# Uganda

# Impact Assessment of the Small and Medium Agribusiness Development Fund (SMADF)

**BASELINE** REPORT **No. 5**

## PURA ORGANIC AGRO TECH LTD (PURA)

IFAD
Investing in rural people

YIELD UGANDA
INVESTMENT FUND

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# 1. INTRODUCTION

This is the fifth baseline report for the impact assessment of the Small and Medium Agribusiness Development Fund (SMADF), also known as the Yield Uganda Investment Fund (YUIF). The SMADF is an impact investment fund which provides tailored financing to Small and Medium Agribusinesses (SMAs) in Uganda. The fund invests in agriculture-related business across all value chains, including input supply, production, and processing of agricultural products. SMAs are selected based on their growth potential and on their linkages with smallholder farmers.

Given the fund's novelty, the scope for learning from its implementation is high. To capture these lessons in a thorough and systematic way, the fund's implementing partners have established an innovative monitoring and evaluation system including rigorous ex-ante impact assessment (IA) for a selected set of SMAs.

For the ex-ante IA, five SMAs have been selected to study the impact of the SMADF investments on smallholder farmers who are part of the SMAs supplier network. The ex-ante IA design involves two rounds of data collection: one at the point of the initial investment (the baseline) and again after five years (the endline). To estimate the impact of the investment on smallholder farmers linked to investees, a set of beneficiary and non-beneficiary households are compared for each SMA. This comparison is based on in-depth quantitative data collected from these households through a household questionnaire and qualitative inquiry through Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs). Once all the assessments are completed, a final report is produced that collates the findings and estimates the overall impact of the Fund using aggregation and projection methods. This, combined with individual reports for each SMA, is expected to contribute extensive lessons that can be used to inform future investment funds and wider efforts to spur rural development in Uganda and beyond. The baseline round of the ex-ante IA is supported by IFAD's Research and Impact Assessment (RIA) (Paolantonio et al., 2017).

This report presents details of the baseline data activities for beneficiary households targeted as future suppliers for Pura Organic Agro Tech Ltd (here afterward referred to as Pura). Pura is an agro-processing company that plans to produce in-demand cassava-based products. This report follows the first two baseline reports conducted in 2019 for Sesaco Ltd and CECOFA (Paolantonio and Higgins, 2019; Paolantonio et al., 2019), while the third baseline report refers to Pristine Foods Limited and the fourth baseline report refers to AMFRI (Anderson and Zucchini, 2023a; b).

In the proceeding sections of this report, we first present details of the SMA, of the investment and its expected benefits, highlighting the key areas of impact that will be tracked over the next five years (Sections 2 and 3). The next section details the methodology that was followed for this baseline data collection (Section 4), followed by results of statistical tests that compare the treatment and control groups identified for this SMA to assess the quality of the sample design (Section 5). Finally, using insights from the quantitative and qualitative data from the treatment group and SMA staff, the report provides a snapshot of the pre-investment situation of the SMA and the expected smallholder beneficiaries, highlighting the challenges and opportunities they face and contextual factors that may help or hinder impact (Section 6).

# 2. BACKGROUND

## 2.1 THE SMALL AND MEDIUM AGRIBUNESS DEVELOPMENT FUND

The SMADF (or YUIF) is an innovative public-private partnership established in 2017 by the European Union (EU), the International Fund for Agricultural Development (IFAD) and the National Social Security Fund (NSSF) of Uganda. The initial budget amounted to EUR 12 million, which reached EUR 20.4 million in 2019 thanks to the additional financing from Soros Economic Development Fund of the Open Society Foundations (OSF) and Finnish Church Aid Investments Limited (FCAI). The fund is managed by Pearl Capital Partners (PCP), that contributed EUR 0.4 million, and IFAD acts as implementing partners.

The fund was created to increase the flow of financing to Ugandan SMAs. SMAs have the potential to stimulate sustainable and inclusive growth throughout the rural economy. However, because they are often too large to access micro-credit enterprises and too small to access traditional means of bank financing, they lack access to necessary capital and credit needed to expand their operations. With funding from public and private investors the fund offers innovative financial products to SMAs, such as equity, quasi-equity, and debt funding, ranging in size from EUR 250,000 to EUR 2 million. In addition to financial products, the fund also offers a Business Development Services (BDS) facility which investees can use to improve both their own operational capacity and the operational capacity of the smallholder farmers that supply them with agricultural products.

Since the establishment and launch of the Fund in January 2017, the Fund has invested a total of EUR 15.9 million in fifteen agribusinesses. In addition, a BDS support commitment of EUR 3.2 million has been made across the investment portfolio (PCP, 2022).

## 2.2 THE CONTEXT

Spurred mostly by agricultural growth, Uganda is one of the fastest growing economies in East Africa. The majority of Uganda's labor force is employed through agriculture that relies on the cultivation of rainfed crops that are highly affected (or at risk of being affected) by climate change. The intensification of climate change throughout Uganda is projected to bring higher temperatures and an increased frequency and intensity of low precipitation events. To mitigate the negative effects of these events, smallholder farmers' investment into the cultivation of drought tolerant crops, such as cassava, is essential (Jarvis et al., 2012). However, to sustain and promote the production of such crops, proper marketing channels, price dynamics, and support networks for smallholder farmers must exist.

Once considered a "poor man's food", cassava is quickly becoming one of the most important staple crops for consumption and income in Uganda (Trust, 2012). Cassava is mostly grown by small scale-farmers and is identified as a drought tolerant crop that can grow in a range of agro-ecological environments (Reincke et al., 2018). Despite its growing popularity, smallholder farmers face several challenges to its cultivation including inadequate and poor quality planting materials, low access to credit and capital, a high prevalence of crop diseases, and insufficient access to marketing channels (Trust, 2012).

Despite these barriers, the cassava industry in Uganda is evolving from a subsistence farming system to a value chain system. These changes are primarily being spurred by the increase in demand for cassava. Increases in demand are attributed to several factors including both changes in dietary preferences spurred by income growth (Mottaleb et al., 2021) and an increase in cassava-based products used for industrial purposes (Kleih et al., 2012).

Cassava supply in Uganda has been unable to meet the increasing demand. In a study conducted by Trust (2012), traders often reported that they were unable to meet their required volumes of cassava due to lack of supply. The supply gap was primarily caused by poor road networks and persistently low harvested values. Providing smallholder farmers with access to inputs, extension services and information, and direct marketing channels could potentially improve cassava harvest values and meet some of the growing demand for cassava.

## 2.3 PURA ORGANIC AGRO TECH LTD

Pura Organic Agro Tech Ltd is an agro-processing company focused on the perennial crop value chain. The company was incorporated in 2011 and subsequently acquired 485 ha of agricultural land in Namaasa-Nabiswera, Nakasongola District on a 99-year lease. Pura focuses on the cultivation of long-term and perennial crops such as cashew nuts, orchard lime, and oranges which are most suitable for the ecological zone of the farm and have proven to be climate resilient crops. Recently the company introduced two new agriproducts – chili and cassava.

Chili for Pura is farmed through a combination of irrigated open gardens and enclosed greenhouse structures. It is harvested three to four times a year and provides much of the cash flow needed to fund Pura's current operations. Cassava, in comparison, is more drought tolerant and less capital intensive. Additionally, cassava has a lower gestation period than the other perennial crops grown on the farm. As Pura shifts production to cassava, it is mainly targeting industrial markets that consume large values of starch in their production processes.

Cassava is a versatile agriproduct whose derivatives are applicable in multiple industrial products such as foods, confectionary sweeteners, and as an adhesive in paperboard processing. Currently the industrial starch market is dominated by industries who import corn starch from India, Egypt, and Kenya. As industrial consumption increases, and domestic producers of cassava remain scarce, Pura has a unique opportunity to develop a sustainable cassava value chain in Uganda.

Pura is targeting local and regional markets with its starch product to substitute imported corn starch. Demand for high quality cassava starches is currently high and rising due to growing industrialization in the region. Additionally, increased living standards and income coupled with a growing health-conscious population has increased the demand for more healthy foods such as cassava. Pura plans to produce three cassava-based products, tapioca starch, sago, and cassava flour. These products will be marketed to national and international markets.

Pura aims to extend its operational capacity and produce the three aforementioned cassava products (high quality cassava flour, tapioca starch, and sago). To meet this processing goal Pura plans to source through a mixed system of its own production, commercial farmers, and smallholder farmers. Pura has received the investment to support the on-going construction of a new vertically integrated cassava processing plant in the rural Nakasongola district. Furthermore,

the company has acquired and installed equipment to produce Tapioca Starch and Sago. Additionally, Pura has received funding from the BDS facility to support their fresh cassava out-grower scheme, initial factory operations and the continuous development of their farm estate to maintain the quality of the cultivated cassava variety (PCP, 2022).

# 3. EXPECTED IMPACT OF THE INVESTMENT ON SMALLHOLDER FARMERS

Pura has currently delegated 110 of the 485 leased hectares to support the cassava project. With the opening of the new processing plant the company plans to source 70 per cent of the fresh cassava roots from a combination of commercial farmers, its own leased estate and 30 per cent from smallholder farmers. Over a four year span it will gradually increase its sourcing from smallholder farmers to 46 per cent.

Through this expansion the company will provide solutions to the key challenges faced by smallholder farmers in cassava production. These challenges include lack of access to a sustainable market, lack of access to disease resistance quality planting material, and a knowledge gap in understanding successful agronomic practices and post-harvest-handling. To assist farmers in overcoming these challenges Pura plans to develop a sustainable out-grower model in which farmers are organized into groups. This will improve the organizational capacity of smallholder farmers. Then, the company will provide improved cassava cuttings that are drought tolerant, disease resistant, have high starch content, have lower maturity periods, and give higher yields. The company intends to distribute cassava cuttings through seed multiplication centres (approximately 20) in Nakasongola and the neighbouring districts. Finally, the company will provide extension services to out-growers to improve cassava production.

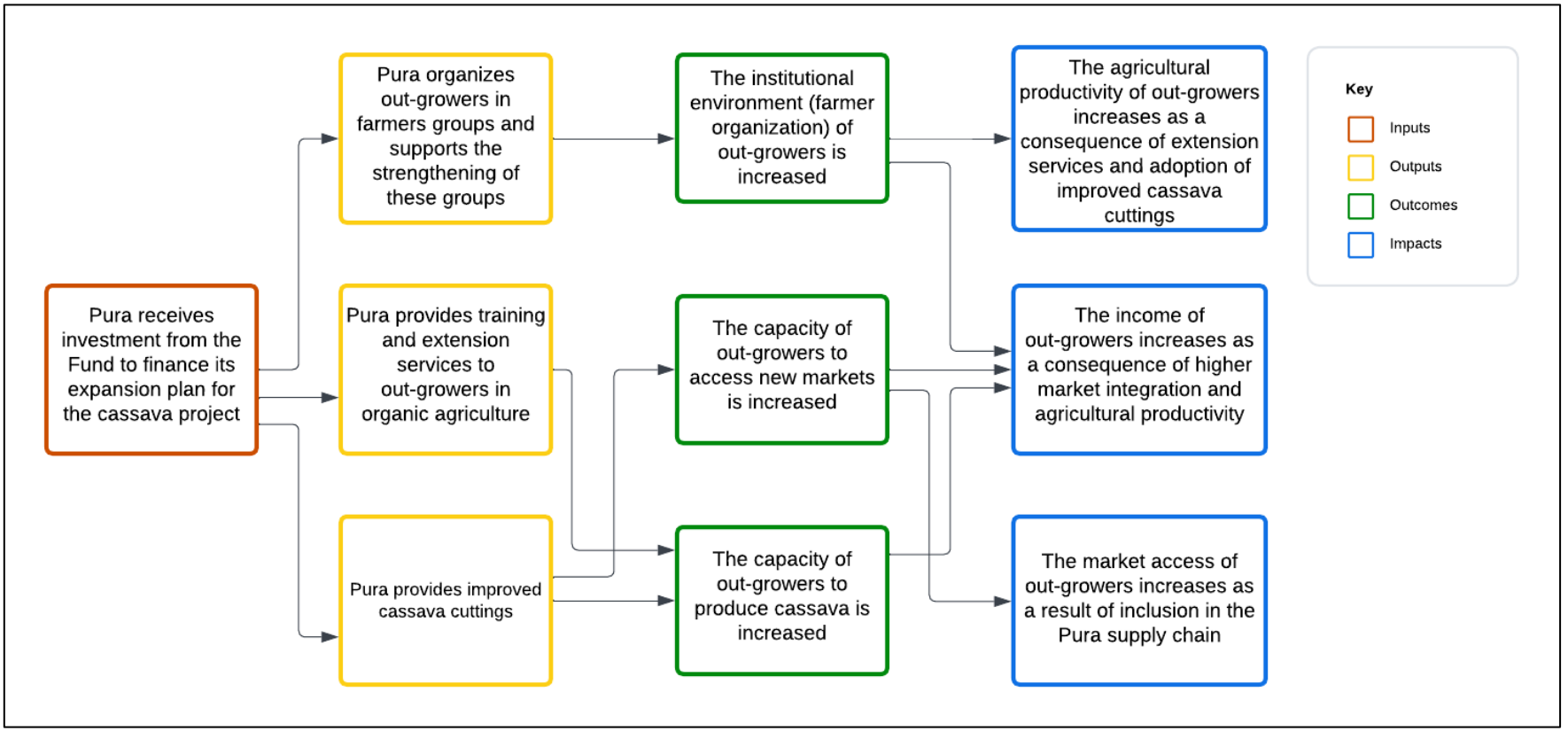
Through these services the institutional environment facilitating farmer organization will improve and the amount of cassava produced by smallholder farmers will increase. Additionally, through cassava purchases from smallholder farmers, Pura will increase the market integration of smallholder farmers into the cassava value chain. These outcomes are projected to directly impact smallholder farmers through an increase in their income and agricultural productivity.

In addition to direct impacts to smallholder farmers, Pura will increase the economic opportunities within the communities that it operates. The company currently employs 65 full-time staff and recruits an additional 40 casual workers during the peak seasons. The plant expansion will create an additional 50 full-time positions by the year 2024 and a further 50 temporary positions will be filled on demand during the peak production period.

Finally, the project will lead to national development by providing locally grown cassava for the agro-processing industries and thereby fostering industrialization in Uganda. Currently, Ugandan companies import starch from India, Egypt, Tanzania, and Kenya for various industrial uses. Pura will play an important role in the Ugandan economy by providing a substitute to the imported starch.

For more details on the direct impacts of the investment on smallholder farmers see the Theory of Change diagram in Figure 1.

**Figure 1: Theory of change: Expected impact channels of the SMADF investment in Pura.**




Note: Authors' elaboration.

# 4. METHODOLOGY

## 4.1 SAMPLE DESIGN

An important aspect of quasi-experimental impact assessments is the construction of a reliable counterfactual. This involves identifying non-beneficiary (control) households that are similar to beneficiary (treatment) households across a range of characteristics at the baseline stage. We therefore design the sample framework such that non-beneficiary households live in the same context as beneficiary households in terms of economic background, market access and agro-ecological production potential.

We considered treated districts the six districts targeted by Pura and Nakasongola district – the district in which Pura operates. Additionally, Pura identified 44 districts in which its competitors operated and 124 districts that are suitable for cassava production. We considered the untreated districts to be those that were suitable for cassava production in which no competitors operated – 66 districts. We used Propensity Score Matching (PSM) to match treated and untreated districts across a set of characteristics.

To match districts, we used data originating from the nationally representative 2020 LSMS-ISA survey. The variables were created at the district level using survey weights. The matching characteristics used were the percentage of households involved in cassava production, the percentage of households involved in agricultural production, land holdings size (ha), and average land (ha) planted with cassava. These variables are a proxy of cassava production within each district.

Additionally, because of their agro-ecological potential, the main cassava growing regions in Uganda are the eastern and northern regions. To match these agro-ecological conditions we incorporated the long-run annual average of total rainfall and range of temperature as selection criteria in the PSM.

For the treated districts, we selected Kiryandongo and Nakasongola as Pura has identified these as districts in which farmers are being targeted. For the control districts, we selected the exact one-to-one match using one nearest neighbour from PSM. These districts are Ibanda for Kiryandongo and Kamuli for Nakasongola.

A local consultant was deployed to the selected control districts to list smallholder farmers who were currently growing cassava. From the selected districts, villages that had at least 10 farmers growing cassava were randomly selected from the list supplied by the local consultant. Additionally, villages that had at least 10 farmers that were identified as being targeted by Pura were randomly selected. Within each selected village ten to fifteen smallholder farmers were randomly selected to interview. Table 1 shows the distribution of the baseline sample by treatment and control groups.

**Table 1: Baseline sample distribution.**

| Assignment | District | No. of targeted households | No. of achieved households |
|---|---|---|---|
| Treatment | Kiryandongo | 123 | 123 |
| | Nakasongola | 111 | 111 |
| | *Subtotal* | *234* | *234* |
| Control | Ibanda | 117 | 117 |
| | Kamuli | 116 | 118 |
| | *Subtotal* | *233* | *235* |
| | **Total** | **467** | **469** |

## 4.2 DATA COLLECTION TOOLS

Each household selected from the sample was administered an in-depth quantitative questionnaire that covered various details of their livelihoods and agricultural practices for the period of July 2021 - June 2022. This referenced timeframe allows us to capture the situation of both control and treatment households before Pura fully extends its supply network to include the treatment farmers. Some of the treatment farmers began to receive cassava cuttings in April and May of 2022. However, at the time of data collection Pura had not purchased cassava from the farmers within the treatment group.[1]

As noted above, the investment in Pura is mainly expected to impact smallholder farmers through the consistent supply of improved cassava cuttings that are drought tolerant, disease resistant, have high starch content, have a lower maturity period, and give higher yields and through the purchase of fresh cassava from farmers. The questionnaire, therefore contained detailed questions on the agricultural production of cassava and other crops. To capture a holistic purview of the impact of the investment on household livelihood the questionnaire also covers sources of income, household characteristics, asset ownership, access to credit and savings, shock exposure, societal capital, food security, and women's empowerment.

To complement the quantitative household data, we also conducted qualitative data collection. This consisted of focus group discussions (FDGs) and key informant interviews (KIIs). The KIIs were conducted with the Managing Director, Financial Officer, two Agronomists, an outside Consultant Agronomist, Mobiliser, and an Out-grower Supervisor who were employed by Pura.

FDGs were conducted with collections of farmers in both the treatment and the control groups. FDGs were organized to consist of six to 10 participants of all genders and designed to last 1.5-2 hours. Respondents were recruited from parishes where a large number of farmers resided in close proximity to each other. FDGs focused on reasons for joining Pura as an out-grower supplier, expectations of the relationship with PURA, village conditions, and challenges to production. KIIs were organized and attended by one qualitative enumerator and lasted 30 to 60 minutes.

[1] Pura commenced the recruitment of farmers in March of 2022. In April and May of 2022 Cassava cuttings were distributed to the Lead farmers, some of which are treatment farmers. However, these cuttings were not distributed for the growing of Cassava to be purchased by PURA.

## 4.3 IMPACT INDICATORS

Table 2 describes the main outcome and impact level indicators that will be used to assess the quantitative impact of the investment on smallholder farmers, organized by subject domain.

**Table 2: List of impact indicators for the Pura investment.**

| Indicator | Description | Impact area |
|---|---|---|
| **Cassava production** | | |
| Yields (kg/ha) | The amount of the commodity produced by land size. | Effectiveness/efficiency of farming practices. |
| Expenditure on inputs | Cash expenditure on buying seeds, fertilizers, etc. | Investment in farming practices |
| Harvest uses | Proportion of harvest dedicated to home consumption, sale, and lost due to disease, pests, etc. | Market access, effectiveness/efficiency of farming practices. |
| Revenue and prices from sale of cassava | Cash income received from the sale of crops and the amount received per kg. | Market access, income, effect of improved cassava cuttings |
| Cassava sale practices | Type and location of buyer; amount sold under certification (by certification type). | Market access, effect of improved cassava cuttings |
| **Overall agricultural production and sale** | | |
| Gross value of crop production | Converts harvest of all crops into a common unit (US$[2]), equal to the income from crop sales plus the value of non-sale uses (including home consumption), valued using the median price for the sample for each crop when sold (Carletto et al., 2007). | Effectiveness/efficiency of farming practices. |
| Land cultivated | Number of hectares of land cultivated calculated as the sum of the hectares cultivated with annual crops in both seasons and the hectares of land under trees and perennials. | Input access, wealth. |
| Number of crop types | Count of the different crops grown. | Input access, farming practices, resilience. |
| Revenue from crop sales | Cash income received from sale of all crops; Proportion of harvest sold as a percentage of the gross value of crop production (as opposed to the other non-sale uses). | Market access, income. |
| Harvest uses | Proportion of harvest dedicated to home consumption, sale, and lost due to disease, pests, etc. Expressed as a percentage of gross value of crop production. | Market access, effectiveness/efficiency of farming practices. |
| **Livestock ownership and production** | | |
| Number owned | Count of the number of key livestock owned: bulls, cows, chickens, goats, oxen, and pigs. | Livelihood practices, wealth. |
| Gross value of livestock production | Value of all livestock and livestock products that were either sold or consumed at home. For non-sold, valued using median price for the sample for each animal/product when sold. | Livelihood practices, effectiveness/efficiency of livestock prod. |
| Revenue from sale of livestock and livestock products | Cash income from sale of whole livestock and livestock products (cuts of meat, milk, eggs, manure). | Effectiveness/efficiency of livestock prod., income. |

Note: Values with outliers are winsorized such that values exceeding the 95th percentile of the respective distribution are replaced with values at the 95th percentile. This is done for outliers throughout analysis.

[2] All values are converted from Ugandan Shillings (USH) to United States Dollars (US$) using the following conversion factor: $\left(\frac{CPI_{2019}}{CPI_{2021}}\right)\left(\frac{1}{PPP_{2019}}\right)$ where CPI denotes the consumer price index and PPP denotes the purchase price parity rate for GDP, both rates are provided by the World Bank. Prices are normalized to 2019 levels for comparisons to previous baseline reports.

# 5. COMPARISON OF TREATMENT AND CONTROL HOUSEHOLDS

Table 3 summarizes and compares households in the control and treatment groups across a wide spectrum of key characteristics such as income, agricultural production, asset ownership, financial inclusion, and the receipt of support and advice. A key requirement to successfully measure the impact of a specific program or treatment is balance across the treatment and control groups. Here we determine balance based on the standardized difference (SD) in means. The SD is a measure of the difference between the treatment and control groups that is comparable across different indicators (Austin, 2009). The threshold to decide whether the SD is high to indicate imbalance is subject to discussion in the literature, but an absolute value greater than 0.10 or 0.25 is used widely (Austin, 2009). It should be kept in mind that the chosen value depends on the importance of the covariate being tested (hence for some a value of 0.25 may be more appropriate) and that small samples are more likely to have higher SDs, as balance is a large sample attribute. Given our samples are relatively small we use a threshold of 0.25 SD to determine imbalance.

Households in the treatment and control groups are balanced on thirteen out of the twenty-two key characteristics summarized in Table 3. Although household heads in the control group are slightly more educated than the treatment, the SD is -0.17 indicating balance on this characteristic. Additionally, households in the treatment and control groups are balanced on the percent of households headed by a female. However, households in the treatment are larger and less educated on average.

Households in the treatment and control groups are balanced across many of the agricultural production variables. However, households in the control group earn a larger part of their income from crop production. Households in the control group earn, on average, 63 per cent of their income from crop production in comparison to households in the treatment group who earn 54 per cent of their income from crop production. Income composition is balanced across groups within the proportions of income coming from household enterprises, livestock production, and formal wage labor. However, both groups differ on the proportion of income generated from informal wage labor. Households in the treatment sample earn 6 per cent of their income from informal wage labor in comparison to households in the control group who only earn 2 per cent of their income from informal wage labor.

Households are balanced on the total livestock units, indicating that they have relatively similar livestock ownership. However, there are significant differences in their asset ownership levels. To measure household asset ownership, we construct an asset index using principal component analysis (PCA)[3] that is normalized to a scale of zero to one. The asset index assigns a relative score to proxy for the asset level of each individual in the analysis. The mean of the asset index does not tell us much on its own, but it allows us to compare the relative wealth of individuals or groups of individuals within the sample. For instance, the average scores of the asset index for the treatment

[3] Assets used in the the PCA analysis to construct the asset index are binary indicators for the following: household appliances, TV, radio, solar panel, bike, motorcycle, jewelry, sprayers, hand-cart, oxcart, household made of burnt bricks, iron roof, and covered pit latrine toilet.

and control groups are 0.39 and 0.50, respectively. This indicates that control households, on average, have more assets than treatment households.

Key characteristics summarizing the production and marketing of cassava are mostly balanced. Households in both the control and treatment groups are balanced on the total area under cassava cultivation and the percent of households selling cassava. However, households in the treatment group produce a higher value of the cassava harvest. Balance is achieved in most of the variables summarizing agricultural production. Households are balanced on the total value of crop production, the total value of crop production per hectare, and the amount of land cultivated. However, households in the control and treatment groups differ on the number of crops harvested. Households in the control group harvest a more diverse number of crops; they harvest 2.73 crops on average in comparison to 1.76 harvested by the treatment group.

Finding perfect samples that are balanced across all key characteristics within an impact assessment is near impossible. However, our sample between treatment and control households is largely balanced. Specifically, and most important to the empirical estimation of the impact of the Fund's investment on smallholder livelihoods, the key characteristics of cassava production are balanced across groups. When the impact analysis is conducted at the endline stage the baseline differences will be addressed using rigorous statistical methodologies designed to eliminate imbalances and ensure an accurate comparison of treatment and control groups.[4]

**Table 3: Comparison of household characteristics, income and agricultural production between treatment and control households.**

| | Treatment | Control | SD |
|---|---|---|---|
| **Household characteristics** | | | |
| Household size | 7.06 | 6.35 | 0.26 |
| Education of household head (years) | 7.67 | 8.63 | -0.17 |
| Average education in household (years) | 8.22 | 9.52 | -0.33 |
| Female household head (%) | 13.25 | 17.02 | -0.11 |
| **Income** | | | |
| Gross household income p/capita (US$) | 602 | 873 | -0.34 |
| **Proportion of gross income from (%)** | | | |
| Crop production | 53.57 | 62.79 | -0.29 |
| Household enterprise | 17.27 | 14.55 | 0.12 |
| Livestock production | 14.89 | 15.10 | -0.01 |
| Formal waged labor | 3.31 | 2.56 | 0.07 |
| Informal waged labor | 6.11 | 1.89 | 0.33 |
| Other | 4.85 | 3.12 | 0.16 |
| **Agricultural production** | | | |
| Total value of crop production (US$) | 2,042 | 3,014 | -0.22 |
| Total value of crop production per hectare (US$) | 905 | 1,200 | -0.21 |
| Land cultivated (ha) | 3.10 | 2.70 | 0.09 |
| Number of crops grown | 1.76 | 2.73 | -0.74 |
| **Cassava production** | | | |
| Total area under cassava cultivation (ha) | 0.75 | 0.70 | 0.05 |
| Total value of cassava harvest (US$) | 1,681 | 1,453 | 0.06 |
| Percent of households selling cassava (%) | 29.06 | 26.81 | 0.05 |
| **Assets and livestock** | | | |
| Asset index | 0.39 | 0.50 | -0.53 |
| Livestock ownership in Tropical Livestock Unit | 6.04 | 2.81 | 0.10 |

[4] Additional matching rounds at the household level could be implemented to ensure that beneficiary and non-beneficiary households are comparable. Furthermore, difference-in-difference modelling will include a set of variables to control for these imbalances and to ensure that differences between beneficiary and non-beneficiary households are only attributable to the intervention.

| | Treatment | Control | SD |
|---|---|---|---|
| **Received training and support on (%)** | | | |
| Agriculture | 18.38 | 21.28 | -0.07 |
| Other | 3.42 | 7.23 | -0.17 |

Note: Number of households in the treatment and control groups equals 234 and 235, respectively.

# 6. KEY CHARACTERISTICS OF TREATMENT HOUSEHOLDS

## 6.1 CASSAVA PRODUCTION AND SALES

Table 4 presents the mean values of key indicators that summarize the production and sales of cassava for beneficiary households. Approximately 74 per cent of beneficiary households cultivated cassava from July 2021 – June 2022. During qualitative interviews, several farmers reported that prior to being recruited by Pura they were not cultivating cassava because a local and lucrative market to sell cassava did not exist. Twenty nine percent of beneficiary households sold cassava. Sellers of cassava on average sell 70 per cent of their total cassava harvest.

Despite low participation in cassava marketing channels, the revenue from cassava sales is on average US$2,345. We note that this is higher than the total gross value of the cassava harvest. This is largely attributed to differences in the production of households who sell cassava and those that do not. Households that sell cassava produce a harvest on average valued at US$1,918. In comparison, households who do not sell cassava produce on average a harvest valued at 363. Yields of cassava selling households are also substantially higher. On average households who sell cassava have cassava yields of 4,400 kg/ha in comparison to non-selling households who produce yields of 1,609 kg/ha. These differences also help explain the large standard deviations on several of the statistics in Table 4.

**Table 4: Cassava production and sales of beneficiary households.**

| | Mean | Std. Dev |
|---|---|---|
| **Production** | | |
| Percent of household that cultivated crop (%) | 74.36 | |
| Production (kg) | 1,681 | 4,167 |
| Land cultivated (ha) | 0.75 | 0.84 |
| Percent of households that harvested crop (%) | 50.43 | |
| Yield (kg/ha) | 3,281 | 5,020 |
| Gross value of production (US$) | 1,259 | 2,457 |
| **Sales** | | |
| Percent of households that sold crop (%) | 29.06 | |
| Percent of harvest sold (%) | 70.10 | 40.46 |
| Value of harvest sold (US$) | 2,345 | 7,012 |
| Median prices per kg (US$) | 0.51 | |

Note: Number of households in the sample equals 234.

## 6.2 OVERALL AGRICULTURAL ACTIVITIES

Table 5 summarizes agricultural activities of beneficiary households. On average, beneficiary households produce a total harvest valued at US$2,076 on 3.10 hectares of land. Crop production diversity is low; on average beneficiary households produce 1.76 different crops. The most commonly grown crop is maize; 82 per cent of households harvested maize during the reference period.

Beneficiary households spend approximately US$570 on inputs for crop production. Labor is the largest input expense, followed by machinery and seeds. Farmers in qualitative interviews report

that weeding is a time-consuming barrier to crop production, and while laborers are available for hire, farmers often are too financially strained to hire them.

After harvest, farmers, on average, net a total harvest valued at US$1,506. They consume almost half of this and sell majority of the remainder. In addition to maize the most commonly harvested crops amongst beneficiary households include groundnuts, sweet potatoes, and coffee.

**Table 5: Overall agricultural production and sales of beneficiary households.**

| | Mean | Std. Dev |
|---|---|---|
| **Production** | | |
| Value of crop production (US$) | 2,076 | 3,171 |
| Value of crop production per ha (US$) | 905 | 1,747 |
| Land cultivated (ha) | 3.10 | 5.31 |
| Number of crops grown | 1.76 | 1.16 |
| **Expenditure on inputs (US$)** | | |
| Total | 570 | 1,786 |
| Labor | 375 | 1,451 |
| Seeds | 61 | 173 |
| Fertilizer | 10 | 50 |
| Pesticide/Insecticide/Herbicide | 4 | 35 |
| Machinery | 121 | 446 |
| **Gross margin value of production - expenditure on inputs (US$)** | 1,506 | 3,146 |
| **Proportion of harvest (%)** | | |
| Used for home consumption | 48.73 | 31.55 |
| Sold | 45.04 | 31.52 |
| Lost due to disease, pest, floods, etc. | 0.82 | 2.38 |
| Used for seed, feed, or other uses | 5.42 | 9.62 |
| **Median price received per kg of (US$)** | | |
| Coffee | 1.18 | |
| Groundnuts | 2.65 | |
| Maize | 0.69 | |
| Sweet potatoes | 0.25 | |

Note: Number of households in the sample equals 234.

## 6.3 LIVESTOCK

According to both the household questionnaire and qualitative data, beneficiary households are not very involved in livestock rearing activities. Table 6 presents livestock statistics for beneficiary households from the household questionnaire. Very small amounts of key livestock are owned on average. Chickens are the most commonly owned livestock, followed by goats. Households own approximately 9.14 and 5 chickens and goats, respectively. Total livestock production has an average total value of US$749.

Households spent on average between US$263 a year on inputs for livestock (including vaccinations, housing, feed, equipment, etc.) and the gross value of production was on average US$749 annually. Most revenue from livestock production is attained through the sale of whole livestock, both alive and slaughtered.

**Table 6: Livestock ownership, income, expenditure of beneficiary households.**

| | Mean | Std. Dev |
|---|---|---|
| **Number of animals owned:** | | |
| Chicken | 9.14 | 12.64 |
| Goats | 4.97 | 12.59 |
| Calves | 0.85 | 3.14 |
| Pigs | 1.18 | 2.55 |
| Bulls | 1.76 | 13.20 |

| | Mean | Std. Dev |
|---|---|---|
| Oxen | 0.15 | 0.65 |
| **Gross value of livestock production (US$)** | 749 | 1,401 |
| **Expenditure on inputs for livestock production (US$)** | 263 | 483 |
| **Net value of livestock production (US$)** | 570 | 1,089 |
| **Revenues from the sale of (US$):** | | |
| Whole livestock (alive or slaughtered) | 439 | 842 |
| Milk | 127 | 419 |
| Eggs | 0.00 | 0.00 |
| Manure | 0.00 | 0.00 |

Note: Number of households in the sample equals 234.

## 6.4 INCOME AND LIVELIHOOD COMPOSITION

Table 7 presents statistics on income and livelihood composition for beneficiary households. The average total income and total income per capita is US$3,591 and US$602, respectively. For context, in 2021 the World Bank classified the lower-middle income economies as those with a gross national income per capita of US$1,085.[5] Beneficiary farmers approximately a little more than half of the World Bank threshold on average. However, as indicated by the large standard deviation for both total income and total income per capita, beneficiary income is highly variable.

The low levels of gross household income are reflective of the low income and high poverty levels experienced by agricultural households in rural Uganda (World Bank, 2016). To supplement income generated from crop production, beneficiary households are also engaged in livestock production and household enterprises. However, these income sources combined still account for a smaller proportion of income than crop production.

**Table 7: Total household income and income composition of beneficiary households.**

| | Mean | Std. Dev |
|---|---|---|
| **Gross household income (US$):** | | |
| Total | 3,591 | 3,166 |
| Per capita | 602 | 767 |
| **Proportion of income from (%):** | | |
| Crop production | 53.57 | 34.70 |
| Livestock production | 17.27 | 26.88 |
| Household enterprise | 14.89 | 26.73 |
| Formal wage labor | 3.31 | 12.20 |
| Informal wage labor | 6.11 | 15.86 |
| Other | 4.85 | 14.52 |

Note: Number of households in the sample equals 234.

## 6.5 LOANS AND SAVINGS

Table 8 presents statistics on access to credit and savings of beneficiary households. Approximately one third of beneficiary households took at least one loan. From the households that took loans, 80 per cent of households took them from savings groups. Beneficiary farmers report that credit is a large barrier to expanding their farm operations. In the qualitative interviews one farmer cited that they had a large amount of land that could be productive. However, they lacked the financial resources to purchase inputs and cultivate the land.

[5] The World Bank constructs the gross national income per capita threshold for lower-middle income countries using the World Bank Atlas method. This is different from the method used to construct the average income per capita. Thus this number should not be used as a direct comparison.

The percentage of beneficiary households that had at least one member with cash savings is higher than the percentage of households that took at least one loan. Fifty-three percent of households had at least one household member that had cash savings. The average amount of cash savings per capita of beneficiary households was US$211.

**Table 8: Loans and savings of beneficiary households.**

| | Mean | Std. Dev |
|---|---|---|
| **Household took at least one loan (%)** | 33.33 | |
| **Source of loan (% of sample who took a loan)** | | |
| Savings group | 80.77 | |
| Bank | 2.56 | |
| Microfinance institution | 6.41 | |
| Farmer's group/cooperative | 3.85 | |
| Trader/Buyer | 2.56 | |
| Friend/Family | 2.56 | |
| **Loan size (US$)** | 347 | 635 |
| **Household had at least one member with cash in savings (%)** | 53.42 | |
| **Total savings per capita (US$)** | 211 | 556 |

Note: Number of households in the sample equals 234. Statistics reported for where households took loans from, and the loan amount are conditional on a household taking a loan.

## 6.6 WELLBEING

Table 9 presents statistics reflecting other areas of beneficiaries' wellbeing including food security outcomes, children's education, shock exposure, and gender equality. We summarize the household's food security status using two measures – the Household Dietary Diversity Score (HDDS) and Food Insecurity Experience Score (FIES). Following Kennedy et al. (2010), we construct the HDDS from a total of 12 food groups. FIES is the summation of eight yes or no questions capturing the severity of household food insecurity over the past 12 months, where yes equals one and no equals zero. Lower scores of the FIES indicate higher levels of food security.

The HDDS measures the overall diversity of a diet which has been found to be correlated with positive nutritional outcomes (Arimond & Ruel, 2004). Despite low incomes, beneficiary households on average have high dietary diversity. The average 7-day HDDS is 8.25, meaning in the past week beneficiary households consumed the majority of the major food groups required for a healthy diet. However, the FIES indicates that of the eight yes or no questions beneficiary households respond yes to an average of 5.15 questions indicating some level of food insecurity. The two questions of the FIES indicating the most severe level of food insecurity are: during the last twelve months was there a time where 1) you went or a member of your household went without eating for a whole day and 2) you or a member of your household were hungry but did not eat; 52 per cent and 45 per cent of households responded positively to the first and second question, respectively. Together this indicates elevated levels of food insecurity in beneficiary households.

High levels of food insecurity may be a result of a significant amount of shock exposure. During the reference period 96 per cent of beneficiary households reported being exposed to a shock. The most common shocks experienced were associated with climate. Ninety-one percent and 31 per cent of households experienced droughts and irregular rainfall, respectively. In addition to shocks caused by climate, 32 per cent of households also report having been affected by price changes of agricultural inputs and/or outputs.

To gauge overall household well-being, we also measure gender equality using a set of questions to determine how much women are involved in the decision-making process. Evidence of women's empowerment has been found to be correlated with higher levels of household wellbeing (Sell & Minot, 2018). Women in beneficiary households are involved in more than half of household decisions pertaining to household purchases, sending children to school, and agricultural practices which include both crops and livestock.

**Table 9: Food security, education, shock exposure, and gender equality of beneficiary households.**

| | Mean | Std. Dev |
|---|---|---|
| **Food security and nutrition** | | |
| 7 day Household Dietary Diversity Score (1-12 scale) | 8.25 | 2.33 |
| 1 day Household Dietary Diversity Score (1-12 scale) | 5.61 | 2.10 |
| Household Food Insecurity Experience Score | 5.15 | 2.59 |
| **Assets** | | |
| Asset index | 0.39 | 0.24 |
| **Education** | | |
| Percent of school aged children enrolled (%) | 66.68 | |
| **Shock exposure** | | |
| Exposed to shock in past year (%) | 95.73 | |
| Shock type experienced (%) | | |
| Drought | 90.60 | |
| Crop pest/disease | 29.06 | |
| Illness/accident/death of income earner | 6.41 | |
| Irregular rains | 31.20 | |
| Ag. input/output price change | 31.62 | |
| Livestock pest/disease | 14.53 | |
| Theft | 5.13 | |
| Other | 29.49 | |
| **Gender equality** | | |
| Women involved in the decision-making processes of (%) | | |
| Household purchases | 62.82 | |
| Crop or livestock production | 61.11 | |
| Sending children to school | 68.80 | |

Note: Number of households in the sample equals 234. Statistics on the percent of school aged children enrolled in school are conditional on having a school aged child in the household.

## 6.7 EXTERNAL SUPPORT

Table 10 summarizes external support received by beneficiary households. Only 22 per cent of beneficiary households received any training or advice. Most training and advice received is related to farming practices or livestock rearing. When asked, during qualitative interviews, if the support was useful most farmers responded no. When asked further about what Pura could do for farmers it was reported that they are most interested in trainings to fulfil existing knowledge gaps on agricultural practices.[6] Currently, a majority of the advice and trainings are received from NGOs/Charity groups and the government.

**Table 10: External support received by beneficiary households.**

| | Mean |
|---|---|
| **Received any training or advice (%)** | 21.79 |
| **Received any training or advice ON (%)** | |
| Farming | 84.31 |
| Livestock rearing | 41.18 |
| Obtaining credit | 13.73 |
| Marketing and sales | 25.49 |

[6] However, the interviewees gave no further indication of what types of gaps or agricultural practices.

| | Mean |
|---|---|
| Social | 0.00 |
| **Received any training or advice FROM (%)** | |
| NGO/Charity | 31.37 |
| NAADS/Government | 39.22 |
| Farmer's group | 9.80 |
| International organization | 9.80 |
| Individual trader/buyer | 0.00 |
| Private company trader/buyer | 0.00 |

Note: Number of households in the sample equals 234. Statistics reported for percent of households receiving training or advice on and from are constructed conditional on a household receiving support.

# 7. CONCLUDING REMARKS AND NEXT STEPS

This baseline report provides a summary of smallholder farming households who are or will be targeted by Pura as new suppliers of cassava. The descriptive analysis provides evidence that Pura could offer access to an emerging market that has the potential to expand the production of more drought tolerant crops by smallholder farmers. Specifically, the financial strain of poor market access, unfavourable crop prices, and a lack of access to credit is negatively affecting the wellbeing of beneficiary households.

With the Fund's investment, Pura has the potential to stimulate economic growth in rural areas by increasing the access to marketing channels and providing invaluable training and extension services pertaining to the production of cassava.

In the coming years, Pura will continue with the investment by providing the technical assistance and market opportunities to cassava farmers. In five years, the endline data will be collected from the same households included in the baseline. These two rounds of data collection will allow a rigorous estimation of the impact of the investment on smallholder farmers and understand the potential that this type of investment can have on rural development.

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