Household Panel Survey, the full module of this survey includes several segments, mainly:

1. **Food consumption** - which includes a set of around 120 individual items, including meats (pork, beef, other meats), vegetables (e.g onions, tomatoes), processed foods (e.g Corn Flakes, doughnuts), tubers (e.g sweet potatoes, cassava), grains (as well as food, soda and beer consumed in restaurants, among many others. For each of these items we asked about quantities consumed in the last 7 days, unit of consumption (if applicable), expenditure by source of the item (e.g purchased at home, away from home, from home production, in kind). Additional questions on quality of the item are also asked in the World Bank survey. These are measured over the last 7 days.
2. **Non-durable goods and frequently purchased services** - which includes around 53 items including expenditure on sanitary items (e.g toothbrush, toothpaste, soap, etc), transportation and maintenance of vehicles, personal care (e.g hairdresser, cosmetics), household utilities (e.g electricity, water), fuel and energy (e.g petrol, diesel, candles, matches), housing costs (e.g rent, imputed rent of owned house), expenditure on health (medicines, doctor fees, transportation costs) among other categories of items and services. These are measured over the last 30 days.
3. **Semi-durable goods and services** - including expenditure on clothing, education, furniture, appliances and equipment, glass/tableware and utensils and insurance premiums. These are measured over the last 365 days.
4. **Non-consumption expenditure** - including taxes (income, property, local service), user fees and charges (e.g passport, legal), other financial service fees, pension and social security, remittances and gifts, funerals and other social functions, interest on loans, etc. These are measured over the last 365 days.

The length of the module has prompted alternatives to reduce the time to implement the consumption module. These include

Rapid approach, where a core module is produced and asked to all households based on the most consumed items, and the remaining items are combined into alternative modules that are then randomly asked to households in the sample along the core module. This reduces survey time at the expense of accuracy based on the number of core items and the number of alternative modules (Pape, 2021). The aggregated consumption for each of the alternative modules is then imputed using a set of socio-demographic and regional covariates.

Reduced consumption module, where only a set of all the items are asked to all households.

Cross-survey imputation, which uses existing surveys to aid in the imputation of consumption estimates using common variables in both surveys.

The relative advantages and issues of each of the methods are summarized in Table 3.2.1 below, which has been adapted from a World Bank paper that uses the rapid consumption methodology in Somalia (Pape,2021).

Annex 5 Table 3: Sources of error for consumption module and its variations (adapted from Pape 2021)

Methodology	Unit non-response	Item non-response	Implementation Issues	Error Inherent to Method
Full Consumption	Elevated non-response, especially among urban and wealthy households	Long item lists increase item non-response and measurement error; unfinished interviews	Limited issues due to straightforward design; length may pose challenges.	Theoretically unbiased if fully implemented with complete responses.
Rapid Approach	Non-response present but lower than full consumption due to shorter questionnaires.	Less significant compared to full consumption because of fewer items.	Substantial issues with paper forms; largely mitigated with CAPI (Computer-Assisted Personal Interviewing).	Trade-off between questionnaire length and accuracy; underestimation of variance affects poverty/inequality estimates
Reduced Consumption	Non-response occurs but is lower than in full consumption due to shorter questionnaire.	Less significant compared to full consumption because of fewer items.	Limited implementation issues; design is straightforward.	Substantial bias in total consumption; variance reduction affects accuracy.
Cross-Survey Imputations	Non-response present but lower than in full consumption due to shorter questionnaire.	Very small issue as there is no consumption section.	Very limited issues; questions are simple.	Relies on older data, introducing bias in structural models, leading to biased poverty estimates

Considering that the rapid consumption module is superior to having a reduced consumption module, we decided to implement this type of consumption module for this study.

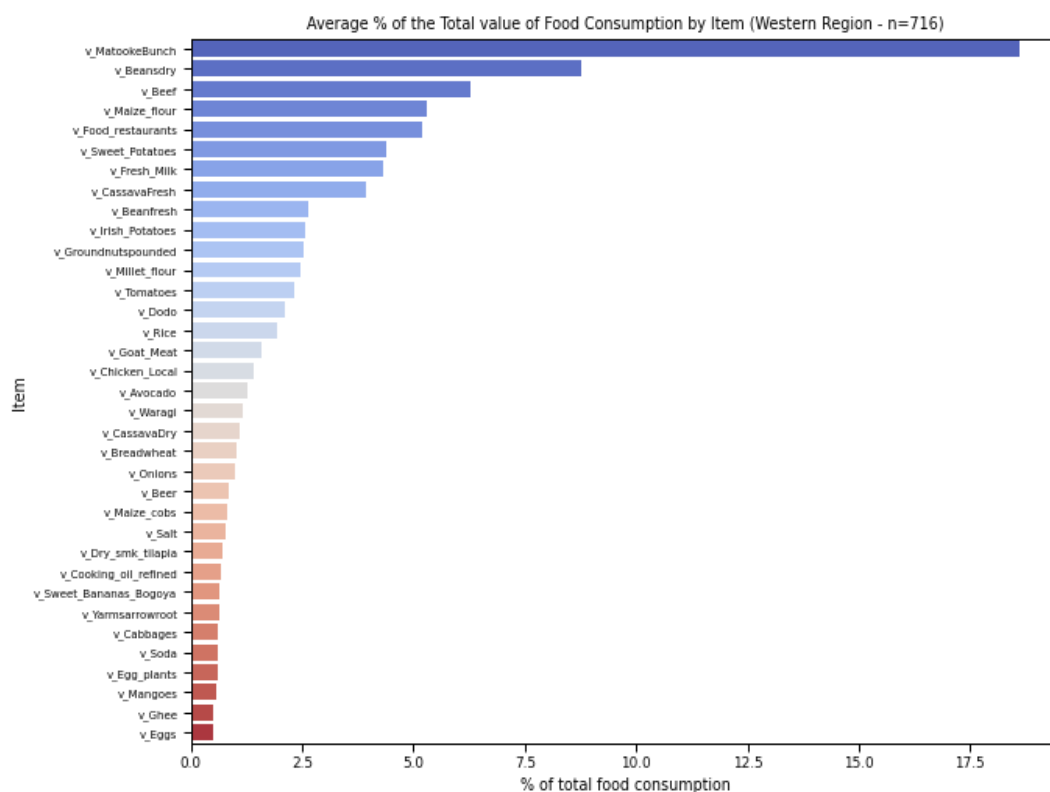
RTV's rapid consumption module development

For the development of the rapid consumption module for Kitagwenda (Western region) and Rakai (Central region), several steps were followed. We decided to focus only on food and non-durable goods considering these are the modules used for the imputation in the Somalia case (Takamatsu, 2022). We have excluded housing from the estimate, as 96% of the sample owns their home.

First, we used microdata from the Ugandan Household Panel 2019-2020 survey to obtain both the prevalence of item consumption, as well as the amount and proportion of total expenditure of each individual item at the regional level. This is because there were few observations in the survey at the district level. We did this for food and non-durable goods and frequently purchased services.

This information was used as input for determining which items would be included in the core modules for both food and non-food consumption, as well as determining the total items to be divided into the alternative modules to be randomly allocated to households participating in the study.

Figure A5.1 Food items with highest proportion of expenditure consumed in the Ugandan Household Panel Survey 2019-20 (Western, Central)



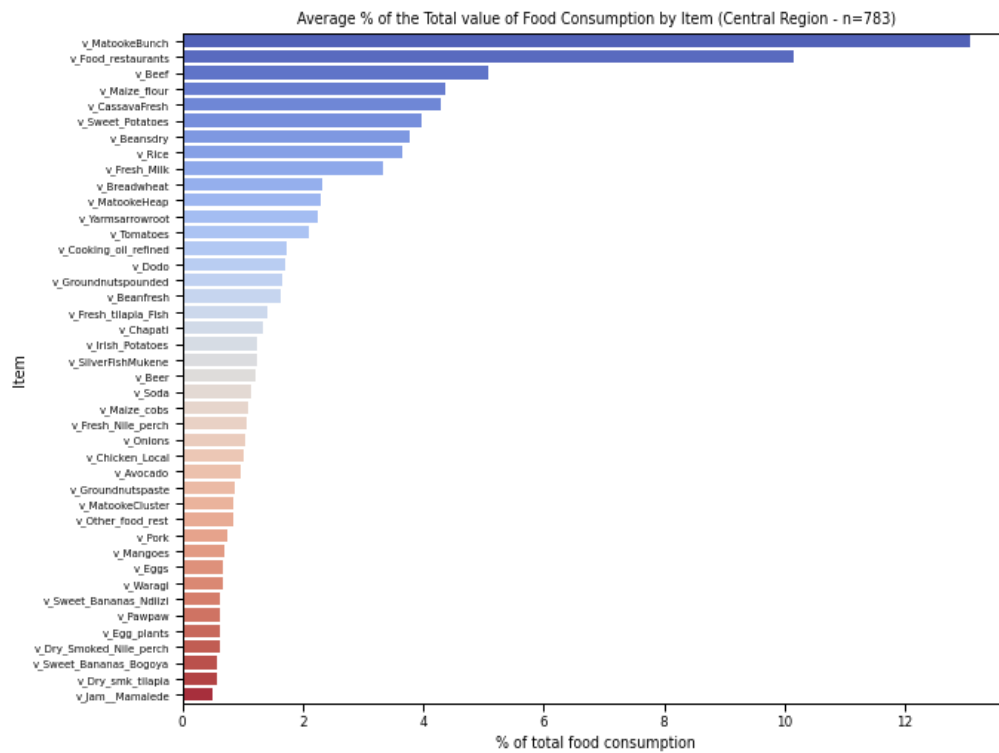
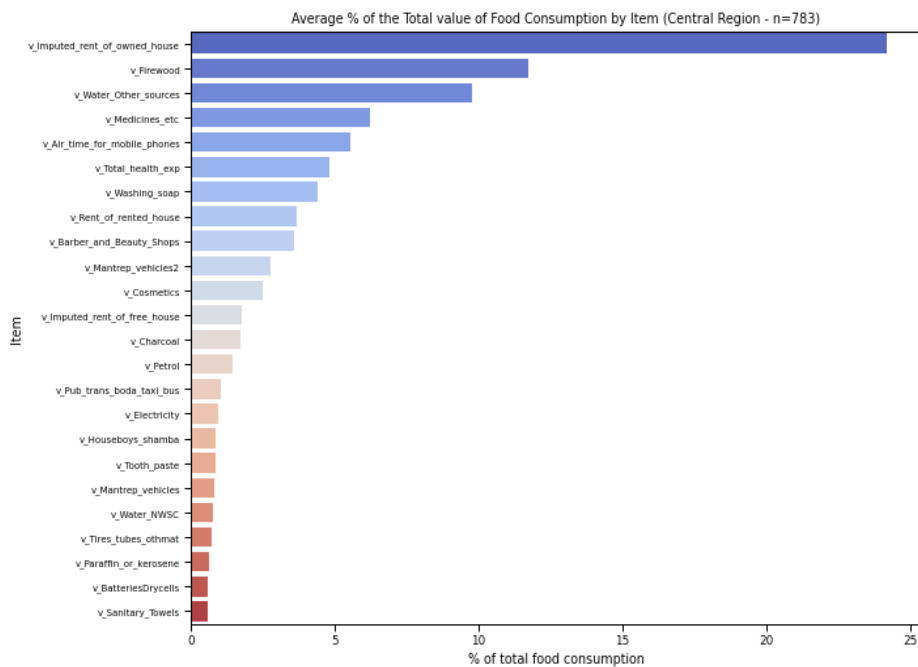
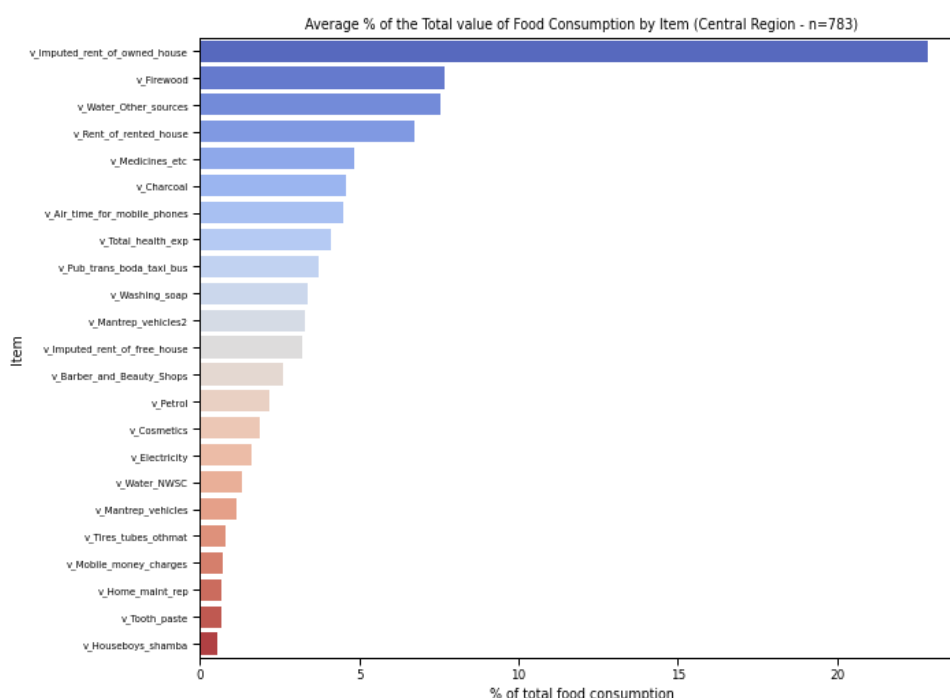


Figure A5.2 Non-durable goods and services with highest proportion of expenditure consumed in the Ugandan Household Panel Survey 2019-20 (Western, Central)





The second step was to determine the number of items to be assigned to the core module, as well as the number of alternative modules and the number of items in each module. The main consideration for determining the number of alternative modules was survey length. **We decided to have 1 core module and 7 alternative modules per district.** This means that each household is asked for 45 items in total (24 in core and 21 in alternative modules). Table 3.2.2 shows the distribution of items per core/alternative modules, as well as by food and non-food consumption items. The top items in the figures above were selected to be among the core items. These items account for 44.3% of total consumption in non-food items for Kitagwenda and 63% of total consumption for food items. For Rakai this accounts for 60% of food consumption and 37% for non-food consumption.

Annex 5 Table 4: Distribution of Items per Household

Category	Food Items	Non-food Items	Total Items per Household
Core	13	11	24
Alternative	15	6	21
Total Items (w/o Core)	107	42	45

Consumption estimates adjustments and poverty headcount/gap index calculation

The final estimates that were used prior to the imputation were adjusted for several factors that are important to discuss and document in this report. The original amounts are reported in 2024 UGX. Our goal is to have household equivalized consumption per day in 2017 PPP USD. Following the World Bank’s Guidelines to consumption estimates for welfare analysis (2002), the core and alternative module items were:

- a) Checked for gross outliers in prices and quantities - this was done through the construction of item/unit boxplots and producing an outlier report that flagged gross outliers. For these cases, the prices were set to the median price of the food-item combination. Evident errors in data inputting were corrected both in quantities and prices.
- b) Adjust for regional price differences using the Paasche index - this was done in order to account for district level differences in prices. The adjustment was done using the median price of each item/unit combination at the district level as the adjustment price vector. (See Deaton 2002, p.7).
- c) Adjusted income for household composition using:

1. **The “arbitrary approach”** - calculated adult equivalent using:

$$AE=(A+\alpha K)^\theta,$$

where

A=number of adults

K=number of children

α = cost of a child relative to an adult. Set to 0.3 in poor economies, 1 in rich countries

θ = extent of economies of scale. Set to 1 in poor countries (since food is mostly a private good - rival and exclusive).

- a. **Per capita adjustment** – using household member number for the adjustment, counting children and adults as 1 full member. We present this as main results considering they are the standard for poverty reporting.

2. Deflated to 2017 UGX using Consumer Price Index and converted to 2017 PPP USD using official sources

The **Foster-Greer-Thorbecke (FGT) poverty measures** are a family of indices widely used to analyze poverty, with the poverty headcount (headcount ratio) and poverty gap being its most commonly applied variants. These measures are derived from a general formula that adjusts based on a parameter alpha, which reflects the sensitivity to poverty depth.

$$FGT(\alpha) = \frac{1}{N} \sum_{i=1}^N \left(\frac{z - y_i}{z} \right)^\alpha I(y_i < z)$$

Where

y_i = household consumption per capita

z = poverty line (2.15 USD 2017 PPP)

N =total sample size

α = 0 for poverty headcount, 1 for poverty gap

When alpha is 0, the **FGT formula simplifies to the poverty headcount ratio**. It calculates the proportion of the population living below the poverty line, ignoring the depth or distribution of poverty.

When alpha is 1, the FGT measure becomes the poverty gap index. This captures the intensity of poverty by calculating the average shortfall of income (or consumption) of the poor from the poverty line, normalized by the poverty line. This measure provides insight into how far, on average, the poor are from escaping poverty. It accounts for the depth of poverty but does not emphasize inequality among the poor.

Both measures are part of the FGT family and offer complementary views of poverty: while FGT(0) shows the prevalence, FGT(1) gives a sense of intensity. These metrics are critical for designing effective poverty alleviation policies, as they help identify not just how many people are poor, but how poor they are.

Imputation of alternative modules - aggregates vs individual item-level

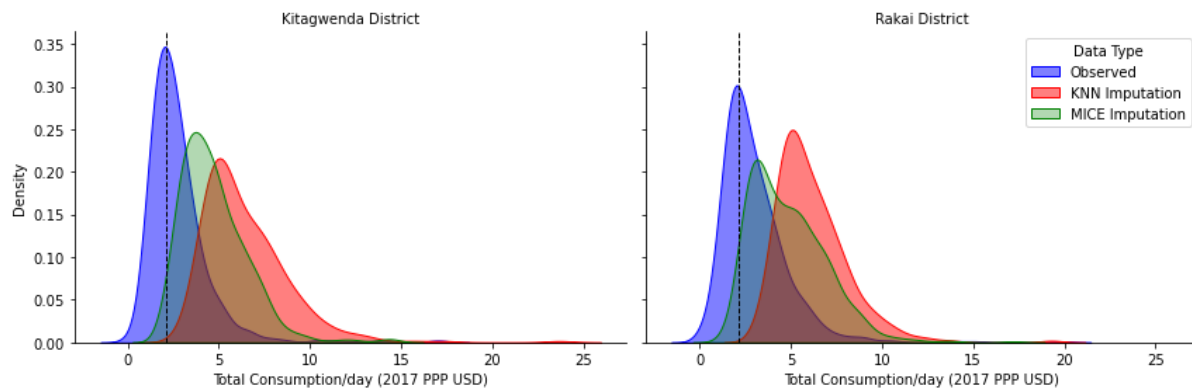
At its inception, the imputation was envisioned to be done at the aggregated alternative module and core levels. However, the imputation using this approach yielded unfeasibly low estimates of poverty. We then explored using data at the more granular item level, and using a machine learning approach, we imputed not at the aggregate level, but at the item level. This approach led to much better poverty estimates. We describe both processes and challenges below.

Aggregate level imputation (core and alternative modules)

Following Takamatsu et al (2022) in their World Bank paper on using the rapid consumption methodology, we first used MICE (Multiple Imputation by Chained Equations). It is a statistical method for handling missing data by imputing multiple datasets. It's widely used to avoid biases and inaccuracies caused by missing values. We also estimated imputation by medians and by simple regression. The main difference with their approach is that we do not have issues with the alternative modules having zero consumption. For the imputation we specify regression models separately for Rakai and Kitagwenda, where the dependent variable is the natural logarithm of household equivalized consumption for each alternative module, and the independent variables are quartiles of core food consumption, quartiles of non-food core consumption, total number of assets out of 10 items (e.g mattress, watch), percent of the household members engaged in casual labour, percent of children, percent of women, household head literacy, and water source. We excluded material of the floor and the walls because of multi-collinearity with other regressors after assessing using variance inflation factor (VIF) post-regression using the regression-based estimates. We did this for each of the 7 modules, separately by food and non-food consumption and by district.

As an alternative approach using the aggregated core and alternative module consumption, we also used nearest neighbor imputation (KNN) using both the same covariates, as well as an extended version of the covariates. The results of the imputation can be observed in the figure below.

Annex 5 Figure 1: AE Consumption per day (2017 PPP USD – excluding semi-durable expenses) for reduced consumption module (blue), and aggregate level (core/alternative modules) imputation. Dashed line at 2.15 USD.

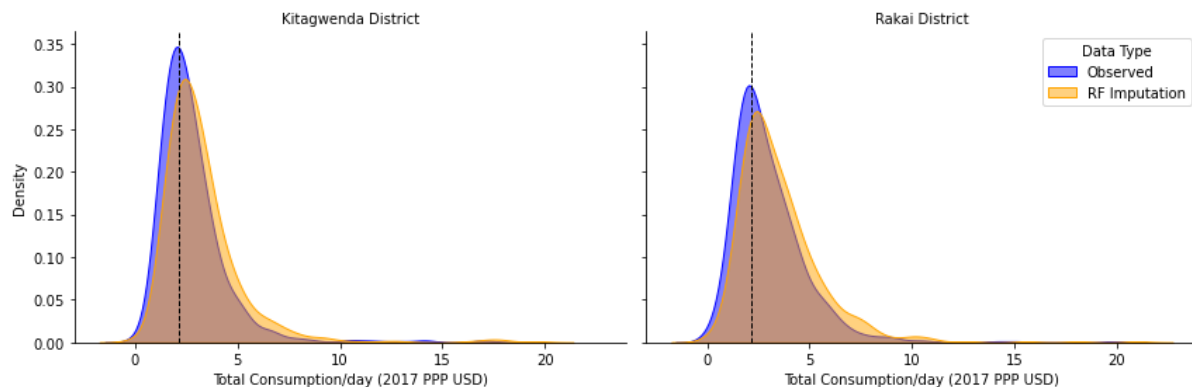


The imputation using the aggregated modules shifts all distributions substantially to the right, showing that most of the sample has increased consumption substantially (close to doubling consumption on average). The overestimated poverty headcount for the reduced consumption (e.g. sum of observed core and observed alternative module - in blue) is 38%. This is reduced to 3% of people living below poverty line with the MICE imputation (in green) and even lower for share of households living below poverty line in the KNN imputation. These values of poverty are unfeasibly low, and the imputed consumption is unlikely to be so high. The reason for the inaccuracy in using the aggregated modules is that regression-based methods indicate that the models predict very low proportions of the variance, and often none of the coefficients in the models are significant. The advantage that Pape et al (2022) had was that they had a sample size per alternative module, a factor ten times larger than ours (around 1,000). They also had four alternative modules, while we had seven. **Both the larger sample size, and fewer alternative modules increase the accuracy of the imputation at the aggregate level.**

Individual item-level imputation

Considering the poor performance of the aggregate-level imputation, we decided to use the granularity of the item-level consumption module to our advantage. When we aggregate to the core and alternative modules, we lose all the information on item-level consumption patterns. Furthermore, regression-based methods are constrained by issues like multi-collinearity, which happened at the aggregate level modelling. We implemented a machine learning method (random forests) to model and predict whether a household consumes each of the items in all of the alternative modules, and then to predict the value of the item consumed. We used as explanatory variables the consumption (yes/no) and expenditure (UGX) of core-module items (for which we have no missing values), the same covariates used in the MICE imputation, and additional covariates that were not included in the aggregate level imputation (wall material, floor material, PPI score, wealth index quintiles, distance to water source and others).

Annex 5 Figure 2: AE Consumption per day (2017 PPP USD) for reduced consumption module (blue), item level imputation using random forests. Dashed line at 2.15 USD.



The figure above shows the shift in distribution of adult equivalent consumption (not including yearly semi-durable expenditures – clothing, school fees and donations) using the item-level data and the random forests as imputation methods. The shift is substantially less pronounced than in the aggregate level imputation estimates. Average AE consumption per day for the observed reduced consumption is 2.89 USD, and it increases to 3.42 USD with the RF imputation. The poverty headcount is 38% overall for the observed reduced consumption module. This decreases to 24.6% with the RF imputation. The addition of semi-durable expenditure decreases poverty headcount to 13% for the AE adjusted consumption. Adjustment to per capita amounts does not change the imputation output since it is done post-imputation.

The tables below use per capita adjustment, and include the yearly semi-durable expenses (clothing, school fees, donations) that are asked for separately, on a yearly basis and for is available for most households. A similar imputation process is followed for the small fraction missing due to the semi-durable item questions being implemented on the second day of the survey.

Annex 5 Table 5: Daily consumption per capita, poverty headcount and poverty gap index (poverty line<2.15 USD PPP) by district. p-value: test of difference between districts

<i>Per capita</i>	Kitagwenda (N=710)	Rakai (N=550)	p-val
Poverty count at 2.15 USD PPP			p=0.16
No	342 (48.18%)	293 (53.20%)	
Yes	368 (51.82%)	257 (46.80%)	
Poverty gap index	0.18 (0.15, 0.22)	0.17 (0.14, 0.19)	p=0.52
Daily food consumption/day (2024 UGX)	2435.37 (2243.16, 2627.57)	2427.60 (2240.56, 2614.64)	p=0.95
Daily non-food consumption/day (2024 UGX)	1106.33 (974.57, 1238.10)	1153.32 (1081.09, 1225.55)	p=0.51
Daily consumption: clothing, school fees, donations (2024 UGX)	980.50 (727.78, 1233.21)	1140.96 (986.49, 1295.43)	p=0.26
Total daily consumption (2024 UGX)	4506.54 (4014.01, 4999.08)	4708.26 (4359.65, 5056.88)	p=0.49
Daily food expenditure (2017 PPP USD)	1.52 (1.40, 1.64)	1.52 (1.40, 1.64)	p=0.95
Daily non-food expenditure (2017 PPP USD)	0.69 (0.61, 0.77)	0.72 (0.68, 0.77)	p=0.51
Daily consumption: clothing, school fees, donations (2017 PPP USD)	0.61 (0.46, 0.77)	0.71 (0.62, 0.81)	p=0.26
Total daily consumption (2017 PPP USD)	2.82 (2.51, 3.13)	2.94 (2.73, 3.16)	p=0.49

The poverty gap reflects how far on average, the poor are from the poverty line. A value of 0.17 means that, collectively, poor households would need resources equal to 17% of the poverty line to bring them all up to the poverty threshold. The imputation of the alternative modules reduces the poverty gap index to 6%. There are no significant differences between districts in average consumption, poverty headcount and gap index.

Annex 5 Table 6 shows that there are significant differences between cohorts in daily consumption with cohorts 3 and 4 having the lowest consumption per day (3.16 and 3.10USD) respectively and cohorts 2 and 5 having the highest consumption (3.52 and 3.08 USD). There are no significant differences in the poverty headcount between cohorts, but there is a significant difference in poverty gap index.

Annex 5 Table 6: Consumption, poverty headcount and poverty gap index summary statistics by cohort. p-value: test of difference between cohorts

Per capita	Cohort 1 (N=318)	Cohort 2 (N=146)	Cohort 3 (N=189)	Cohort 4 (N=232)	Cohort 5 (N=251)	Cohort 6 (N=125)	p-value
Poverty count at 2.15 USD PPP							p=0.09
No	161 (50.51%)	83 (56.76%)	84 (44.35%)	104 (44.77%)	142 (56.53%)	62 (49.75%)	
Yes	157 (49.49%)	63 (43.24%)	105 (55.65%)	128 (55.23%)	109 (43.47%)	63 (50.25%)	
Poverty gap index	0.18 (0.16, 0.21)	0.13 (0.11, 0.14)	0.21 (0.17, 0.25)	0.20 (0.16, 0.24)	0.13 (0.09, 0.18)	0.18 (0.13, 0.23)	p<0.01
Daily food consumption/day (2024 UGX)	2473.90 (2264.45, 2683.34)	2744.41 (2323.93, 3164.89)	2290.11 (1996.93, 2583.29)	2206.48 (1979.92, 2433.05)	2559.43 (2324.01, 2794.85)	2337.81 (2011.65, 2663.96)	p=0.19
Daily non-food consumption/day (2024 UGX)	1081.20 (958.73, 1203.68)	1250.92 (1147.96, 1353.87)	1022.50 (967.29, 1077.71)	999.72 (847.79, 1151.64)	1321.65 (1177.70, 1465.59)	1100.62 (959.41, 1241.83)	p=0.01
Daily consumption: clothing, school fees, donations (2024 UGX)	988.99 (704.90, 1273.08)	1669.86 (843.04, 2496.67)	938.11 (715.81, 1160.42)	833.88 (606.79, 1060.97)	1048.85 (823.20, 1274.49)	1059.77 (629.59, 1489.96)	p=0.46
Total daily consumption (2024 UGX)	4538.47 (3972.44, 5104.51)	5635.48 (4413.64, 6857.32)	4198.03 (3821.58, 4574.47)	4040.08 (3486.36, 4593.79)	4920.02 (4471.48, 5368.56)	4498.20 (3685.04, 5311.36)	p=0.05
Daily food expenditure (2017 PPP USD)	1.55 (1.42, 1.68)	1.72 (1.45, 1.98)	1.43 (1.25, 1.62)	1.38 (1.24, 1.52)	1.60 (1.45, 1.75)	1.46 (1.26, 1.67)	p=0.19
Daily non-food expenditure (2017 PPP USD)	0.68 (0.60, 0.75)	0.78 (0.72, 0.85)	0.64 (0.60, 0.67)	0.63 (0.53, 0.72)	0.83 (0.74, 0.92)	0.69 (0.60, 0.78)	p=0.01
Daily consumption: clothing, school fees, donations (2017 USD)	0.62 (0.44, 0.80)	1.04 (0.53, 1.56)	0.59 (0.45, 0.73)	0.52 (0.38, 0.66)	0.66 (0.51, 0.80)	0.66 (0.39, 0.93)	p=0.46
Total daily consumption (2017 PPP USD)	2.84 (2.48, 3.19)	3.52 (2.76, 4.29)	2.63 (2.39, 2.86)	2.53 (2.18, 2.87)	3.08 (2.80, 3.36)	2.81 (2.30, 3.32)	p=0.05

Annex 5 Table 7: Consumption, poverty headcount and poverty gap index by sex of household head. p-value: test of difference between genders

<i>Per capita</i>	Male (N=1043)	Female (N=217)	p-value
Poverty count at 2.15 USD PPP			p=0.16
No	513 (49.22%)	122 (55.94%)	
Yes	530 (50.78%)	96 (44.06%)	
Poverty gap index	0.18 (0.16, 0.20)	0.15 (0.11, 0.18)	p=0.11
Daily food consumption/day (2024 UGX)	2375.85 (2223.50, 2528.19)	2699.94 (2283.76, 3116.12)	p=0.17
Daily non-food consumption/day (2024 UGX)	1138.29 (1049.89, 1226.69)	1072.29 (956.08, 1188.50)	p=0.34
Daily consumption: clothing, school fees, donations (2024 UGX)	1062.49 (885.18, 1239.80)	993.38 (734.81, 1251.96)	p=0.63
Total daily consumption (2024 UGX)	4559.00 (4209.87, 4908.13)	4765.62 (4075.61, 5455.62)	p=0.59
Daily food expenditure (2017 PPP USD)	1.49 (1.39, 1.58)	1.69 (1.43, 1.95)	p=0.17
Daily non-food expenditure (2017 PPP USD)	0.71 (0.66, 0.77)	0.67 (0.60, 0.74)	p=0.34
Daily consumption: clothing, school fees, donations (2017 PPP USD)	0.66 (0.55, 0.78)	0.62 (0.46, 0.78)	p=0.63
Total daily consumption (2017 PPP USD)	2.85 (2.63, 3.07)	2.98 (2.55, 3.41)	p=0.59

The table above shows that there are no significant differences between women and men led households in the consumption and poverty outcomes.

Annex 5 Table 8: Consumption, poverty headcount and poverty gap index by age of household head. p-value: test of difference between age of household head

<i>Per capita</i>	18-29 (N=73)	30-44 (N=391)	45-60 (N=489)	60+ (N=305)	p-value
Poverty count at 2.15 USD PPP					p=0.07
No	48 (65.89%)	177 (45.23%)	240 (49.09%)	169 (55.20%)	
Yes	25 (34.11%)	214 (54.77%)	249 (50.91%)	137 (44.80%)	
Poverty gap index	0.11 (0.04, 0.19)	0.21 (0.17, 0.24)	0.18 (0.15, 0.20)	0.15 (0.13, 0.17)	p<0.01
Daily food consumption/day (2024 UGX)	3640.45 (2352, 4928)	2223.91 (2010, 2436)	2353.03 (2173, 2532)	2534.26 (2340, 2728)	p=0.02
Daily non-food consumption/day (2024 UGX)	2079.84 (1264, 2894)	1106.08 (994, 1217)	1041.85 (957, 1126)	1068 (955, 1180.36)	p=0.04
Daily consumption: clothing, school fees, donations (2024 UGX)	1709.34 (980, 2437)	997.68 (704, 1290)	1112.52 (877, 1347)	866.28 (675, 1056)	p=0.16
Total daily consumption (2024 UGX)	7308.01 (4650, 9966)	4312.96 (3774, 4851)	4497.31 (4113, 4881)	4462.69 (4055, 4869)	p=0.19
Daily food expenditure (2017 PPP USD)	2.28 (1.47, 3.08)	1.39 (1.26, 1.52)	1.47 (1.36, 1.58)	1.58 (1.46, 1.71)	p=0.02

Daily non-food expenditure (2017 PPP USD)	1.30 (0.79, 1.81)	0.69 (0.62, 0.76)	0.65 (0.60, 0.70)	0.67 (0.60, 0.74)	p=0.04
Daily consumption: clothing, school fees, donations (2017 PPP USD)	1.07 (0.61, 1.52)	0.62 (0.44, 0.81)	0.70 (0.55, 0.84)	0.54 (0.42, 0.66)	p=0.13
Total daily consumption (2017 PPP USD)	4.57 (2.91, 6.23)	2.70 (2.36, 3.03)	2.81 (2.57, 3.05)	2.79 (2.54, 3.05)	p=0.19

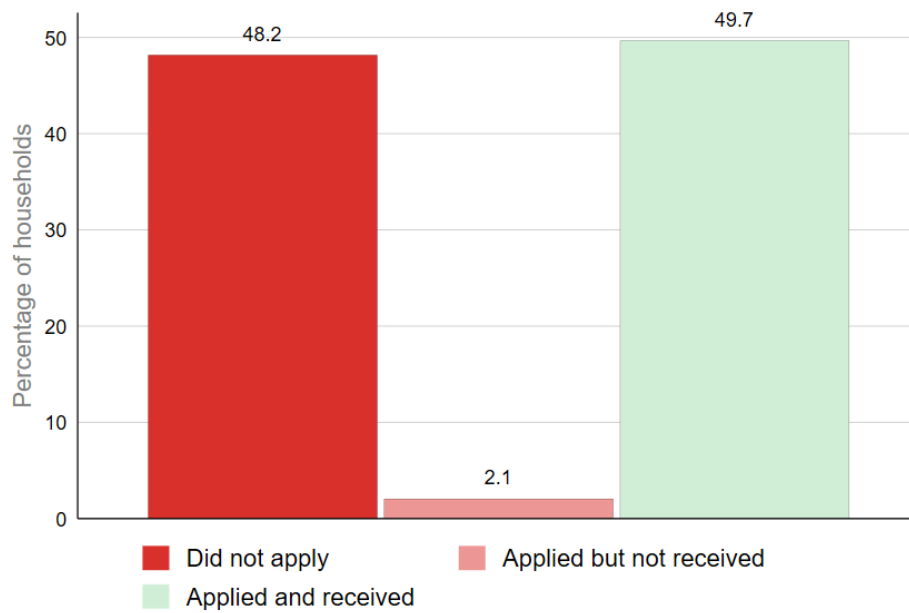
Household headed by younger people (18–29) have the lowest poverty rate (34.11%) and poverty gap index (0.11), while the 30–44 age group faces the highest poverty rate (54.77%) and gap index (0.21), partly highlighting differences in household composition between age groups ($p=0.079$, $p<0.001$). Daily food and non-food consumption are significantly higher among the youngest group (3640.45 UGX and 2079.84 UGX, respectively) compared to older age groups, with the lowest consumption observed in the 30–44 group ($p=0.027$, $p=0.041$). **Total consumption and poverty headcount differences across age groups are not statistically significant.**

The table below shows that there are significant differences between male and female headed households in total household savings, total debt and amount borrowed in past 12 months, but not in VSLA participation.

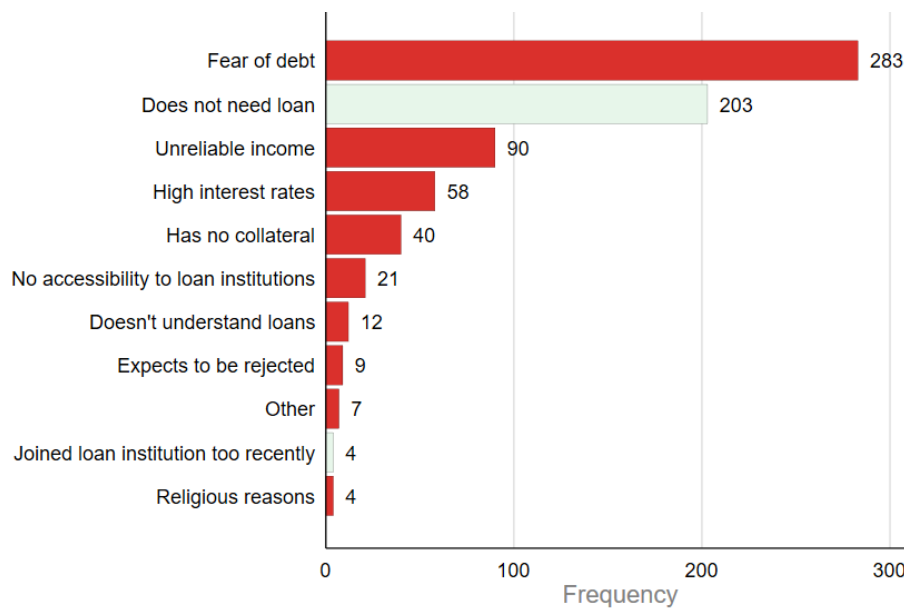
Annex 5 Table 9: Consumption quintiles, PPI score and debt/savings statistics by gender of household head. p-value: test of difference between household head gender

	Gender		
	Male (N=1043)	Female (N=217)	
Household wealth quintile based on consumption			p=0.26
Quintile 1 (poorest) (n=206)	206 (19.76%)	31 (14.35%)	
Quintile 2 (n=204)	204 (19.52%)	46 (21.12%)	
Quintile 3 (n=217)	217 (20.81%)	40 (18.40%)	
Quintile 4 (n=221)	221 (21.16%)	45 (20.58%)	
Quintile 5 (richest) (n=195)	195 (18.74%)	56 (25.55%)	
Probability of being under USD 2.15 2017 PPP 2020	0.24 (0.22, 0.26)	0.21 (0.19, 0.24)	p=0.08
Total household savings in 2017 USD PPP	343.05 (297, 388)	173.43 (134.36, 212.51)	p<0.01
Total debt outstanding in 2017 USD PPP	153.84 (130, 176)	81.48 (59.38, 103.58)	p<0.01
Total amount borrowed in past 12 months in 2017 USD PPP	305.77 (257, 353)	130.48 (94.45, 166.51)	p<0.01
Household is currently participating (saving or borrowing) with VSLA	0.48 (0.43, 0.53)	0.51 (0.41, 0.61)	p=0.54

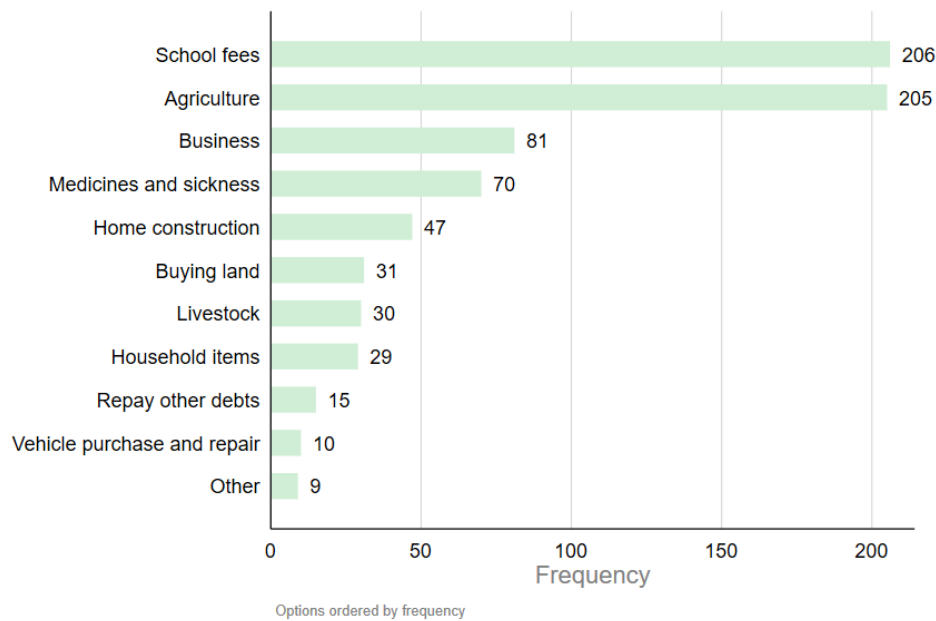
Annex 5 Figure 3: Percentage of households that applied for loans and received the loans they applied for in the past 12 months (N = 1,260)



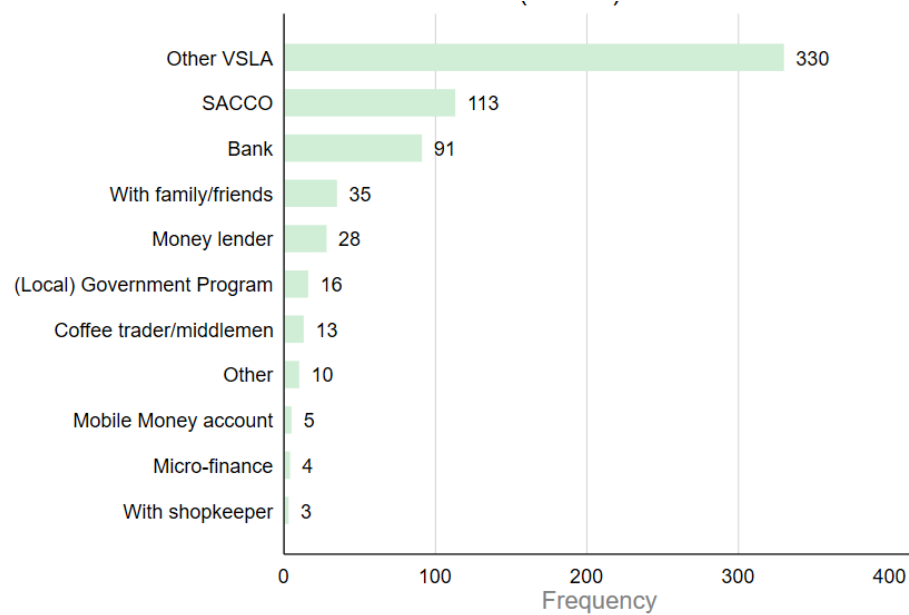
Annex 5 Figure 4: Frequency of reasons mentioned for not having applied for loans in the past 12 months (n = 608)



Annex 5 Figure 5: Frequency of loan purposes mentioned by households that received loan in the past 12 months (n=626)

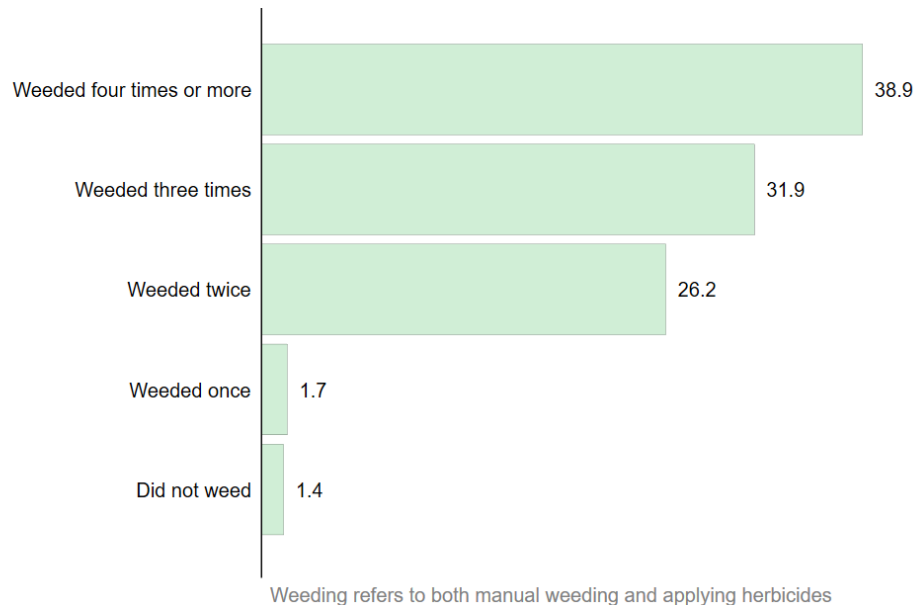


Annex 5 Figure 6: Frequency of loan sources mentioned by households that received loans in the past 12 months (n=627)

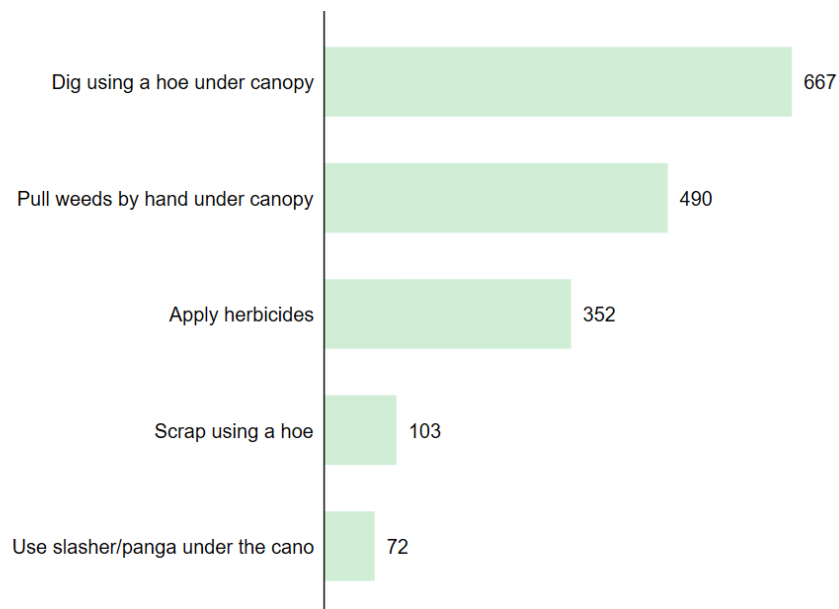


Annex 6: Supplementary tables – agricultural and health outcomes

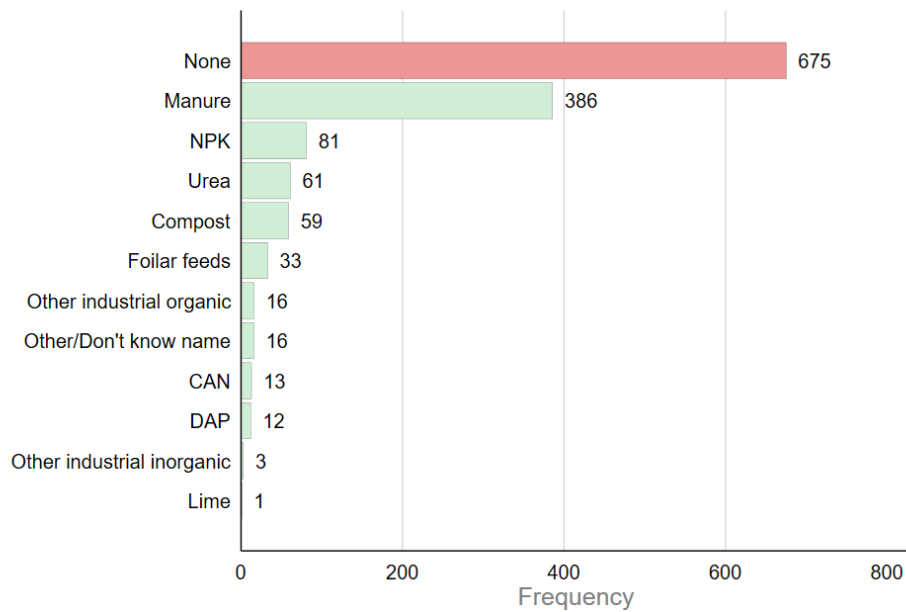
Annex 6 Figure 1: Number of times that farmers weeded (manually and with herbicides) their coffee plantation in the past 12 months in percentage (n = 1,258)



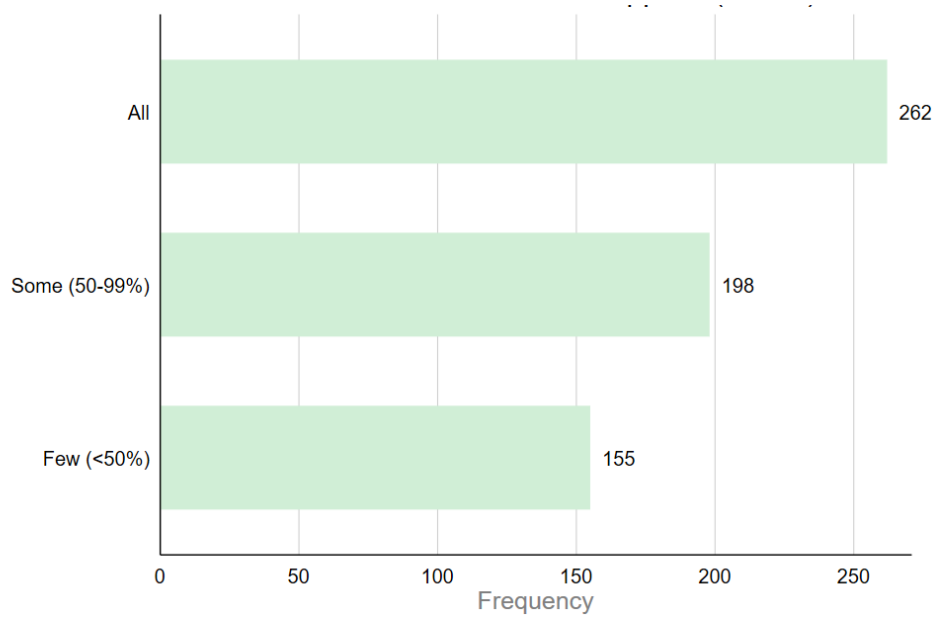
Annex 6 Figure 2: Frequency of mentioned weeding methods by farmers that weeded their farms in the past 12 months (n = 1,240).



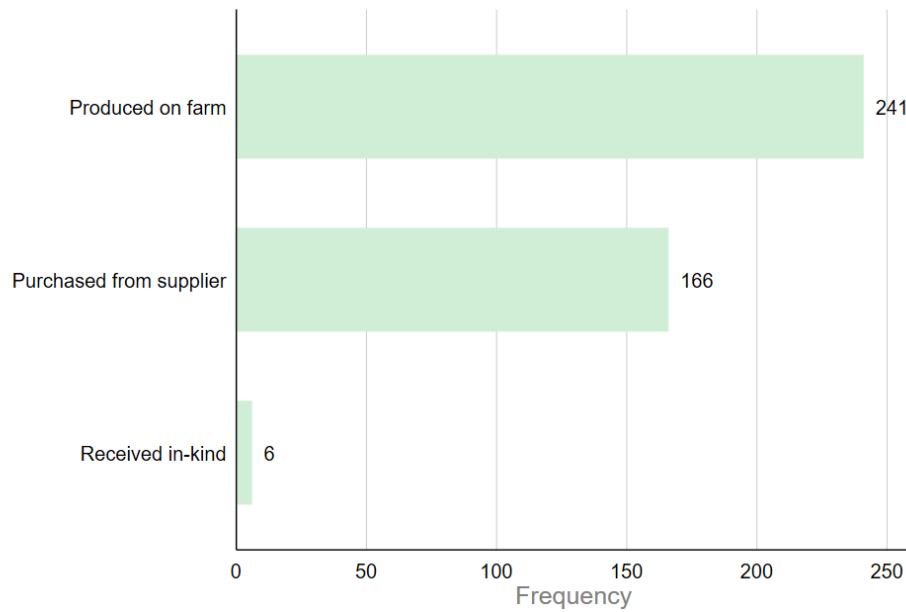
Annex 6 Figure 3: Frequency of mentioned type of fertilizer used on coffee plantation in the past 12 months (n = 1,258)



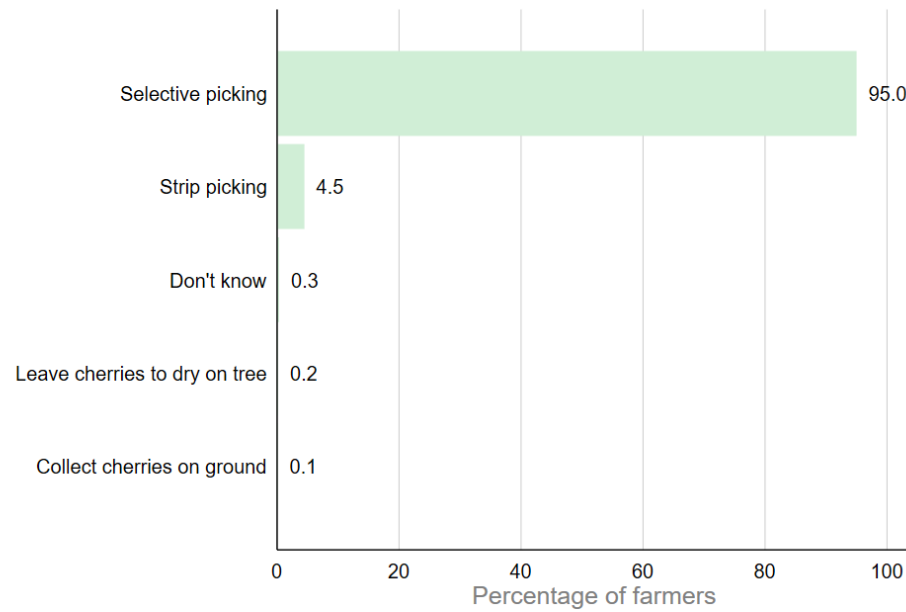
Annex 6 Figure 4: Share of coffee trees on which the used fertilizer(s) is/are applied in the past 12 months (n = 615)



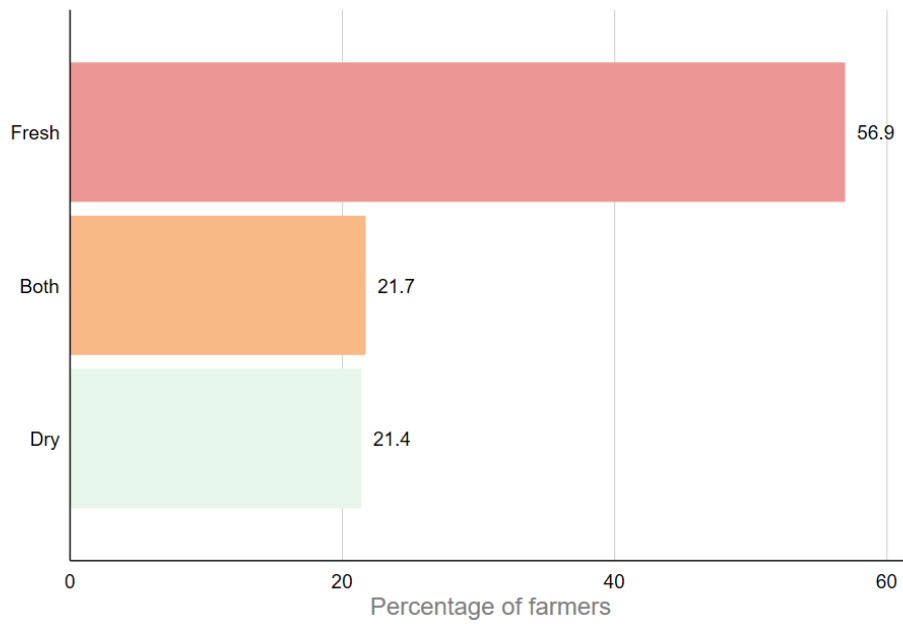
Annex 6 Figure 5: Number of farmers who produced manure/compost on farm, purchased it from supplier or received it in-kind (n = 403)



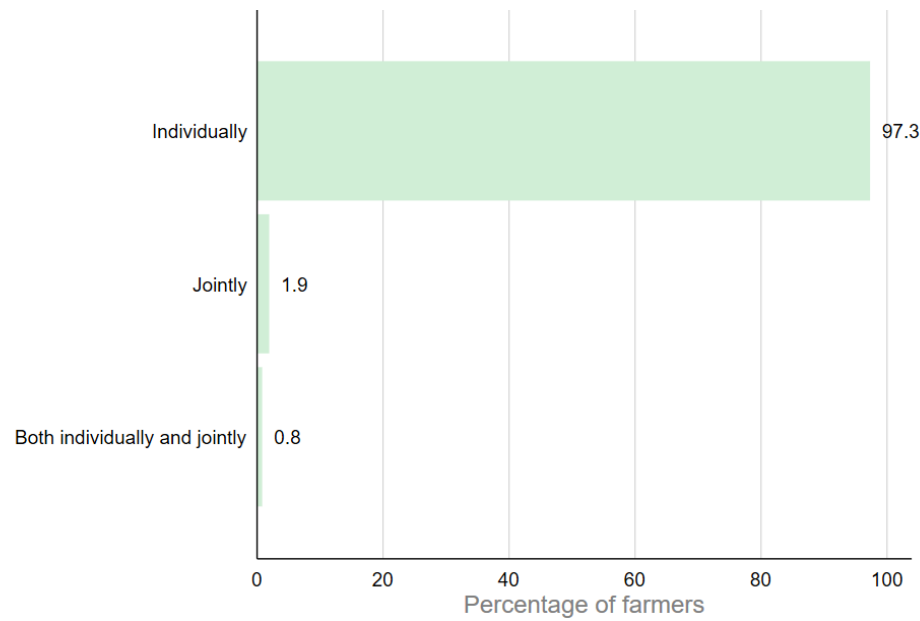
Annex 6 Figure 6: Percentage of farmers that applied a certain harvest method as their most common method in the past 12 months (n = 1,258)



Annex 6 Figure 7: Percentage of farmers that reported their coffee yield in fresh, dry or in both states in the past 12 months (n = 1,258)



Annex 6 Figure 8: Percentage of farmers that sold their coffee individually, jointly, or both (n = 1,258)



Annex 6 Table 1: Agricultural land use in acres by cohort. P-value: test of difference between cohorts

	Cohort 1 (N=318)	Cohort 2 (N=146)	Cohort 3 (N=189)	Cohort 4 (N=232)	Cohort 5 (N=251)	Cohort 6 (N=125)	p- value
Coffee plantation size	1.03 (0.77, 1.30)	1.40 (0.86, 1.95)	1.36 (0.98, 1.73)	1.19 (0.86, 1.53)	1.55 (1.27, 1.83)	1.50 (1.40, 1.60)	p=0.05
Robusta	0.92 (0.68, 1.17)	1.11 (0.54, 1.67)	1.07 (0.79, 1.36)	0.99 (0.64, 1.34)	0.95 (0.33, 1.57)	1.26 (0.90, 1.62)	p=0.77
Arabica	0.11 (-0.01, 0.22)	0.29 (0.00, 0.57)	0.29 (0.02, 0.55)	0.21 (0.12, 0.30)	0.47 (0.14, 0.80)	0.24 (-0.05, 0.52)	p=0.37
Non-coffee crops area size	1.52 (1.36, 1.68)	1.88 (1.31, 2.46)	1.72 (1.37, 2.07)	1.98 (1.51, 2.45)	1.63 (1.23, 2.03)	1.90 (1.58, 2.23)	p=0.22
Bananas	0.67 (0.48, 0.85)	0.78 (0.64, 0.92)	0.62 (0.51, 0.74)	0.59 (0.39, 0.78)	0.57 (0.37, 0.76)	1.02 (0.75, 1.30)	p=0.12
Beans	0.22 (0.11, 0.33)	0.27 (0.12, 0.42)	0.30 (0.19, 0.40)	0.36 (0.22, 0.50)	0.30 (0.22, 0.38)	0.19 (0.10, 0.29)	p=0.37
Vegetables	0.05 (0.02, 0.08)	0.06 (0.03, 0.08)	0.06 (0.02, 0.10)	0.06 (0.02, 0.11)	0.06 (0.01, 0.11)	0.02 (0.00, 0.04)	p=0.10
Other tree crops	0.09 (0.04, 0.14)	0.21 (0.11, 0.30)	0.17 (0.10, 0.25)	0.21 (0.11, 0.32)	0.14 (0.08, 0.20)	0.11 (0.04, 0.19)	p=0.12
Annual crops	0.47 (0.41, 0.53)	0.53 (0.22, 0.85)	0.56 (0.40, 0.71)	0.75 (0.49, 1.02)	0.55 (0.34, 0.76)	0.55 (0.36, 0.75)	p=0.44
Livestock pasture and rearing	0.12 (0.04, 0.21)	0.15 (-0.02, 0.32)	0.23 (-0.01, 0.48)	0.28 (0.14, 0.41)	0.10 (-0.05, 0.25)	0.07 (0.02, 0.13)	p=0.17
Other activities	0.22 (0.13, 0.31)	0.42 (0.15, 0.70)	0.39 (0.08, 0.71)	0.48 (0.31, 0.65)	0.32 (0.12, 0.52)	0.18 (0.09, 0.28)	p=0.06
Total farm size	2.87 (2.43, 3.31)	3.76 (2.47, 5.04)	3.56 (2.63, 4.49)	3.84 (2.97, 4.71)	3.56 (2.93, 4.20)	3.69 (3.27, 4.10)	p=0.16

Annex 6 Table 2: Land use per agricultural activity in acres by gender and age of farm manager. p-value: test of difference between gender of farm manager (male vs female); and between farm manager age

Agricultural activity	Gender of farm manager			Age of farm manager				
	Male (N=931)	Female (N=309)	p-value	18-29 (N=55)	30-44 (N=331)	45-60 (N=437)	60+ (N=283)	p-value
Coffee plantation size	1.42 (1.25, 1.59)	0.94 (0.75, 1.12)	p<0.01	0.97 (0.49, 1.44)	1.22 (1.04, 1.39)	1.50 (1.24, 1.76)	1.34 (1.14, 1.55)	p=0.06
Robusta	1.10 (0.94, 1.26)	0.76 (0.58, 0.94)	p<0.01	0.67 (0.20, 1.15)	0.99 (0.78, 1.20)	1.12 (0.91, 1.33)	1.11 (0.93, 1.30)	p=0.10
Arabica	0.29 (0.16, 0.41)	0.17 (0.09, 0.24)	p=0.02	0.33 (0.13, 0.52)	0.21 (0.08, 0.34)	0.31 (0.15, 0.46)	0.23 (0.14, 0.32)	p=0.60
Non-coffee crop area size	1.85 (1.68, 2.02)	1.39 (1.13, 1.65)	p<0.01	0.95 (0.57, 1.32)	1.47 (1.29, 1.64)	1.93 (1.69, 2.18)	2.06 (1.77, 2.35)	p=0.00
Livestock pasture and rearing	0.19 (0.12, 0.25)	0.08 (0.03, 0.12)	p<0.01	0.01 (-0.01, 0.03)	0.12 (0.04, 0.20)	0.16 (0.09, 0.23)	0.26 (0.14, 0.38)	p=0.00
Other use	0.38 (0.29, 0.47)	0.18 (0.10, 0.27)	p=0.01	0.03 (-0.00, 0.07)	0.20 (0.09, 0.30)	0.43 (0.33, 0.54)	0.47 (0.32, 0.62)	p=0.00
Total farm size	3.75 (3.40, 4.11)	2.61 (2.14, 3.08)	p<0.01	2.00 (1.19, 2.82)	2.97 (2.61, 3.34)	3.90 (3.40, 4.41)	4.09 (3.51, 4.68)	p=0.00

Annex 6 Table 3: Relative land use per agricultural activity in acres by gender and age of farm manager. P-value: test of difference between gender of farm manager (male vs female); and between farm manager age

	Farm manager gender			Farm manager age				
	Male (N=931)	Female (N=309)	p-value	18-29 (N=55)	30-44 (N=331)	45-60 (N=437)	60+ (N=283)	p-value
Coffee plantation %	0.40 (0.37, 0.43)	0.38 (0.35, 0.41)	p=0.15	0.47 (0.37, 0.56)	0.43 (0.39, 0.46)	0.39 (0.37, 0.42)	0.36 (0.33, 0.38)	p=0.00
Non-coffee crop area %	0.53 (0.51, 0.55)	0.57 (0.55, 0.60)	p=0.02	0.50 (0.41, 0.59)	0.51 (0.49, 0.54)	0.54 (0.51, 0.56)	0.56 (0.53, 0.58)	p=0.03
Livestock pasture and rearing %	0.03 (0.02, 0.03)	0.01 (0.01, 0.02)	p<0.01	0.00 (-0.00, 0.01)	0.02 (0.01, 0.03)	0.02 (0.02, 0.03)	0.04 (0.02, 0.05)	p=0.00
Other activities %	0.06 (0.05, 0.07)	0.03 (0.02, 0.04)	p<0.01	0.02 (-0.00, 0.03)	0.04 (0.02, 0.06)	0.06 (0.05, 0.07)	0.07 (0.05, 0.08)	p=0.00

Annex 6 Table 4: Mean Tropical Livestock Unit (TLU) in sample and by cohort

	Total (n= 1,260)	Cohort 1 (n=318)	Cohort 2 (n=146)	Cohort 3 (n=138)	Cohort 4 (n=232)	Cohort 5 (n=251)	Cohort 6 (n=125)	p-value
Mean TLU	0.89 (0.72, 1.06)	0.84 (0.71, 0.98)	0.79 (0.61, 0.97)	0.72 (0.40, 1.03)	1.31 (0.85, 1.77)	0.82 (0.30, 1.33)	0.76 (0.61, 0.92)	p=0.432

Annex 6 Table 5: Livestock ownership and mean TLU across consumption quintiles. Mean (CI)

	Consumption quintile					p-value
	1	2	3	4	5	
Owns livestock (95% CI)	0.96 (0.94, 0.98)	0.92 (0.89, 0.96)	0.92 (0.87, 0.97)	0.95 (0.92, 0.98)	0.91 (0.86, 0.96)	p=0.476
Mean TLU (95% CI)	0.65 (0.54, 0.76)	0.82 (0.55, 1.09)	0.76 (0.56, 0.95)	0.96 (0.72, 1.19)	1.26 (0.85, 1.66)	p=0.046

Annex 6 Table 6: Average coffee yield per acre across different cohorts (Mean (CI)) p-value: test of difference between cohorts

	Total (N=1,201)	Cohort 1 (N=318)	Cohort 2 (N=146)	Cohort 3 (N=189)	Cohort 4 (N=232)	Cohort 5 (N=251)	Cohort 6 (N=125)	p-value
Coffee yield per acre (kg)	520.66 (473.77, 567.54)	471.22 (377.87, 564.58)	503.02 (400.41, 605.64)	552.52 (444.25, 660.79)	483.31 (363.26, 603.36)	597.45 (500.95, 693.95)	528.35 (445.30, 611.39)	p=0.54
Robusta yield per acre (kg)	546.17 (494.02, 598.33)	495.54 (403.73, 587.35)	517.67 (434.87, 600.48)	566.96 (447.72, 686.19)	520.00 (400.54, 639.45)	651.55 (504.70, 798.40)	544.73 (469.05, 620.40)	p=0.63
Arabica yield per acre (kg)	476.31 (393.80, 558.81)	409.52 (187.76, 631.28)	514.76 (305.43, 724.10)	482.57 (355.18, 609.96)	364.02 (253.28, 474.76)	585.28 (472.40, 698.16)	364.55 (300.92, 428.18)	p=0.02

Annex 6 Table 7: Yield in kg dried cherries per productive Robusta and Arabica tree. Mean (CI)

Yields per tree (kg)	Farm size category					p-value
	Total (N=1,201)	Under 1.5 acres (N=437)	1.5 to 3 acres (N=375)	3 to 7 acres (N=286)	Over 7 acres (N=163)	
Robusta yield mean (95% CI)	3.00 (2.72, 3.28)	2.99 (2.67, 3.31)	2.89 (2.54, 3.24)	2.82 (2.39, 3.25)	3.65 (2.95, 4.34)	p=0.032
Median	2	2.2	2	1.88	2.25	
Arabica yield mean (95% CI)	1.88 (1.53, 2.23)	1.85 (1.42, 2.27)	1.88 (1.41, 2.35)	1.98 (1.50, 2.45)	1.82 (1.29, 2.36)	p=0.970
Median	1.14	1.11	1.17	1.08	1.25	

Annex 6 Table 8: Average yield in kg dried cherries per acre of coffee plantation and per productive coffee tree. Mean (CI)

		Kitagwenda	Rakai	p-value
Yield (kg) per acre	Robusta	513 (433, 594)	584 (512, 658)	p=0.179
	Arabica	480 (396, 563)	239 (-107, 585)	p=0.077
Yield (kg) per tree	Robusta	2.95 (2.50, 3.39)	3.07 (2.73, 3.41)	p=0.652
	Arabica	1.88 (1.53, 2.24)	1.96 (0.76, 4.69)	p=0.937

Annex 6 Table 9: Average revenue per farming activity as defined in RTV's PMF

	Revenue in the past 12 months in 1,000UGX
Farmers engaged in specific farming activity only	Mean (95% CI)
Coffee (n=1,188)	2,791 (2,333, 3,248)
Other perennial crops (n=400)	815 (674, 958)
Coffee + other perennial crops (n=1,203)	2,994 (2,550, 3,439)
Annual (seasonal) crops (n=927)	3,046 (2,576, 3,518)
All farmers in sample	Mean (95% CI)
Coffee (n=1,260)	2,633 (2,204, 3,062)
Other perennial crops (n=1,260)	253 (191, 315)

Coffee + other perennial crops (n=1,260)	2,861(2,442, 3,290)
Annual (seasonal) crops (n=1,260)	2,215 (1,815, 2,616)

Note: the top rows represent means and medians for farmers that derived revenue from the mentioned farming activities. The bottom rows represent the means and medians for all farmers in the sample, including those that did not engage in the mentioned activities.

Annex 6 Table 10: Income per farming activity per acre in 1,000UGX sample average and by cohort. p-value: test of difference between cohorts

	Total (N=1,201)	Cohort 1 (N=318)	Cohort 2 (N=146)	Cohort 3 (N=189)	Cohort 4 (N=232)	Cohort 5 (N=251)	Cohort 6 (N=125)	p-value
Coffee related income per acre	2,243 (1,931, 2,555)	2,015 (1,490, 2,540)	1,990 (1,661, 2,319)	2,222 (1,857, 2,586)	1,941 (1157, 2724)	2,912 (2238, 3585)	2,348 (1,971, 2,724)	p=0.25
Non-coffee crop related income per acre	1,605 (1,313, 1,897)	2,043 (1,555, 2,531)	1,575 (1,210, 1,939)	1,573 (906, 2,241)	1,159 (718, 1601)	1,544 (512, 2575)	1,553 (913, 2,193)	p=0.28
Livestock related income per total acreage farmland	82.08 (64.05, 100.11)	90.23 (73.65, 106.81)	82.68 (72.59, 92.78)	72.59 (39.60, 105.58)	66.87 (41.61, 92.12)	114.85 (54.59, 175.10)	37.08 (24.09, 50.07)	p<0.01

Annex 6 Table 11: Total household income by agricultural and non-agricultural income generating activities in the prior 12 months in 1,000UGX by cohort and total sample

Income source	Sample	Cohort						p-value
	N=1,260	1 (n=318)	2 (n=146)	3 (n=189)	4 (n=232)	5 (n=251)	6 (n=125)	
Farm income	5,614 (4,888, 6,340)	5,611 (3,370, 7,852)	5,984 (4,038, 7,929)	5,335 (4,011, 6,659)	4,721 (3,083, 6,359)	6,024 (5,189, 6,860)	6,448 (5,291, 7,605)	p=0.670
Coffee income	2418 (2,022, 2,814)	1,965 (1,156, 2,775)	2,276 (1,369, 3,182)	2,324 (1,763, 2,885)	2,012 (1,071, 2,954)	3,172 (2,616, 3,727)	3,125 (2,327, 3,923)	p=0.092
Non-coffee crop income	2,117 (1,744, 2,490)	2,366 (1,550, 3,183)	2,077 (1,511, 2,643)	2,239 (1,542, 2,936)	1,687 (816, 2,557)	1,990 (847, 3,133)	2,403 (1,548, 3,259)	p=0.875
Livestock income	215 (182, 248)	217 (166, 267)	206 (158, 255)	194 (113, 276)	220 (137, 303)	276 (200, 353.)	118 (68, 167)	p=0.027
Non-farm IGA income	1,279 (964, 1,593)	844 (560, 1,128)	1,757 (786, 2,727)	891 (624, 1,159)	1,615 (393, 2,837)	1,632 (1,024, 2,240)	1,078 (965, 1,191)	p=0.131
Total household income	6,893 (6,021, 7,765)	6,455 (4,004, 8,907)	7,741 (5,720, 9,761)	6,226 (4,721, 7,731)	6,336 (4,130, 8,543)	7,657 (6,635, 8,680)	7,527 (6,339, 8,715)	p=0.617

Annex 6 Table 12: Non-farm income generating activities total income and as percentage of total household income, by consumption quintile

	Consumption quintile					p-value
	Quintile 1 (N=242)	Quintile 2 (N=247)	Quintile 3 (N=257)	Quintile 4 (N=266)	Quintile 5 (N=248)	
Non-farm income (in 1,000 UGX)	552 (344, 759)	893 (605, 1180)	1,041 (736, 1,346)	1,343 (962, 1,724)	2,551 (1,320, 3,782)	0.001
Percentage of total household income	19.9% (16.0, 23.8)	19.7% (15.7, 23.7)	21.0% (16.3, 25.3)	20.9% (16.3, 25.6)	18.8% (13.7, 23.9)	0.962

Annex 6 Table 13: Health status, prevalence of diarrhea and cough among adults, and diarrhea prevalence among children by cohort. p-value: test of difference between cohorts

	Total (N=1,201)	Cohort 1 (N=318)	Cohort 2 (N=146)	Cohort 3 (N=189)	Cohort 4 (N=232)	Cohort 5 (N=251)	Cohort 6 (N=125)	p-value
Health status farm manager	3.25 (3.17, 3.33)	3.38 (3.24, 3.53)	3.23 (3.09, 3.37)	3.20 (3.04, 3.35)	3.26 (3.16, 3.36)	3.13 (2.88, 3.39)	3.21 (3.05, 3.38)	<i>p=0.50</i>
Prevalence of diarrhea among adults	0.13 (0.11, 0.15)	0.17 (0.13, 0.21)	0.13 (0.11, 0.16)	0.10 (0.06, 0.13)	0.12 (0.10, 0.14)	0.12 (0.06, 0.19)	0.09 (0.04, 0.14)	<i>p=0.16</i>
Prevalence of cough among adults	0.58 (0.55, 0.61)	0.56 (0.50, 0.63)	0.58 (0.53, 0.62)	0.56 (0.47, 0.64)	0.59 (0.51, 0.68)	0.60 (0.55, 0.66)	0.56 (0.49, 0.64)	<i>p=0.90</i>
Prevalence of diarrhea among children under 5	0.19 (0.16, 0.23)	0.23 (0.17, 0.30)	0.24 (0.14, 0.33)	0.16 (0.07, 0.24)	0.17 (0.09, 0.26)	0.15 (0.07, 0.24)	0.20 (0.10, 0.30)	<i>p=0.57</i>

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