UGANDA

IMPACT ASSESSMENT OF THE SMALL AND MEDIUM AGRIBUSINESS DEVELOPMENT FUND (SMADF)

BASELINE REPORT **No. 4**

AMFRI FARMS LIMITED (AMFRI)

IFAD
Investing in rural people

YIELD UGANDA
INVESTMENT FUND

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1. INTRODUCTION

This is the fourth 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 of the AMFRI Farms Limited (AMFRI), specializing the production, processing and export of fresh, dry, and frozen organic fruits, vegetables, herbs and spices. This report follows the first two baseline reports conducted in 2019 for Sesaco Ltd and CECOFA (Paolantonio and Higgins, 2019; Paolantonio et al., 2019). The third baseline report refers to Pristine Foods Limited (Anderson and Zucchini, 2023).

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 farmer 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 AGRIBUSINESS 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

Organic certified production has been promoted as a way to increase African smallholder farmer livelihoods. Specifically in Uganda, organic certified production has increased dramatically since 2013, most in part due to an increase in European's demand for certified organic foods (Bendjebbar & Fouilleux, 2022). As demand for these products continue to increase, several opportunities are arising for smallholder farmers to enter the market.

There are several environmental, economic, social, and health benefits to organic farming. Organic farming is overwhelmingly considered an environmentally friendly and highly sustainable method of agricultural production. Environmental benefits include biodiversity conservation, better soil quality, and the reduction of greenhouse gas emissions (Seufert et al., 2017; Reganold & Wachter, 2016). Economically, the profitability of organic production is approximately 22-35 per cent higher than traditional farming. Evidence from 14 case studies on a variety of crops spanning several agro-ecological environments indicates that organic farming is a feasible and financially lucrative option for smallholder farmers, including those from vulnerable groups such as women, minorities, and tribal communities (Giovannucci, 2006).

Farmers receiving higher profit margins for organically produced and certified crops have been found to have higher levels of social capital – measured by higher bargaining power, better access to credit and markets, increased rural employment opportunities, education, and access to health services (Van Elzakker & Eyhorn, 2010). In addition to higher levels of social capital, organic farming has been noted to have positive effects on food security and nutrition outcomes. Meemken & Qaim (2018) review the literature on the relation of organic farming to food security and highlight that organic farming has been found to increase dietary diversity even in the absence of income gains. Additionally, farms engaged in organic farming often have higher levels of production diversity.

While organic farming has several positive benefits, it is a more costly form of agricultural production. Certification fees and the investment to become certified are both costly. Also, in most smallholder farming environments organic certification involves a transition period from traditional agricultural production to organic production which can be viewed as a high sunk cost (Caldwell et al., 2014). For these reasons organic farming is often criticized for its exclusion of the poorest farmers (Bolwig et al., 2009). Despite these disadvantages, the organic food industry is one of the fastest growing sectors of the food market and organic certified products often fetch a higher price premium (Crowder & Reganold, 2015).

More recent work on organic farming has found that smallholder farmer success in certified organic production is dependent on several factors. Loconto & Hatanaka (2017) indicate that organic certified production is catalyzed under certain institutional arrangements such as participatory guarantee systems and community supported agriculture platforms. Organic certification has no advantage to smallholder farmers if they reside in a region with no reliable or accessible organic market. Thus, institutional arrangements and market access infrastructure are consequential (Jouzi et al., 2017). Additionally, because successful organic certified production is dependent on specific and non-traditional agricultural practices, the exchange of knowledge and information to smallholder farmers is also integral to its success.

2.3 AMFRI FARMS LIMITED

AMFRI Farms Limited (AMFRI), based in Kampala, produces, processes, and exports fresh, dry, and frozen certified organic fruits, vegetables, herbs, spices, cereals, seeds, and nuts. Having been certified organic for 25 years with an unblemished record of providing organically certified products, AMFRI is widely recognized as the preeminent practitioner of climate-smart, eco-friendly, and sustainable agriculture in the region.

AMFRI's core market strength lies in its ability to supply product to a niche market independently assessed as meeting the standard of certified organic. Currently, the bulk of its sales are derived from fresh fruits, specifically pineapples, apples, bananas, passion fruits, and vanilla. These products are primarily sourced from smallholder farmers in central and northern Uganda who supply 80 per cent of all produce that is processed and exported primarily to Europe, the United States, and the Middle East. In lieu of the COVID-19 pandemic that has shifted diets to healthier food options, AMFRI anticipates growth in the organic market. However, due to current operational and capacity constraints AMFRI has been unable to meet the current demand of its international customers.

AMFRI has a mixed model of production and supply in which they use both their own farms and an established robust out-grower network. To ease logistical challenges in sourcing several products, supplier out-growers are required to produce more than one product. Additionally, to ensure year-round supply AMFRI diversifies its product sourcing across agroecological zones and is engaged in an almost continuous harvest sourcing season. Moreover, AMFRI operates seven company owned farms that are spread across the country. The promotion and use of the company's own farms as a major supplier ensures that there is sufficient quality planting material for the out-growers and them; the demonstration of agronomic practices to enhance yields before the expansion of a particular product line; a controlled production environment for certified organic products.

AMFRI has standard operating procedures for recruiting new out-growers. Before a farmer becomes an out-grower, AMFRI determines if the land can be certified. The suitability of the land determines the conversion period. The conversion period for virgin land is much shorter than land on which conventional agriculture has been practiced. During the conversion period the soil is routinely tested, and a suite of data on the out-grower is captured including age, number of dependents, land ownership and total acreage. When the out-grower fully conforms to a set of standards, their land is certified, and the farmer is advised to join one of the village farmers' groups. They are also introduced to other annual crops which can be sold locally to diversify the risk of a single market.

AMFRI has a coordinated system in place to interact, communicate, and source from its approximately 700 current (and future) out-growers who are organically certified. Individual out-growers are grouped in different villages headed by a lead/contact farmer that relays information from the company to the farmers regarding training dates, produce collection and presents the farmers' challenges. The company's internal production team trains and inspects the new farmers to ensure compliance with the organic certification standards. Farmers are trained more than once a year to enhance their knowledge of organic agriculture. Additionally, to reduce the risk of an uncertified organic farmer claiming to be certified organic and undercutting the price for authentic organic products a standard operating procedure of random quarterly, bi-annual, or annual based random samples are collected from the farms of out-growers and tested in a credible Belgian laboratory.

With the Fund's investment AMFRI intends to expand its operations to meet both the current and growing demand for organic foods. The fund provides the company's working capital and capital expense to increase crop production capacity, upgrade their production line with more energy efficient machinery, expand processing capacity, and maintain certification along the entire business value chain (PCP, 2022).

3. EXPECTED IMPACT OF THE INVESTMENT ON SMALLHOLDER FARMERS

With the Fund's investment AMFRI intends to scale its operations by constructing a larger processing plant to process greater volumes of dried and frozen varieties. The objective is to reduce their current dependency on vanilla and fresh fruits and vegetables by increasing their business in dried and frozen fruits and the development of natural colourants (e.g., annatto and butterfly pea). The financing of the Fund will be used for new equipment purchases and civil works to construct the new processing facility.

While dried and frozen varieties have lower profit margins, they have longer shelf lives that are favorable to a business model rooted in exporting and sourcing from smallholder farmers. With this expansion AMFRI intends to purchase a higher volume of organically certified fresh produce from smallholder farmers. AMFRI is specifically targeting farmers who cultivate chia, groundnuts, sesame, and pineapples. As they expand, AMFRI plans to more than double the number of smallholder farmers they source from. Currently the company sources from approximately 700 smallholder farmers; they intend to increase this number to 2,000 during the period of investment.

AMFRI anticipates this investment to directly impact smallholder farmers across three categories:

i. Access
ii. Knowledge
iii. Employment benefits

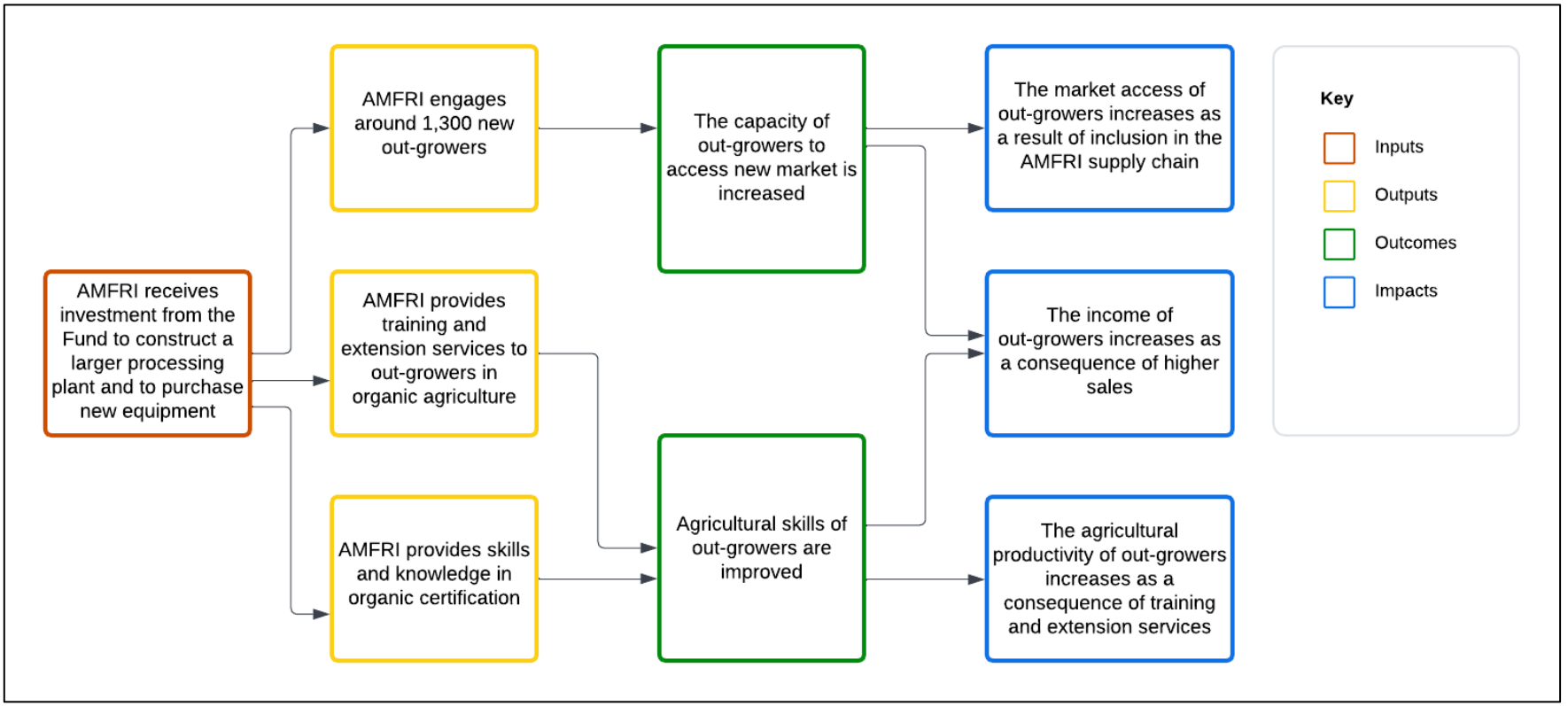
AMFRI has several organic product certifications that will facilitate smallholder farmers' access to markets that offer premium prices for organic produce. Current pricing indicates that AMFRI pays almost two to three times the local farmgate prices for uncertified fresh pineapple, apple, bananas, and passion fruit.

The management of its own farms and supplier networks have already led to large transfers in knowledge, skills, and technology to smallholder farmers living within and around the communities AMFRI interacts with. With the expansion of its out-grower network AMFRI will work directly with more lead farmers to conduct peer-to-peer training on the best practices in organic farming, aggregation, and bulking of produce. The company also provides smallholder farmers with plant materials such as hybrid cultivars.

Finally, company employment benefits include a school fees program which enable all employees to offer their children of school going age quality and affordable education. This school fees program educates children from nursery level to A-level. Additionally, AMFRI has a medical scheme which takes care of the health needs of all the employees. The company pays 100 per cent of employee medical bills, even those that are non-work related.

These impacts are succinctly presented in Figure 1.

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



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 like 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.

AMFRI identified treatment districts for each commodity. AMFRI identified pineapple farmers in the districts of Luwero, Nakaseke, Mbarara and Ntungamo; chia farmers in Arua, Zombo and Lamwo districts; sesame farmers in Arua, Pakwach and Lamwo districts; and groundnuts farmers in Arua, Lamwo and Pakwach. Besides these districts, AMFRI already operates in other districts for its current network, which were excluded from the sample framework.[1]

The company selected these districts because of their agro-ecological potential in the production of the identified crops. AMFRI also identified and listed districts outside of treatment districts that were potentially eligible to be used as control districts.

From the list of AMFRI identified districts, treated and control districts were matched using propensity score matching (PSM). Districts were matched on characteristics specific to the cultivation of pineapple, sesame, chia, and groundnuts. Specifically, matching characteristics included rainfall, temperature, the percentage of households growing crops, the average share of land that primary use was permanent or perennial crops, the percentage of households growing chia, sesame, and/or groundnuts, and the average number of hectares of land owned by households at the district level.

The data used in the PSM originated from two secondary sources. We used GIS data to construct the climate variables, CHIRPS for precipitation, and ECMWF for temperature. For data on agricultural production, we used the nationally representative survey LSMS-ISA 2020. All variables used in the matching procedure were constructed at the district level. Moreover, because the interested crops are cultivated in two different agro-ecological systems, we applied two different matching procedures – one for pineapple and the other for sesame, chia, and groundnuts.

A local consultant was deployed to the selected control districts to list smallholder farmers who farmed the respective crops. From the selected districts, villages that had at least 10 famers cultivating the respective crops were randomly selected from the list supplied by the local consultant. Additionally, villages that had at least 10 famers cultivating the respective in the selected treatment districts were randomly selected from a list of recruited farmers provided by AMFRI. 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.

[1] These districts are Kayunga, Lwengo, Masaka, Mpigi, Mubende and Rakai in Central region; Budaka and Kamuli in Eastern region; and Koboko in Northern region.

Table 1: Baseline sample distribution.

Commodity	Assignment	District	No. of targeted households	No. of achieved households
Chia seeds/ Sesame/ Groundnuts	Treatment	Arua	81	81
		Madi Okollo	74	88
		Kitigum	28	28
		Subtotal treatment	*183*	*197*
	Control	Dokolo	90	90
		Oyam	89	89
		Subtotal control	*179*	*179*
		Subtotal commodity	**362**	**376**
Pineapple	Treatment	Luweero	27	23
		Nakaseke	24	15
		Subtotal treatment	*51*	*38*
	Control	Kazo	54	55
		Subtotal control	*54*	*55*
		Subtotal commodity	**105**	**93**
		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. AMFRI first recruited farmers during the fourth quarter of 2022 and plans to continue expanding its smallholder farmer supplier network. This referenced timeframe allows us to capture the situation of both control and treatment households before AMFRI fully extends its supply network to include the treatment farmers. None of the farmers in the treatment group have received organic certification and thus cannot yet sell their crops to AMFRI.

As noted above, the investment in AMFRI is mainly expected to impact smallholder farmers through the organic certification and sale of chia, groundnuts, sesame, and/or pineapple at higher and consistent prices. The questionnaire, therefore contained detailed questions on the agricultural production of these 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 Chief Executive Officer, Chief Financial Officer, a monitoring and evaluation officer, an extension officer, and a field officer of AMFRI. KIIs were also conducted with a technical advisor and analyst from Pearl Capital Partners who externally provide advisement and funding to AMFRI.

FDGs were conducted with 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 organic certification, expectations of becoming a supplier to AMFRI, village conditions, and challenges to production. KIIs were organized and attended by one qualitative enumerator and lasted 30 to 60 minutes.

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 AMFRI investment.

Indicator	Description	Impact area
Pineapple, chia, groundnut and sesame 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 chia, groundnuts, pineapple, and/or sesame	Cash income received from the sale of crops and the amount received per kg.	Market access, income, effect of certification
Chia, groundnut, pineapple, and sesame sale practices	Type and location of buyer; amount sold under certification (by certification type).	Market access, effect of certification
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.

[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.

Indicator	Description	Impact area
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.

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 and support of 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.

Finding perfect samples that are balanced across all key characteristics within an impact assessment is near impossible. Additionally, finding balance on the percentage of households cultivating the four crops of interest, some which are not commonly grown in Uganda, was difficult and not fully achieved. 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 arcuate treatment and control comparison. 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.

Because the sample design selected districts based on two different agricultural cropping systems, we present the key differences between the control and treatment groups for farmers selected from pineapple producing districts and chia, groundnut, and sesame producing districts separately.

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

	Pineapple			Chia/Groundnuts/Sesame		
	Treatment	Control	SD	Treatment	Control	SD
Household characteristics						
Household size	7.13	5.60	0.54	5.69	6.37	-0.28
Education of household head (years)	8.79	6.76	0.37	6.75	10.06	-0.65
Average education in household (years)	9.63	7.96	0.42	6.86	9.48	-0.76
Female household head (%)	13.16	9.09	0.13	21.32	8.38	0.37
Income						
Gross household income p/capita (US$)	1,367	1,029	0.24	536	856	-0.31
Proportion of gross income from (%)						
Crop production	78.69	62.07	0.59	74.26	81.54	-0.27
Livestock production	8.32	13.94	-0.37	10.15	3.83	0.42

	Pineapple			Chia/Groundnuts/Sesame		
	Treatment	Control	SD	Treatment	Control	SD
Household enterprise	8.23	19.78	-0.45	11.21	10.00	0.05
Formal waged labor	1.94	0.49	0.27	1.03	1.64	-0.09
Informal waged labor	0.13	1.87	-0.30	1.39	0.34	0.16
Other	2.68	1.85	0.17	1.95	2.64	-0.12
Agricultural production						
Total value of crop production (US$)	6,222	2,298	1.03	1,562	3,491	-0.77
Total value of crop production per hectare (US$)	2,242	1,520	0.42	1,162	909	0.21
Land cultivated (ha)	4.29	1.46	0.57	1.80	3.65	-1.04
Number of crops grown	9.61	9.25	0.27	8.28	8.27	0.01
Assets and Livestock						
Asset index	0.58	0.41	0.89	0.20	0.40	-0.92
Livestock ownership in Tropical Livestock Unit	1.76	2.56	-0.27	2.10	1.42	0.25
Loans and savings						
Took at least one loan (%)	57.89	29.09	0.60	41.12	33.52	0.16
Has savings (%)	84.21	38.18	1.06	58.38	67.04	-0.18
Total cash savings per capita (US$)	63	42	0.18	30	36	-0.12
Received training and support on (%)						
Agriculture	47.37	9.09	0.93	32.49	24.58	0.18
Other	21.05	1.82	0.63	12.69	24.02	-0.30
Percent of households that cultivated:						
At least one crop of chia, groundnuts, and sesame				83.76	59.22	0.56
Chia				4.57	6.70	-0.09
Groundnuts				57.36	30.73	0.56
Sesame				50.25	45.81	0.09
Pineapple	50.00	69.09	-0.39			

Note: Number of households in pineapple sample treatment and control equals 38 and 55, respectively. Number of households in the chia/groundnuts/sesame sample treatment and control equals 197 and 179, respectively.

5.1 COMPARISON OF TREATMENT AND CONTROL HOUSEHOLDS IN THE PINEAPPLE SAMPLE

Treatment households in the pineapple sample reside in Luweero or Nakaseke. All farmers in this group have indicated to AMFRI that they currently cultivate pineapple or will grow pineapple in the future. Control households in this sample reside in Kazo. Control households indicated that they currently grow pineapple.[3] Households in the control and treatment groups are balanced on the following four of the twenty-six key characteristics in Table 3: the percent of female headed households, gross household income per capita, the percentage of income received from other sources, and the total cash savings per capita.

Households in the control group for pineapple are smaller and less educated. They have on average 5.60 people in the household in comparison to 7.13 people in the treatment group. The education level of the household head is lower than the head of the treatment group, the head of household has approximately 7 years of schooling in comparison to 9 years in the treatment group. The average number of years of education experienced by all household members is also lower in

[3] As indicated in Table 3, not all farmers in the control group grew pineapple during July 2021 – June 2022.

control households – household members in the control group collectively average 8 years of education in comparison to 10 years in treatment households.

Although both groups overwhelmingly earn a majority of their income from crop production, the total composition of income is unbalanced between groups. Households in the treatment group earn more of their income from crop production than households in the control group. Households in the control group receive a larger proportion of their income from livestock production. This may correlate with their higher rate of livestock ownership. On average households in the control group own 2.56 total livestock units in comparison to households in the treatment group that own approximately 1.76 total livestock units.

Agricultural practices across both groups are unbalanced. Households in the treatment group grow on average slightly higher number of crops, cultivate more land, and have a higher value of total crop production than those in the control group. The total value of crop production is measured by the overall monetary value of all crops during July 2021 – June 2022. The monetary value of each crop is calculated using the median reported selling price of the crop. However, households in the control group have on average a higher total value of crop production per hectare. These imbalances could be caused by the selection criteria of AMFRI, which requires out-growers to produce and supply more than one crop. The percentage of farmers who harvested pineapple during July 2021 – June 2022 is also higher in the control group than the treatment group – 70 per cent of farmers harvested pineapple in the control group in comparison to 50 per cent in the treatment.

There are significant differences in their asset ownership levels. To measure household asset ownership, we construct an asset index using principal component analysis (PCA)[4] 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 and control groups are 0.58 and 0.41, respectively. This indicates that treatment households, on average, have more assets than control households.

Households in the treatment group have a larger percentage of households who have savings, and their total savings per capita is significantly higher than the households in the control group – households in the treatment group on average had US$63 in savings per capita in comparison to households in the control group that had US$42. Households in the treatment group also have on average relatively more assets than households in the control group.

5.2 COMPARISON OF TREATMENT AND CONTROL HOUSEHOLDS IN THE CHIA/GROUDNUT/SESAME SAMPLE

Treatment households in the chia, groundnut, and sesame sample reside in Arua, Madi Okollo, and Kitigum. All farmers in this group have indicated to AMFRI that they currently cultivate chia, sesame,

[4] 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.

or groundnuts or will grow one or more of these crops in the future. Control households in this sample reside in Dokolo or Oyam. Control households indicated that they currently grew chia, sesame, or groundnuts at the time the survey was administered. Households in the chia/groundnuts/sesame sample are balanced on more key characteristics than households in the pineapple sample.

Households in this sample are balanced on the following fourteen of twenty-six key characteristics summarized in Table 3: proportion of income coming from crop production, household enterprises, formal and informal wage labor, the value of crop production per hectare, the number of crops grown, the number of livestock units owned, percentage of households who took at least one loan, percentage of households who have savings, the total amount of savings per capita, support received on agriculture, and the percentage of households farming chia and sesame.

The household composition is quite unbalanced between treatment and control households in this sample. Households in the control group are on average larger, have collectively more education, and the household head has on average more education than households in the treatment group. Households in the treatment group are more likely to be female headed than those in the control group.

The composition of income sources is mostly balanced across control and treatment households. However, households in the control group attribute a larger proportion of their income to crop production than households in the control group. Approximately 82 per cent of control households' income comes from crop sales in comparison to 74 per cent in the treatment group. The second largest source of income for both households comes from household enterprises. The third largest source of income is from livestock production for both groups. However, households in the treatment group earn a larger percentage of their income from this income stream – 3.83 per cent of income comes from household enterprises in the control group in comparison to 10.15 per cent in the treatment group.

Although households are balanced on the number of crops they cultivate and the total value of crop production per hectare. However, households in the control group have a higher value of total crop production than households in the treatment group. The average number of households in both groups that grew chia and sesame is balanced. However, more households in the treatment group grew groundnuts than households in the control group – 57.36 per cent of households cultivated groundnuts in the treatment group and 30.73 per cent cultivated them in the control group.

6. KEY CHARACTERTICS OF TREATMENT HOUSEHOLDS

6.1 PINEAPPLE AND CHIA, GROUNDNUTS, SESAME PRODUCTION AND SALES

Table 4 presents the mean values for key production and sales indicators of pineapple (Table 4a) and chia, groundnuts, sesame (Table 4b) for the beneficiary households. Not all beneficiaries grew pineapple, chia, groundnuts, or sesame, during the reference period July 2021 – June 2022.

Pineapple is only grown in one district where beneficiary households are located. On average farmers within the sample grew 13,665 kgs of pineapple. However, we note that the standard deviation of this amount is high; beneficiary pineapple farmers harvested 100 to 140,000 kgs of pineapple during the reference period. Additionally, several farmers reported having grown, but not harvested, pineapple.

Production of chia from July 2021 – 2022 is low. During qualitative interviews farmers within the treatment areas reported that AMFRI has motivated them to change their crop mix. Specifically, within the chia, groundnuts, sesame sample, the promise of purchase prices and training in organic farming has motivated many farmers within the area to invest in the production of chia. However, much of this investment had not been made during the reference period.

Groundnuts are a common commodity harvested throughout Uganda. On average beneficiary farmers produced 297 kgs of groundnuts and dedicated approximately 0.45 hectares of land to the cultivation of groundnuts from July 2021 – June 2022. Farmers reported in the qualitative interviews that a market for groundnuts currently exists, but they are excited by the prospect of AMFRI's promise to buy all of their groundnuts at a set price that is higher than what they were able to get in the market during this time period. AMFRI has agreed to purchase groundnuts between September and October and sesame in December. Given that most farmers have recently joined AMFRI, we expect to see higher sales and production of these commodities during the upcoming season.

Sesame referred to as simsim in Uganda is also a common grown crop. Fifty per cent of beneficiary households cultivated sesame during the reference period. Almost all households that produce sesame sell it – 45 per cent of households sold sesame, indicating there is currently a market for sesame sales.

Table 4a: Pineapple production and sales of beneficiary households.

	Pineapple	
	Mean	**Std. Dev.**
Production		
Percent of household that cultivated crop (%)	50.00	
Production (kg)	13,665	21,857
Land cultivated (ha)	2.40	2.86
Percent of households that harvested crop (%)	28.95	
Yield (kg/ha)	11,159	11,192
Gross value of production (US$)	15,339	15,944
Sales		
Percent of households that sold crop (%)	18.42	

	Pineapple	
Value of harvest sold (US$)	15,240	16,770
Percent of harvest sold (%)	63.64	50.45
Prices per kg (US$)	0.65	

Note: Number of households in pineapple sample equals 38.

Table 4b: Chia, groundnuts, sesame production and sales of beneficiary households.

	Chia/Groundnuts/Sesame					
	Chia		Groundnuts		Sesame	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Production						
Percent of household that cultivated crop (%)	4.57		57.36		50.25	
Production (kg)	45	32	297	311	260	264
Land cultivated (ha)	0.31	0.33	0.45	0.34	0.21	0.36
Percent of households that harvested crop (%)	4.57		52.79		49.24	
Yield (kg/ha)	567	813	955	932	175	352
Gross value of production (US$)	162	116	582	561	670	668
Sales						
Percent of households that sold crop (%)	0.00		41.62		45.18	
Value of harvest sold (US$)	0.00	0.00	433	432	485	530
Percent of harvest sold (%)	0.00	0.00	78.85	41.04	91.75	27.65
Prices per kg (US$)	3.61		1.81		2.53	

Note: Number of households in the chia/groundnuts/sesame sample 197. The median price for chia is reported from non-beneficiary households.

6.2 OVERALL AGRICULTURAL ACTIVITIES

Table 5 presents details of beneficiaries' agricultural production; it covers all perennial and seasonal crop production spanning the time period July 2021 – June 2022.

Beneficiaries in the pineapple sample have a higher value of crop production than households within the chia/groundnuts/sesame sample. They also grow more crops and cultivate more land. Most of the expenditure on crop production in both samples is spent on labor. Households in the pineapple and chia/groundnuts/sesame sample spent on average US$303 and US$117, respectively, on labor. The expenditure of other inputs in both samples is relatively low. Specifically, the expenditure of fertilizers and pesticides in the chia/groundnuts/sesame sample is dismally low. This reflects the common sentiments reiterated in the qualitative data. Many of the chia/groundnuts/sesame farmers indicated that they often forgo the use of fertilizers due to prohibitive costs. Despite the high costs of inputs, total expenditure on inputs is on average US$680 and US$128 for the pineapple and chia/groundnuts/sesame sample, respectively.

Both the qualitative and quantitative data demonstrates that the primary income generating activity in both samples is crop production. All beneficiary households are involved in crop production. Beneficiary households in both samples sell majority of their total harvest. The remainder of the harvest is primarily devoted to home consumption.

Table 5 also reports the median prices of the most commonly sold crops across both samples, which include soyabeans, maize, groundnuts, beans, and finger millet.

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

	Pineapple		Chia/Groundnuts/ Sesame	
	Mean	Std. Dev	Mean	Std. Dev
Production				
Value of crop production (US$)	6,222	4,515	1,562	2,006
Value of crop production per hectare (US$)	2,242	1,977	1,162	1,663
Land cultivated (ha)	4.29	6.89	1.80	1.55
Number of crops grown	9.61	1.35	8.28	1.23
Expenditure on inputs (US$)				
Total	680	1,181	128	240
Labor	303	437	117	239
Seeds	63	138	9	37
Fertilizer	119	446	0.04	0.52
Pesticide/Insecticide/Herbicide	67	260	0.19	2.60
Machinery	7	26	0.97	13.51
Gross margin (value of production - expenditure on inputs)	5,541	4,077	1,434	1,983
Proportion of harvest (%):				
Used for home consumption	28.11	27.64	36.27	23.69
Sold	60.88	33.14	52.62	27.26
Lost due to disease, pest, floods, etc.	4.93	17.68	1.78	9.38
Used for seed or feed or other uses	6.07	13.64	9.33	13.89
Prices received per kg of (US$):				
Soyabeans	1.59		1.59	
Maize	0.79		0.79	
Groundnuts	1.81		1.81	
Beans	1.67		1.67	
Finger millet	0.79		0.79	

Note: Number of households in pineapple sample equals 38. Number of households in the chia/groundnuts/sesame sample 197.

6.3 LIVESTOCK

Table 6 presents key livestock statistics for beneficiary households from the household questionnaires. Beneficiary households in the pineapple sample are more involved in livestock production for income purposes than those in the chia/groundnuts/sesame sample – 71.05 per cent of households in the pineapple sample are involved in livestock production for income purposes in comparison to 57.87 per cent of households in the chia/groundnuts/sesame sample.

The primary livestock owned by households in both samples are chickens, followed by goats. Households in the pineapple sample own on average almost double the number of chickens as households in the chia/groundnuts/sesame sample. As households in the pineapple sample own more livestock on average, their gross income of livestock production is also higher. Households in the pineapple sample earn a gross of US$461 on average from livestock production, in comparison to the chia/groundnuts/sesame sample that earns on average US$171. In both samples, the majority of the income generated from the sale of livestock production is from the sale of whole livestock either alive or slaughtered.

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

	Pineapple		Chia/ Groundnuts/ Sesame	
	Mean	Std. Dev	Mean	Std. Dev
Number of animals owned				
Chicken	11.53	11.80	7.06	7.57
Goats	3.50	4.17	4.80	5.37

	Pineapple		Chia/ Groundnuts/ Sesame	
	Mean	Std. Dev	Mean	Std. Dev
Calves	0.24	0.63	0.48	1.28
Pigs	1.92	3.04	0.53	1.29
Bulls	0.24	0.54	0.45	1.04
Oxen	0.00	0.00	0.14	0.59
Gross income of livestock production (US$)	461	607	171	373
Expenditure on inputs for livestock production (US$)	282	379	125	257
Revenues from sale of (US$)				
Whole livestock (alive or slaughtered)	252	390	104	244
Milk	19	40	0.55	7.72
Eggs	0.00	0.00	0.00	0.00

Note: Number of households in pineapple sample equals 38. Number of households in the chia/groundnuts/sesame sample 197.

6.4 INCOME AND LIVELIHOOD COMPOSITION

Table 7 presents statistics on income and livelihood composition for beneficiary households. The average total income per capita is US$1,367 and US$536 for households in the pineapple and chia/sesame/groundnut sample, 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 in the chia/sesame/groundnut sample earn approximately half of the World Bank threshold on average.

The differences in the average income per capita across groups reflect the crop specific economic impact of organic farming. Pineapple is often regarded as a higher valued organic commodity, and pineapple farmers often have higher per capita incomes (Pali et al., 2011). Additionally, differences in per capita income may reflect the significant regional income inequality present in Uganda. Sustained conflict in the Northern regions of Uganda, where the chia/sesame/groundnut sample is located, have resulted in higher levels of regional poverty and a slower rise in household incomes (World Bank, 2016).

Crop production is the primary income generating activity – more than 70 per cent of income is generated from crop production in both samples. Crop income is highly dependent on exogenous factors such as weather and prices. During qualitative interviews extension officers, in beneficiary areas, reported the main challenge experienced by farmers in the area is unpredictable weather. Beneficiary farmers reiterated this challenge and expressed that they feel exploited by various organizations that promise support and extension services, but often disappear quickly. AMFRI's over 20 years of business experience can offer stability and long-term opportunities for beneficiary households to have access to both extension services and stable organic produce markets.

Table 7: Total household income and income composition by beneficiary households.

	Pineapple		Chia/ Groundnuts/Sesame	
	Mean	Std. Dev	Mean	Std. Dev
Gross household income (US$)				
Total	7,684	5,160	2,185	2,433
Per capita	1,367	1,453	536	1,044

[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.

	Pineapple		Chia/ Groundnuts/Sesame	
	Mean	Std. Dev	Mean	Std. Dev
Proportion of income from (%)				
Crop production	78.69	20.92	74.26	31.03
Livestock production	8.32	12.44	10.15	20.23
Household enterprise	8.23	16.82	11.21	23.78
Formal wage labor	1.94	6.64	1.03	5.31
Informal wage labor	0.13	0.63	1.39	9.25
Other	2.68	3.78	1.95	5.87

Note: Number of households in pineapple sample equals 38. Number of households in the chia/groundnuts/sesame sample 197.

6.5 LOANS AND SAVINGS

Table 8 presents details of the loan access and savings of the beneficiary households. 58 per cent and 41 per cent of beneficiary households in the pineapple and chia/sesame/groundnut sample, respectively, accessed at least one loan during July 2021 - June 2022. The average loan size was more than double in the pineapple sample. The average loan size in the pineapple sample is US$259 in comparison to US$102 in the chia/groundnuts/sesame sample. Majority of the loans in both periods were provided from a savings group. However, the pineapple sample has a much larger percentage of their loans coming from banks.

Beneficiaries in the pineapple sample were also more likely to have at least one member within the household that had cash savings and the total savings per capita is on average double the amount of total savings per capita in the chia/groundnuts/sesame sample.

Table 8: Loans and savings of beneficiary households.

	Pineapple		Chia/ Groundnuts/ Sesame	
	Mean	Std. Dev	Mean	Std. Dev
Household took at least one loan (%)	57.89		41.12	
Source of loan (% of sample who took a loan)				
Savings group	50.00		92.59	
Bank	22.73		6.17	
Microfinance institution	4.55		1.23	
Farmer's group/cooperative	0.00		1.23	
Trader/Buyer	18.18		0.00	
Friend/Family	9.09		0.00	
Loan size (US$)	259	291	102	179
Household had at least one member with cash in savings (%)	84.21		58.38	
Total savings per capita (US$)	63	94	30	44

Note: Number of households in pineapple sample equals 38. Number of households in the chia/groundnuts/sesame sample 197.

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 household level food insecurity severity over the past 12 months where yes equals one and no equals zero; lower scores indicate higher levels of food security. Despite low incomes,

beneficiary households in the pineapple sample on average have low food insecurity. The average 7-day HDDS is 9, meaning in the past week they consumed the majority of the major food groups required for a healthy diet. Additionally, of the eight questions indicating food insecurity, beneficiaries within the pineapple sample only responded yes to an average of two questions.

Beneficiaries in the chia/groundnut/sesame sample are on average less food secure than beneficiaries in the pineapple sample. Specifically, they respond yes to more than double the number of questions in the FIES. They also have less dietary diversity in a day and over a seven-day span. The food insecurity status of chia/groundnut/sesame beneficiaries reflects information summarized in previous tables – beneficiaries in this sample make less income per capita, have less total value in crop production, and have on average lower savings.

The majority of beneficiaries in both samples have been exposed to a shock. The most common shock experienced across all beneficiaries is drought and irregular rainfall. A much higher proportion of pineapple farmers report having been affected by crop pests and diseases and variable prices in both agricultural inputs and outputs. These higher proportions may attribute to the much higher incidence of pineapple beneficiaries experiencing a shock than chia/groundnut/sesame beneficiaries – 87 per cent of beneficiaries in the pineapple sample report having experienced at least one shock in the past year, while only 52 per cent of beneficiaries in the chia/groundnut/sesame sample report experiencing a shock.

Gender equality, as measured by women being involved in the decision-making processes for household purchases, sending children to school, and decisions on agricultural activities is higher in beneficiary households within the chia/groundnuts/sesame sample. On average women are involved in all of these decisions in approximately 75 per cent of beneficiary households within the chia/groundnuts/sesame sample. In comparison women are involved in the decision-making processes for household purchases, sending children to school, and decisions on agricultural activities in beneficiary households within the pineapple sample 58, 68, and 55 per cent, respectively.

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

	Pineapple		Chia/Groundnuts /Sesame	
	Mean	Std. Dev	Mean	Std. Dev
Food security and nutrition				
7 day Household Dietary Diversity Score (1-12 scale)	8.84	1.90	7.90	1.82
1 day Household Dietary Diversity Score (1-12 scale)	6.39	2.40	5.76	1.77
Household Food Insecurity Experience Score	1.92	2.16	5.38	2.97
Assets				
Asset index	0.58	0.21	0.20	0.19
Education				
Percent of school aged children enrolled (%)	78.12		65.25	
Shock exposure				
Exposed to shock in past year (%)	86.84		52.28	
Shock type experienced (%)				
Drought	60.61		53.40	
Crop pest	21.21		4.85	
Illness/accident/death of income earner	3.03		25.24	
Irregular rains	51.52		51.46	
Ag. input/output price change	51.52		11.65	
Livestock pest/disease	24.24		6.80	
Theft	21.21		11.65	

	Pineapple		Chia/Groundnuts /Sesame	
	Mean	Std. Dev	Mean	Std. Dev
Other	0.00		15.53	
Gender Equality				
Women involved in decision making for (%)				
Household purchases	57.89		75.63	
Crop or livestock production	55.26		75.13	
Sending children to school	68.42		74.11	

Note: Number of households in pineapple sample equals 38. Number of households in the chia/groundnuts/sesame sample 197. Statistics for percent of school aged children enrolled in school is constructed conditional on the having school-aged children within the household.

6.7 EXTERNAL SUPPORT

Table 10 presents statistics on the different types of support received by beneficiary households during the reference period. The majority of households did not receive any form of training or advice. If advice was given it was mostly related to farming, specifically advice on soil management, new seed varieties, and crop management was commonly given. When advice was given, it was given primarily from farmer's groups. The lack of information and support being given to beneficiary households in this area highlights the demand for information that AMFRI is situated to provide.

Table 10: External support received by beneficiary households.

	Pineapple	Chia/ Groundnuts/Sesame
	Mean	**Mean**
Received any training or advice (%)	55.26	32.99
Received any training or advice ON (%)		
New seed variety	23.81	80.00
Soil management	61.90	73.85
Crop management	42.86	69.23
Harvest techniques	33.33	52.31
Post harvest techniques	28.57	41.54
Livestock	19.05	24.62
Sales and marketing	23.81	29.23
Access to credit	9.52	6.15
Other	0.00	1.54
Received any training or advice FROM (%)		
Cooperative	4.76	1.54
Farmers' group	42.86	47.69
National Agricultural Advisory Services	0.00	13.85
NGO/Charity	38.10	10.77
International organization	0.00	6.15
Private company trader/buyer	4.76	0.00
Other	14.29	30.77

Note: Number of households in pineapple sample equals 38. Number of households in the chia/groundnuts/sesame sample 197. Statistics for percent of households receiving support on and from are constructed conditional on a household receiving support.

7. CONCLUDING REMARKS AND NEXT STEPS

This baseline report provides a profile of smallholder farming households who are or will be targeted by AMFRI as new suppliers of chia, groundnuts, and sesame, or pineapple. The descriptive analysis provides evidence that AMFRI could offer access to a unique market that has the potential to expand the production of high value crops by smallholder farmers. Currently, the market in Uganda for chia is limited and while a market for groundnuts and pineapples exist prices for these commodities are variable. Based on the key operating capabilities of AMFRI, the Fund's investment has the potential to stimulate growth in Uganda's rural areas through increasing the operating capacity of AMFRI.

Being part of the AMFRI supplier network could provide smallholder framers with extension services, agricultural advice and improved agricultural practices. As this study found, smallholder farmers have limited access to extension services and inputs, and there is substantial room for improvement in production and productivity levels. These aspects also have the potential to positively influence the overall wellbeing of the targeted households.

In the coming years, AMFRI will continue with the investment by providing the technical assistance and market opportunities to chia, sesame, groundnut, and pineapple 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.

REFERENCES

Anderson, P. and Zucchini, E. 2023. Impact assessment baseline report: Small and Medium Agribusiness Development Fund (SMADF) – Pristine Food Limited, Uganda. IFAD, Rome, Italy.

Austin, P. C. 2009. Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. Statistics in Medicine, 28(25), 3083–3107.

Bendjebbar, P. and Fouilleux, E. 2022. Exploring national trajectories of organic agriculture in Africa. Comparing Benin and Uganda. Journal of Rural Studies, 89, 110–121.

Caldwell, B., Mohler, C. L., Ketterings, Q. M. and Di Tommaso, A. 2014. Yields and Profitability during and after Transition in Organic Grain Cropping Systems. Agronomy Journal, 106(3), 871–880.

Carletto, G. Covarrubias, K. Davis, B., Krausova, M. and Winters, P. 2007. Rural Income Generating Activities Study: Methodological note on the construction of income aggregates. Rome, Italy: FAO.

Crowder, D. W. and Reganold, J. P. 2015. Financial competitiveness of organic agriculture on a global scale. Proceedings of the National Academy of Sciences, 112(24), 7611–7616.

Giovannucci, D. 2006. Salient Trends in Organic Standards: Opportunities and Challenges for Developing Countries. In: "Standards and Trade: Challenges and Opportunities for Developing Country Agro-Food Trade", pp 33.

Jouzi, Z., Azadi, H., Taheri, F., Zarafshani, K., Gebrehiwot, K., Van Passel, S. and Lebailly, P. 2017. Organic Farming and Small-Scale Farmers: Main Opportunities and Challenges. Ecological Economics, 132, 144–154.

Kennedy, P. G., Ballard, T. and Dop, M. 2010. Guidelines for measuring household and individual dietary diversity. Food and Agriculture Organization of the United Nations.

Loconto, A. and Hatanaka, M. 2017. Participatory Guarantee Systems: Alternative Ways of Defining, Measuring, and Assessing "Sustainability". Sociologia Ruralis, 58(2), 412–432.

Meemken, E.-M. and Qaim, M. 2018. Organic Agriculture, Food Security, and the Environment. Annual Review of Resource Economics, 10(1), 39–63.

Pali, P. N., Kaaria, S. K., Delve, R. J., & Freyer, B. (2011). Can markets deliver the dual objectives of income generation and sustainability of natural resources in Uganda?. African Journal of Agricultural Research, 6(11), 2594-2608.

Paolantonio, A., Higgins, D. and Arslan, A. 2017. Impact Assessment Plan: Small and Medium Agribusiness Development Fund (SMADF), Uganda. IFAD, Rome, Italy.

Paolantonio, A. and Higgins, D., 2019. Impact assessment baseline report: Small and Medium Agribusiness Development Fund (SMADF) – Sesaco Ltd., Uganda. IFAD, Rome, Italy.

Paolantonio, A., Higgins, D. and Hossain, M. 2019. Impact assessment baseline report: Small and Medium Agribusiness Development Fund (SMADF), Uganda – CECOFA. IFAD, Rome, Italy.

PCP 2022. Yield Uganda Investment Fund – Annual Report 2022. PCP, Kampala, Uganda.

Reganold, J. P. and Wachter, J. M. 2016. Organic agriculture in the twenty-first century. Nature Plants, 2(2), 1-8.

Seufert, V., Ramankutty, N. and Mayerhofer, T. 2017. What is this thing called organic? – How organic farming is codified in regulations. Food Policy, 68, 10–20.

World Bank. 2016. FY16-21 Country partnership framework for the Republic of Uganda. Report No. 101173-UG. Washington, D.C. USA: World Bank.

International Fund for Agricultural Development
Via Paolo di Dono, 44 - 00142 Rome, Italy
Tel: +39 06 54591 - Fax: +39 06 5043463
Email: ifad@ifad.org
www.ifad.org
facebook.com/ifad
instagram.com/ifadnews
linkedin.com/company/ifad
twitter.com/ifad
youtube.com/user/ifadTV

Delegation of the European Union to Uganda

Crested Towers Building, 15th Floor, Plot 17-23,
Hannington Road, P.O.BOX 5244, Kampala
Uganda
Tel: +256 312-701 000
Email: delegation-uganda@eeas.europa.eu
Website: eeas.europa.eu/delegations/uganda_en

Pearl Capital Partners

Plot M697 Equata Building, 2nd floor, UMA
Showground, Lugogo Kampala, Uganda
Tel: +256 393 264983/4
Email: info@pearlcapital.net
Website: pearlcapital.net/