Farmer Field School & eVoucher Impact Evaluations

Baseline Report

Evaluation team

DIME Mozambique Evaluation Team

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Executive summary

This report presents findings from the Mozambique PROMOVE-Agribiz baseline survey, which was led by the World Bank Development Impact Evaluation team (DIME). The baseline is carried out in the context of the impact evaluation of the FAO implemented Farmer Field Schools (FFS) and eVoucher interventions. The report first describes the evaluation context and the methodology (Sections 1 and 2). It then describes the baseline field work and different data sources and tools that were used (Section 3) and sample general characteristics by treatment group (Section 4). The remainder of the report provides a detailed description of rural households in communities targeted by Farmer Field Schools and eVouchers (Sections 5 - 8).

Generating evidence for policy dialogue in the rural development sector

Despite strong and sustained economic growth over the last two decades, poverty in Mozambique has remained high, particularly in rural areas (Baez and Elabed, 2020). With over 80% of the population deriving its livelihood primarily from agricultural activities, the rural development and structural transformation agenda is central to poverty alleviation in Mozambique (Suit and Choudhary, 2015).

In this context the European Union Delegation to Mozambique launched the PROMOVE Agribiz program, which aims to improve food security and the resilience of smallholder producers as well as boost rural competitiveness. The program is implemented across 10 districts in the rural areas of Nampula and Zambezia provinces.

As part of the Promove-Agribiz program, DIME implements a component that aims to promote evidence based-policy making in the rural sector of Mozambique by increasing availability of rigorous evidence as well as building national capacities for producing and leveraging evidence in policy design.

eVoucher and Farmer Field School Impact Evaluation

As part of the PROMOVE Agribiz program, FAO will roll-out its FFS and eVoucher interventions to increase access to extension services with the aim of increasing local awareness of sustainable land management practices and boost access and adoption of modern agricultural inputs.

To shed light on different constraints to adoption, FAO and DIME coordinated the FFS and eVoucher intervention roll-out in such a way that it allows for the identification of the impact of the individual interventions as well as their complementaries, providing for a richer understanding of constraints to adoption more broadly. Intervention impacts are identified by comparing communities and households that are randomized into one of four groups: i) Receiving an FFS, ii) receiving eVouchers, iii) receiving both, and iv) receiving neither – the control group. The complete experimental sample includes 388 communities and 4630 households.

Baseline survey

The baseline data collection took place from July to December 2021 and covered the 12 month period prior to the start of the data collection – the secondary season of the 2019/20 agricultural campaign (June 2019 to September 2020) and the main season of the 2020/21 campaign (Oct 2020 to May 2021). The sample includes both representative farmers of the project communities as well as likely participants. Over the course of the evaluation this enables analysis of the general agricultural practices of the community, targeting of the interventions, impacts on participants and spillovers from participants to non-participants.

Key insights

- **General agricultural practices**
  - Agriculture is heavily dominated by subsistence farming and cultivation of low-value staple crops. Moreover, cultivation relies heavily on rains and about half of the households do not utilize their available area fully. This suggest a lot of scope for shifting farmers in these communities to

higher value, more intensive agriculture.

  - Rainy season yields for the most common crops are: Maize – 1.1 ton/ha; Rice – 0.9 ton/ha; Cowpea – 0.9 ton/ha.

- **Access and adoption of modern farm inputs**

  - Overall adoption of modern inputs is very low, with only 9% of the households using improved seeds, and 5% of the households using chemical fertilizer.
  - Access to these inputs remains a significant challenge in these communities with a majority of households reporting that they would need to travel outside their communities to an administrative post to purchase inputs like improved seeds fertilizers.
  - Previous experience with fertilizer is correlated with higher willingness to pay for the FAO input packages. This might point towards the value of allowing farmers to experiment with modern inputs to spur sustained adoption. However, experimental evidence is needed to make such causal claims, which the impact evaluations described here will provide.

- **Access to extension and awareness of promoted practices**

  - Awareness and adoption of the sustainable land management practices promoted by FAO supported FFS is relatively low in communities that have not yet had the opportunity to benefit from FFS. Only about half of farmers know at least one of the practices at baseline. By far the most commonly adopted practice is row planting and spacing, with roughly 25% of farmers adopting it on their own farm. Basic awareness and adoption of other practices is much less widespread.
  - Extension agents score much better than the average farmer on detailed knowledge tests. Comparing distributions of test scores, we find that the bottom 10% EA's are only outperformed by the top 2% farmers, indicating a lot of scope for knowledge transfers from EAs to farmers.

The experience of rural households targeted by FFS and eVouchers in communities that have not yet experienced these interventions provides a clear rational for

these interventions. Despite the dominance of agricultural activities in these communities, yields and production are low. Access to improved inputs and knowledge of best practices are both limited, indicating that improvements on both dimensions could significantly improve productivity in these areas. As the impact evaluation moves into the phase of collecting midline and endline surveys, comparisons of communities participating in FFS, using eVouchers, or both with a randomly assigned set of non-intervention control communities will enable rigorous measurement of the causal impacts of these programs on agricultural practices and productivity.

1 Introduction

1.1 The Mozambique context

Despite strong and sustained economic growth over the last two decades, poverty in Mozambique has remained high, particularly in rural areas (Baez and Elabed, 2020). National economic growth was primarily in capital-intensive and import-dependent sectors, while rural poverty remained entrenched, particularly in the agricultural zones of the Northern and Central provinces (Baez et al., 2018).

Boosting the agriculture sector is a key development priority for the Government of Mozambique (GoM) and development partners. Rural areas account for a disproportionately high share of national poverty, comprising 80% of the labor force, but only 25% of GDP. With over 80% of the population deriving its livelihood primarily from agricultural activities, the rural development and structural transformation agenda is central to poverty alleviation in Mozambique (Suit and Choudhary, 2015).

Agricultural intensification and growth are especially important in rural areas of Nampula and Zambezia provinces. Nampula and Zambezia are the most populous provinces in the country, home to 10.9 million Mozambicans – 40% of the total population (INE, 2017). They also have 2 of the 3 highest provincial poverty rates, estimated at 62% and 65% respectively in the most recent National Poverty Assessment of 2015 (Baez et al., 2018).

Technology innovation is one of the key drivers of economic and rural development. Despite the existence of profitable agricultural technologies, such as improved seeds and fertilizers, adoption has remained stubbornly low in sub-Saharan Africa. In the Mozambican context, low agricultural productivity can largely be attributed to limited adoption and use of technologies, and to the continued prevalence of subsistence agriculture (Baez et al., 2018): only 13% of Mozambican farmers commercialize part of their production or grow cash crops, and adoption rates of improved seeds, fertilizers and irrigation are below 5% (Baez and Elabed, 2020).

1.2 Addressing financial and information barriers to adoption

Promove-Agribiz

In this context, the European Union Delegation to MOzambique (EUD) launched the PROMOVE Agribiz program, which is co-financed by the Federal Ministry for Cooperation and Development (BMZ) in Germany and the Food and Agriculture Organization of the United Nations (FAO). The program aims to improve food security and the resilience of smallholder producers as well as boost rural competitiveness. The program is implemented in 10 districts across the provinces of Nampula and Zambezia. While the program includes multiple interventions and policy actions across the sector, the focus of this report is the Farmer Field School (FFS) and eVoucher programs implemented by FAO.

Farmer Field School (FFS) Extension Support Program

To address potential information failures, policymakers have invested in extension service to encourage the diffusion of innovative farming practices and modern inputs in rural communities. However, the impact on knowledge transfer and technology adoption by farmers has been mixed. In Mozambique, despite investments aimed at expanding the reach of the extension system, access to information and agricultural extension remains limited; only 6% of farmers reported receiving extension services in 2015, nor is there evidence that these services have clearly resulted in improved agricultural outcomes (Baez and Elabed, 2020).

To increase access to extension and promote adoption of sustainable land management practices, FAO will implement a large number of FFS. The FFS methodology has been promoted as an improvement over the traditional top-down public extension system which provides generalized recommendations. Traditional extension models focus on the dissemination of information and technology packages from the lab to the farm. In a FFS, farmers are expected to learn together through group discussions and hands-on activities, which focus on identifying local agricultural challenges and proposing feasible solutions based on their individual context. A FFS combines this participatory “classroom learning” with field-based experimentation in “learning plots” to test and observe the productivity gains from a new agricultural input or practices in comparison with conventional practices.

eVoucher Input Subsidy Program

In 2015, only 6% of smallholder farmers in Mozambique utilized chemical fertilizers and, the few who did, applied them in amounts well below recommended standards (Baez and Elabed, 2020). Similarly, just 1% of smallholder farmers used improved seed varieties (ibid.).

To boost access and adoption to modern agricultural inputs, the FAO will roll-out an extensive eVoucher program. Agricultural input subsidy programs (ISPs) have been widely used as a policy instrument to boost the adoption of high-yielding seeds and inorganic fertilizers among smallholder farmers, whilst also addressing food security and nutrition concerns. Like in the previous voucher experiences in Mozambique, the eVoucher has multiple values and levels of farmer co-payment, which are defined by the project parties, to target both smallholder and emerging farmers. The subsidies allow producers to purchase different packages of certified seeds, inorganic fertilizers and/or post-harvest insecticides at a discounted price from agrodealers and their retailers.

1.3 Promoting Evidence-based Policy Making

As part of the PROMOVE-Agribiz program, DIME implements a component that aims to promote evidence based-policy making in the rural sector of Mozambique by increasing availability of rigorous evidence as well as building national capacities for producing and leveraging evidence in policy design. The impact evaluation research implemented under this component is designed to build evidence on two broad policy questions defined at the outset of the program:

1. How to promote the sustained adoption of improved agricultural production practices?
2. How to improve the linkages between producers and commercial markets?

Evidence from rigorous studies on agricultural development suggests that both financial constraints and informational constraints play an important role in encouraging farmers to adopt new practices and join productive value chains, but more

information is needed on supply-side interventions and on the interplay of financial and information constraints (Magruder, 2018). Several evaluations used RCT methods to guide agricultural policy in Mozambique: optimizing extension methods (Kondylis et al., 2016, 2017); and take-up of fertilizer and seed subsidies (Carter et al., 2013). Yet, knowledge gaps remain on the potential complementarities of these policy approaches, as well as how to translate individual demand for inputs or new technologies into profitable value chains.

2 FFS and eVoucher Impact Evaluations

2.1 Objectives

To shed light on different constraints to adoption, FAO and DIME coordinated the FFS and eVoucher intervention roll-out in such a way that it allows for the identification of the impact of the individual interventions as well as their complementarities, providing for a richer understanding of constraints to adoption more broadly.

The main impact evaluation research objectives are as follows:

Farmer Field School: This IE will measure the impact of the FAO FFS extension approach on farmer knowledge, beliefs about the returns and adoption of sustainable and resilient farming techniques, and production outcomes, among others. Moreover, it will test for complementarities with the eVoucher intervention and assess whether strengthening local networks speeds up diffusion within groups.

eVoucher: This IE will measure the impact of FAO eVoucher input subsidies on the adoption of improved agricultural technologies and crop productivity and persist over time and diffuse in the community. The IE will also explore how adjustments to current subsidy rates would affect take-up by different groups (such as women, the food insecure, and those in remote areas) in the short and long run, and the consequences of changing adoption on productivity. The IE design will also permit the identification of the principal factors that determine a farmer's willingness and ability to pay (WTP) for fertilizer and other agricultural inputs and assess whether experience with the eVoucher changes the WTP for inputs over time. In addition it will explore the impacts of the program on agrodealer/retailer input supplies and sales over time.

2.2 Randomization and sampling

The evaluation is based on a randomized phase-in of communities covered by the project extension agents and within community randomization of households. Phasing-in some communities before others creates a period in which some communities have access to the evaluated interventions (treatment) while others do

not yet have access to these interventions (control), with random assignment to these groups ensuring that these groups of communities are statistically comparable on all dimensions aside their access to the program during the evaluation period. Thus, any differences that emerge between the two groups can be attributed to the casual effect of the interventions.

Randomization of communities and households

Step 1 – Identification of possible intervention communities At the beginning of the program, the research team asked FAO to provide a list of extension agents (EAs) who would be responsible for identifying communities for intervention, and established the catchment for each EA. From this list, the research team assigned each EA, by random lottery, a pipeline of communities in which to establish a FFS or register farmers for eVouchers. Working with a total of 102 EAs, the team identified 799 potential intervention communities.[1]

Step 2 – Community level randomization From the long-list of communities in each EA's catchment, four communities were randomly assigned to compose the experimental sample. Each of these communities was then assigned to one of the following four groups receiving either:

1. Farmer Field School
2. eVoucher
3. Farmer Field School + eVoucher
4. Control group

At that time, only 56 of the 97 EAs had all 4 experimental sample communities within range of an agrodealer participating in the FAO eVoucher program. In areas where there is no eVoucher coverage, the EA is assigned two FFS and two control communities. The results of the community level randomization process are shown in Table 2.1. In total the evaluation sample includes 388 communities.

[1] 5 EAs were later dropped from the IE due to performance issues.

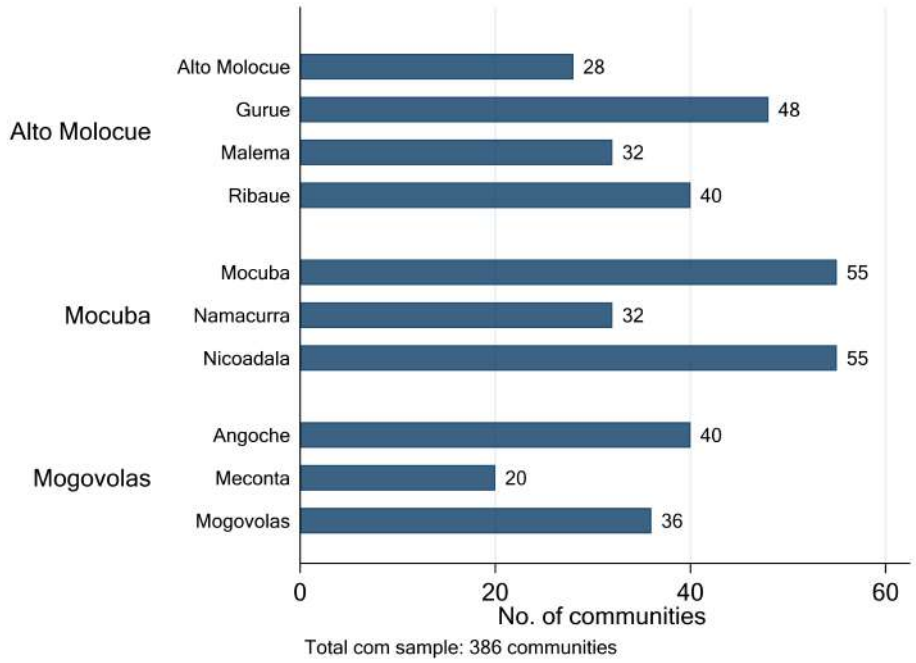
Table 2.1: Overview of community assignment into treatment groups

		eVoucher assignment			
		Treatment	Control	No coverage	Total
FFS assignment	Treatment	55	55	84	194
	Control	56	56	82	194
	Total	111	111	166	388

The sample for eVoucher changed (initially 112 for each treat and control) because of replacements. "No Coverage" means that a community was not in range of an agrodealer expected to participate in the FAO eVoucher program.

The number of communities by project district is displayed in Figure 2.1.[2]

Figure 2.1: Number of evaluation communities - by hub



Step 3 – Within community identification of FFS interested participants Participation in the FFS is voluntary and based on farmers expressing interest. This means that farmers who choose to participate are likely not representative of the average farmer in the community. To allow for identification of likely FFS participants in a similar way in both the FFS treatment and control groups, each of the

[2]Two communities had to be dropped since the research team had not received a community listing by the beginning of the field work.

EAs visited their four experimental communities to list community members interested in participating in a FFS group prior to the roll-out of the interventions. During the listing, communities were asked to also identify two likely FFS facilitators of each group. On average 29.3 members per community were listed as FFS interested participants.

Step 4 – Within community farmer randomization of eVouchers To allow for measurement of spillovers of eVouchers within communities, a second randomization was done to select treatment and control farmers within communities. This is done among both FFS likely participants and among other members of the community. To obtain a list of all members in the experimental communities, an extensive household listing was performed in October and November 2020 (see section 3 for more details). The identification of treatment and control eVoucher households within communities is done for all evaluation communities, not just those assigned to receive eVouchers. This permits the identification of the equivalent households in both treatment and control groups.

Overview experimental groups and sample The sample is composed of all 388 evaluation communities. Within each community, 12 households are sampled from the following groups:

1. FFS interested + eVoucher treatment (6 households)
2. FFF interested + eVoucher control (3 households)
3. Not FFS interested + eVoucher treatment (2 households)
4. Not FFS interested + eVoucher control (1 household)

Both likely facilitators from the FFS listing were prioritized to be included in the survey sample. Sampling weights are applied when translating our sample averages to community wide average or other combinations of groups with different sampling probabilities.

The community and households randomization and selection process leads to the following groups and sample:[3]

[3]The research team could not obtain listing from 2 communities and 1 community only had 10 households

Table 2.2: Survey sample - by treatment group

		eVoucher treatment		eVoucher control		eVoucher no coverage	Total
		Treatment	Control	Treatment	Control		
FFS treatment	Interested	334	167	329	163	743	2316
	Not interested	114	57	111	57	241	
FFS control	Interested	336	170	336	167	730	2314
	Not interested	111	53	112	57	242	
Total		1342		1332		1956	4630

IRB The FFS and eVoucher IEs obtained ethical approval for a combined research protocol at the international and national level. Solutions IRB (IRB registration number 00008523) granted ethical approval for the study in September 2020 under the protocol reference number "#2020/09/2". The National Committee for Bioethics in Health (CNBS) in Mozambique (IRB registration number 00002657) approved the research protocol in January 2021 under the protocol reference number "#59/CNBS/21".

3 Baseline data collection

3.1 Phases and instruments

Phase 1 – Household listing To identify households for surveys in the evaluation communities, a household listing was performed in all communities. This listing involves enumerators making a structured walk of each community to identify all dwellings in the community. In total, 28,064 households were registered in the 388 communities – an average of 72 households per community. These households are used as the sampling frame for population of communities as well as the eVoucher randomization described in the previous section. On average, 25.9 members of the 29.3 interested in the FFS lists provided to EAs could be matched to these household listings, suggesting a good match between the relevant communities for FFS formation and the sampling frame used to understand characteristics of the communities.

Phase 2 – survey data collection The second phase of data collection comprised four types of surveys:

- *Community survey*. Applied to knowledgeable members of the community leadership, to provide general agricultural context, benchmark farm-gate and market crop prices, community geography, access to agricultural inputs and markets, among other topics.
- *Extension agent survey*. All public EAs due to being engaged in the FFS and eVoucher interventions were interviewed. Topics covered included: EA characteristics and training, a knowledge test on agricultural practices, experience and beliefs on the returns to improved agricultural inputs and techniques, their work program and services performed, among other areas.
- *Agrodealer / retailer survey*. Agrodealers and input retailers that expressed interest in participating in the eVoucher program were interviewed about their business operations, input prices and sales, market structure, beliefs in returns to inputs, among other areas.
- *Household survey*. A multi-module agriculture survey was applied at the house-

hold (*agregado familiar*) level and included general household characteristics and extensive modules on land holdings, crop choices, harvest, sales, input use, agricultural practices, access to extension. In addition we collect information on time and risk preferences as well as willingness to pay for different input packages.

3.2 Field work and response rates

Quality control Data quality was assured through DIME's rigorous data quality protocols. Surveys were performed on tablet devices running *SurveyCTO Collect* data collection software. During the interview data consistency and quality is managed through a series of hard checks (e.g., all relevant questions must have an answer, age cannot be more than 120) and soft checks (e.g., enumerators receive a flag for unlikely but not impossible answers such reporting of plot areas larger than 5 ha). The DIME team performed immediate daily quality checks and inconsistencies are then sent back to the field teams for final verification. Each survey was recorded and randomly audited for each enumerator at several points throughout the data collection. Finally a short verification survey (*backcheck*) was applied to a random sample of 15% of household surveys. Cases in which fundamental responses were not aligned (such as the number of plots) were re-interviewed.

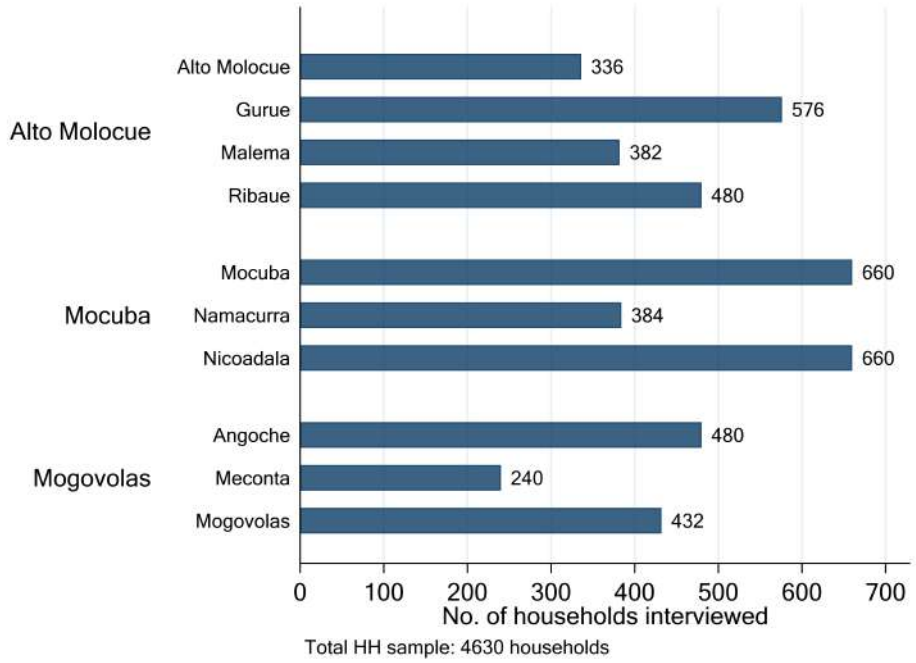
These stringent data quality checks enabled DIME to identify that the first round of household data collection had not been collected properly, and terminated this phase in May 2021. The DIME team identified widespread cases of falsified data from a sample of enumerator audits and these cases invalidated the data collected until that point. The team of enumerators was replaced and a second round of data collection commenced from July 2021.

Covid mitigation DIME survey implementation protocols had to be significantly adapted to the realities of the COVID-19 pandemic to ensure the safety of all survey respondents and enumerators. In-person data collection guidelines were developed by DIME for all surveys globally, which include stringent mitigation measures to be undertaken by all survey personnel, specific implementation monitoring, and approval from the study's IRB to protect the safety of the research participants. The specific protocols employed in the baseline survey were jointly developed by DIME

and the survey firm and are aligned with all Mozambican legislation and guidelines declared under the State of Emergency and State of Calamity, as well as WHO recommendations and data collection best practices. Implementation of the guidelines was monitored by DIME.

Response rates Replacements were made whenever a household in the original sample could not be interviewed after three unsuccessfully attempts by the enumerators. Replacements were impact evaluation sample group specific, i.e., a household on the FFS interested list would be replaced by a household of that same status from the replacement list in that same community, maintaining the sample structure wherever possible. Replacement rate was around 6% of the original randomized sample. Figure 3.1 displays the number households interviewed in each district. A total of 4630 households were successfully interviewed.

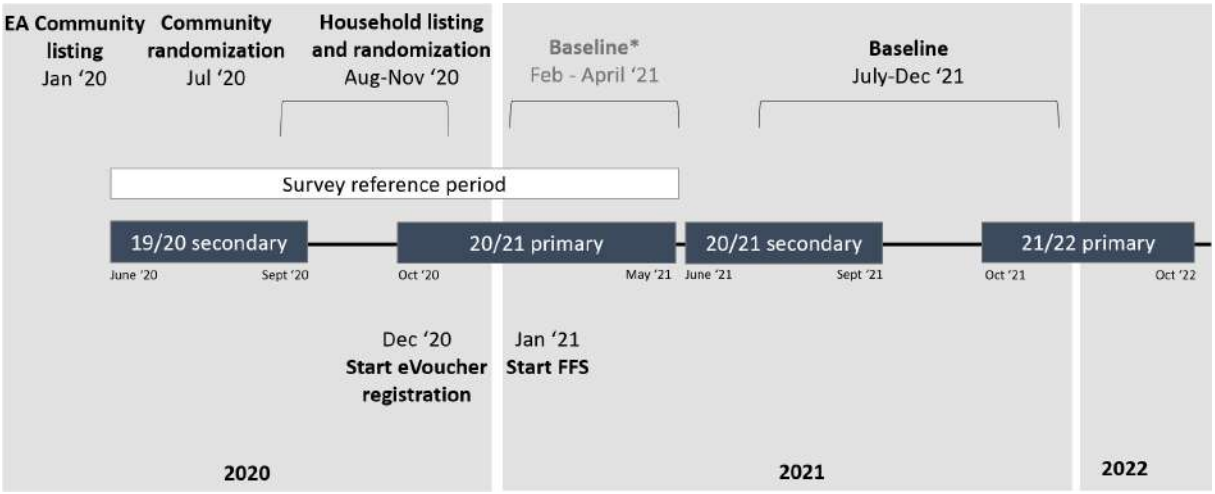
Figure 3.1: Number of households surveyed - by hub



3.3 Timeline

The overall timeline of determining the evaluation sample, data collection and project roll-out are show in Figure 3.2.

Figure 3.2: Timeline of the project



- **Listing and randomization** The EA-led community listing took place in preparation of the intervention roll-out and was finalized early 2020. Due to the outbreak of the global COVID-19 pandemic, further field activities were put on hold for several months. Listing of households interested in the FFS across all evaluation communities resumed in August. The community-wide household listing took place between October and November 2020.
- **Project roll-out** FFS roll-out started during the 2020/'21 primary season. eVoucher registration started later in that same primary season.
- **Data collection** Due to widespread fraud in the first household baseline data collection, the complete survey was redone from July to December 2021. The reference period for reporting on agriculture production is the 12 month period prior to the start of the data collection – the secondary season of the 2019/20 agricultural campaign (June 2019 to September 2020) and the main season of the 2020/21 campaign (Oct 2020 to May 2021).

Since the FFS and eVoucher interventions had already started to roll-out by the time the second iteration of the baseline was conducted, the description of the baseline situation will consider pure control communities only. While it is unlikely that many of the agriculture decisions for seasons referenced in the survey would have been affected by the initial roll-out, others such as knowledge and beliefs might have.

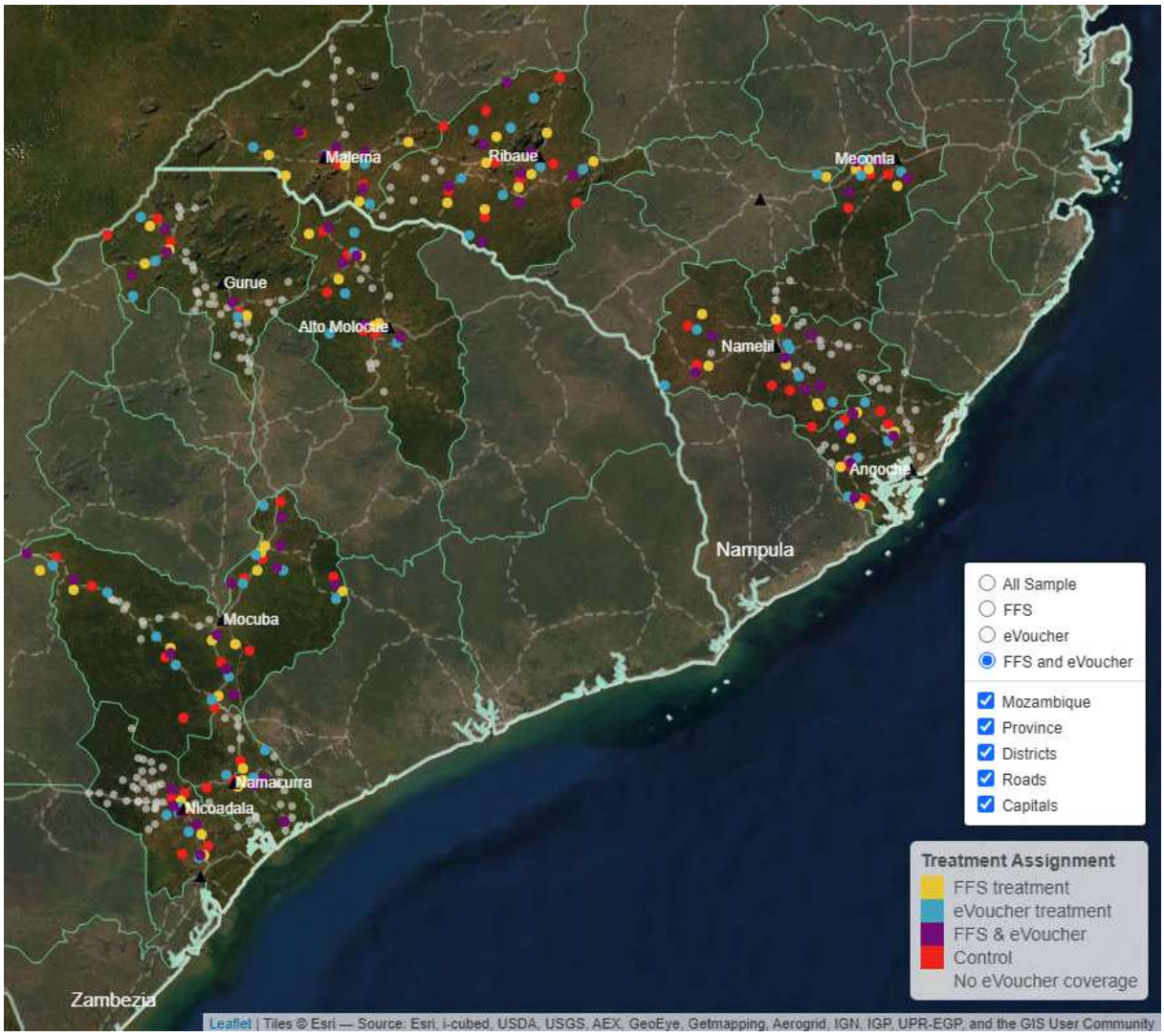
4 General Evaluation Sample Characteristics

This section provides a general characterization of the types of communities and households identified by the extension led community listing process. Further we compare communities across the different treatment arms to verify the randomization led to comparable groups at baseline. Detailed baseline characteristics will be presented from Section 5 onwards.

4.1 Community characteristics

The map in Figure 4.1 shows the spatial distribution of the impact evaluation sample communities, with their combined intervention treatment status denoted by the color in the legend. While we only have GPS data from the communities in our experimental sample, these are a representative sample of the average EA catchment area community. The community distribution suggests that many communities (i.e. those that were under the responsibility of an extension agent prior to the project) are located nearby major roads and clustered around district capitals (the black triangles). Unsurprisingly, those communities covered by agrodealers (the colored points) also exhibit a similar pattern. An interactive version of this map can be accessed here.

Figure 4.1: Intervention map



The average distance to an Administrative Post – the lowest level of government is around 23 kilometers, and over 2 hour of travel using the most common means of transportation (Table 4.1). The travel time to different relevant types of population centers provides an indication of the community's access to services and government structures.

Table 4.1: Distances and travel time

	Mean	SD	Min	Max	N
Distance (km)					
Closest village	4.42	4.02	1	25	145
Administrative post	23.03	20.71	1	160	198
District capital	36.96	25.05	1	140	254
Province capital	191.42	118.43	3	680	366
Travel time (minutes)					
Closest village	47.27	30.53	1	180	145
Administrative post	83.55	70.47	3	360	200
District capital	106.30	109.51	2	700	256
Province capital	211.23	122.71	1	650	368

Source: Community survey. Number of observations: 370.

The communities targeted for FFS and eVouchers are relatively remote as indicated by access to relevant services related to agricultural activities (Table 4.2). Very few communities have a "casa agrária", where most common agricultural inputs can be bought. In subsection 5.2 we will further describe where households can access key inputs. Hardly any communities have access to a bank and only in Mogovolas there is some penetration of mobile banking agents.

Table 4.2: Access to services - by hub

	Alto Molocue		Mocuba		Mogovolas	
	Mean	SD	Mean	SD	Mean	SD
Agriculture						
Mill	0.67	0.47	0.36	0.48	0.27	0.45
Well	0.71	0.46	0.37	0.48	0.81	0.39
Storage house	0.03	0.18	0.05	0.21	0.12	0.32
Borehole	0.70	0.46	0.76	0.43	0.74	0.44
Livestock vaccination	0.06	0.24	0.10	0.30	0.09	0.28
Selling Points						
Casa agrária	0.06	0.23	0.01	0.09	0.03	0.18
Stand (*baraca*)	0.70	0.46	0.51	0.50	0.48	0.50
Fair	0.23	0.43	0.22	0.42	0.48	0.50
Wholesale market	0.03	0.16	0.02	0.12	0.08	0.28
Finance						
Bank	0.01	0.12	0.02	0.12	0.02	0.14
Mobile banking agent	0.01	0.08	0.14	0.35	0.23	0.42
Health						
Health center	0.10	0.31	0.09	0.29	0.13	0.33
Hospital	0.01	0.12	0.00	0.00	0.03	0.18
Observations	146		129		95	

Source: Community survey. Number of observations: 370

4.2 Household characteristics

Table 4.3 summarizes the general profile of the households in our sample.[4] We surveyed a total of 4,626 households. The households, on average, have 5 members and nearly 80% of the households are male-headed.

The average household has 2 hectares of land available for cultivation, which are

[4]Throughout the report, we winsorize all the variables related to land use and agricultural production at the 99 percent level in order to reduce measurement error and attenuate the effect of outliers.

spread across 2-3 plots. Nearly all households planted maize, rice, or beans, and cultivated about 4 crops in a year. About half of the sample has cashew trees.

Adoption of inputs[5] is very low, with only 10% of the households using any inputs or improved seeds, and about 15% using any mechanized equipment. All the households in our sample harvested at least one of the crops planted. Only about a quarter of the households hired any outside labor, which shows that most of the agriculture work is done by household members. Low access to labor can be a constraint in a household's ability to scale up the production.

Table 4.3: Household summary

	N	Mean	SD	Min	Max
Household characteristics					
Household size	4626	5.42	2.31	1	20
Household head is male	4626	0.79	0.40	0	1
Agriculture characteristics					
No. of plots	4626	2.53	1.18	1	10
Total plot area (ha.)	4626	2.23	1.72	0	10
No. of plots irrigated	4626	0.09	0.31	0	3
No. of crops planted	4626	4.36	1.90	0	23
Planted crops other than maize/rice/beans	4626	0.92	0.28	0	1
Used inputs	4626	0.10	0.30	0	1
Used improved seeds	4626	0.09	0.29	0	1
Hired any labor	4626	0.22	0.41	0	1
Sold or planning to sell	4626	0.77	0.42	0	1
Stored any produce	4626	0.89	0.31	0	1
Have cashew trees	4626	0.49	0.50	0	1
No. of fruit trees	4626	2.17	1.81	0	12
No. of livestock animals	4626	0.96	0.86	0	6
Used mechanized equipments	4626	0.15	0.36	0	1

[5]Inputs include chemical/organic fertilizers, pesticides, herbicides, and fungicides.

4.3 Balance checks

Communities and households are randomly assigned to the different treatment and control groups with the goal of generating groups that are similar prior to roll-out of the interventions, both on observable (e.g. land size) and unobservable characteristics (e.g. farmer ability). The randomization of enrollment timing ensures that all differences observed at endline are attributable (as causal impacts) to the project, and is also the fairest way to ensure that equally eligible communities have the same opportunity to start first given program phase-in constraints.

Balance checks describe average characteristics of treatment groups and are conducted to verify that the randomization led to comparable groups. Table 4.4 first compares community level characteristics. Columns 1-4 report the mean and standard deviation of the community characteristics by treatment arm. The last three columns report the difference in means between the pure control communities and the subsequent treatment arms. T-tests are conducted to identify any statistically significant differences between these.

Treatment arms are overall balanced. Only two difference in means are significantly different from zero: when comparing the number of people in communities that are eVoucher only with pure control ones, and the when comparing the number of interested FFS members in communities that are FFS + eVoucher with the pure control group. When testing for joint significance of the difference in means, only last column is significant, at the 10% level. It should be noticed, however, when performing a high number of independent tests, it is to be expected that on average 1 in 10 returns as significant (List et al., 2019).

Table 4.5 further tests for differences between various characteristics of the households across the same treatment arms. We find that on average, households in control communities are slightly bigger. The differences across the rest of the characteristics are small and statistically insignificant.

Table 4.4: Balance of community characteristics - by treatment arm

	(1) Control		(2) eVoucher only		(3) FFS only		(4) FFS + eVoucher		T-test Difference		
Variable	N	Mean/SE	N	Mean/SE	N	Mean/SE	N	Mean/SE	(1)-(2)	(1)-(3)	(1)-(4)
People in the community	132	2323.727	55	1878.327	129	2026.566	52	2223.750	445.400*	297.161*	99.977
		(130.711)		(155.681)		(120.230)		(201.240)			
No. of households listed during community listing	132	72.992	55	67.655	128	69.938	52	75.212	5.338	3.055	-2.219
		(4.622)		(5.156)		(3.860)		(6.418)			
No. of interested FFS members	132	29.038	55	28.127	129	29.047	52	30.942	0.911	-0.009	-1.904*
		(0.497)		(0.753)		(0.554)		(1.001)			
Leader is female	118	0.068	51	0.059	120	0.050	47	0.106	0.009	0.018	-0.039
		(0.023)		(0.033)		(0.020)		(0.045)			
Travel time to District capital (min)	87	112.736	39	112.487	91	94.121	38	116.842	0.248	18.615	-4.106
		(12.081)		(17.357)		(10.331)		(20.896)			
Is there an agrodealer in the community	132	0.091	55	0.145	129	0.093	52	0.173	-0.055	-0.002	-0.082
		(0.025)		(0.048)		(0.026)		(0.053)			
Community has access to mill	132	0.477	55	0.491	129	0.411	52	0.500	-0.014	0.066	-0.023
		(0.044)		(0.068)		(0.043)		(0.070)			
Community has access to well	132	0.644	55	0.509	129	0.636	51	0.608	0.135*	0.008	0.036
		(0.042)		(0.068)		(0.043)		(0.069)			
Community has access to a Stand (*baraca*)	132	0.614	55	0.509	129	0.581	51	0.529	0.105	0.032	0.084
		(0.043)		(0.068)		(0.044)		(0.071)			
F-test of joint significance (p-value)									0.713	0.740	0.024**
F-test, number of observations									114	160	110

Notes: *Source:* Community survey. Only the gender of important leaders (régulo and chefe do povoado) were taken into account. Number of people in the community was winsorized at the 5% tail. The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are p-values. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 4.5: Balance of household characteristics - by treatment arm

	(1)		(2)		(3)		(4)		T-test		
	Control		eVoucher only		FFS only		FFS + eVoucher		Difference		
Variable	N/[Clusters]	Mean/SE	N/[Clusters]	Mean/SE	N/[Clusters]	Mean/SE	N/[Clusters]	Mean/SE	(1)-(2)	(1)-(3)	(1)-(4)
Household size	1643	5.567	670	5.343	1644	5.349	669	5.305	0.225	0.218**	0.262**
	[137]	(0.083)	[56]	(0.115)	[137]	(0.070)	[56]	(0.105)			
Household head is male	1643	0.794	670	0.830	1644	0.781	669	0.790	-0.036*	0.014	0.005
	[137]	(0.013)	[56]	(0.016)	[137]	(0.012)	[56]	(0.019)			
No. of plots	1643	2.528	670	2.482	1644	2.540	669	2.540	0.046	-0.012	-0.012
	[137]	(0.054)	[56]	(0.088)	[137]	(0.051)	[56]	(0.079)			
Total plot area (ha.)	1643	2.264	670	2.291	1644	2.197	669	2.150	-0.026	0.067	0.115
	[137]	(0.073)	[56]	(0.115)	[137]	(0.068)	[56]	(0.085)			
No. of plots irrigated	1643	0.088	670	0.117	1644	0.082	669	0.090	-0.029	0.006	-0.002
	[137]	(0.014)	[56]	(0.032)	[137]	(0.012)	[56]	(0.020)			
Hired any labor	1643	0.219	670	0.226	1644	0.209	669	0.213	-0.007	0.011	0.007
	[137]	(0.015)	[56]	(0.023)	[137]	(0.015)	[56]	(0.024)			
Sold or planning to sell	1643	0.769	670	0.793	1644	0.773	669	0.775	-0.025	-0.004	-0.006
	[137]	(0.017)	[56]	(0.029)	[137]	(0.018)	[56]	(0.029)			
Stored any produce	1643	0.889	670	0.885	1644	0.891	669	0.898	0.004	-0.002	-0.009
	[137]	(0.010)	[56]	(0.018)	[137]	(0.011)	[56]	(0.017)			
Have cashew trees	1643	0.499	670	0.505	1644	0.474	669	0.469	-0.007	0.024	0.029
	[137]	(0.030)	[56]	(0.050)	[137]	(0.029)	[56]	(0.044)			
No. of fruit trees	1643	2.179	670	2.246	1644	2.146	669	2.127	-0.067	0.033	0.052
	[137]	(0.082)	[56]	(0.140)	[137]	(0.080)	[56]	(0.125)			
No. of livestock animals	1643	0.949	670	1.072	1644	0.926	669	0.952	-0.123**	0.023	-0.003
	[137]	(0.032)	[56]	(0.049)	[137]	(0.029)	[56]	(0.049)			
Used mechanized equipments	1643	0.155	670	0.170	1644	0.154	669	0.114	-0.015	0.001	0.040*
	[137]	(0.012)	[56]	(0.018)	[137]	(0.013)	[56]	(0.018)			
F-test of joint significance (p-value)									0.133	0.940	0.532
F-test, number of observations									2313	3287	2312

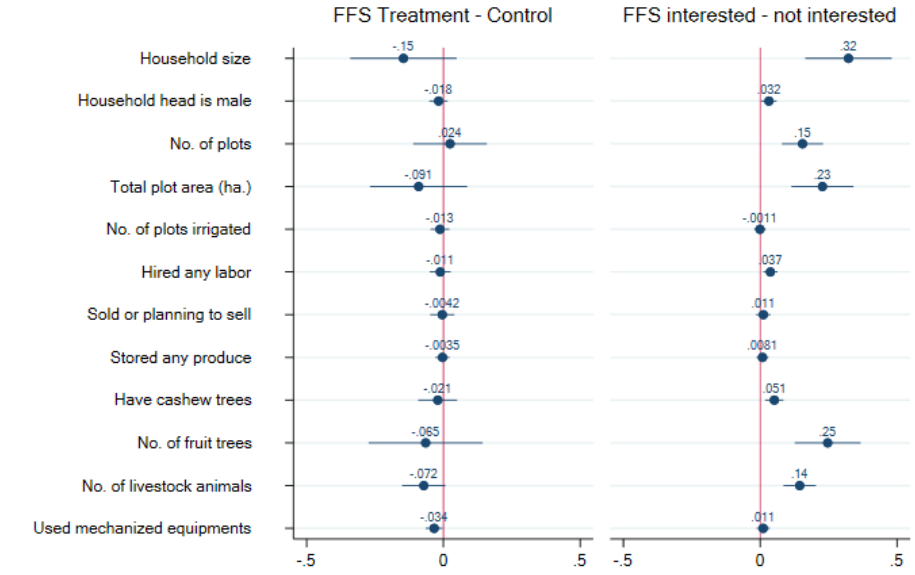
Notes: The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are p-values. Standard errors are clustered at variable com. Observations are weighted using variable weight_com as probability weights.***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

To further highlight the power of randomization to permit attribution of differences in outcomes to program interventions, we show how balance tests play out when comparing randomized versus self-selected groups. In figure 4.2 we show the difference between different groups across a series of indicators. When the blue dot is close to zero and the confidence intervals do not cross zero, it indicates there are no significant differences between groups.

- **Compare randomized groups** On the left, we first compare the households in the randomized FFS treatment communities against households in FFS control communities. The sample on both groups is restricted to households that showed interest in FFS. As found in the earlier balance tables, the differences are small and statistically not significant.
- **Compare self-selected groups** On the right, we compare the households that showed interest in FFS against households that did not, which is a com-

parison often made when evaluating programs. However, we find that households that showed interest in FFS are bigger, and own a higher number of plots, a larger total plot area, more fruit trees and more livestock. As a whole, this suggests that the farmers who self-select into FFS participation may be somewhat wealthier, with more diversified income sources than their fellow community members.

Figure 4.2: Balance on household characteristics



Panel 1: The coefficients plotted are from the regressions of the outcomes on y-axis on the FFS treatment (for FFS interested households). Standard errors are clustered at community level (Clusters = 386, N = 3478). F-test of joint significant (p-value) = .478
Panel 2: The coefficients plotted are from the regressions of the outcomes on y-axis on the dummy - FFS interested household or not. Standard errors are clustered at community level (Clusters = 386, N = 4626). F-test of joint significant (p-value) = 0

5 Agriculture Production

The main objective of the baseline survey is to establish a benchmark for the post-intervention impact analysis and assess whether the planned interventions are tackling relevant constraints. Understanding household's agricultural characteristics provides valuable insight when evaluating and seeking to understand any changes caused by the intervention. Table 5.1 summarizes the agriculture characteristics of the sample.

- **Plots:** The households in our sample have an average of 2.5 hectares of land available for agricultural production, which is spread across 2-3 plots. 83% of the plots are cultivated in the rainy season, whereas only 50% of these are cultivated in the dry season.
- **Crops:** Almost all households cultivate staple crops, but only 30% of the households cultivate cash crops, highlighting the prevalence of subsistence farming and low levels of commercialization.
- **Inputs:** Adoption of inputs is quite low - only 9% of the households use improved seeds, and about 5% of the households use chemical fertilizers. On average, households spend more time working on plots in the rainy season, and only 23% of the households hire any external labor.
- **Output:** The average household cultivates 1.6 hectares of land and produces the equivalence of 22,000 MZN per hectare. About 76% of the households sold any production and made, on average, 12,300 MZN through sales.

  The subsequent sections provide detailed summaries of each characteristic.

Table 5.1: Agriculture summary - by hub

	Alto Molocue Mean	Mocuba Mean	Mogovolas Mean	Overall Mean
Plots:				
No. of plots	2.4	2.9	2.2	2.5
Plots cultivated - rainy season (%)	80.6	84.4	86.5	83.5
Plots cultivated - dry season (%)	58.5	42.9	53.6	51.4
Plot size (ha.)	1.2	0.8	1.0	1.0
Total plot area	2.7	2.0	2.0	2.3
Crops:				
Culitvated - rainy season (%)	95.8	98.8	98.8	97.7
Culitvated - dry season (%)	79.8	68.7	71.7	73.7
Cultivated staple crops - rainy season (%)	94.4	98.8	98.8	97.2
Cultivated staple crops - dry season (%)	77.1	67.6	71.3	72.1
Cultivated cash crops - rainy season (%)	40.7	22.7	17.6	28.3
Cultivated cash crops - dry season (%)	25.0	10.4	7.8	15.3
Inputs:				
Used improved seeds (%)	12.5	6.2	4.2	8.1
Used chemical fertilzier (%)	11.5	0.9	0.5	4.8
Household labor hours (per plot) - rainy season	865.1	922.1	932.4	903.0
Household labor hours (per plot) - dry season	602.2	470.9	531.8	535.5
Hired labor - rainy season (%)	18.3	26.5	15.5	20.7
Hired labor - dry season (%)	7.4	7.0	2.7	6.1
Expenditure on labor in rainy season (1000 MZN)	1.1	0.8	0.9	0.9
Expenditure on labor in dry season (1000 MZN)	0.3	0.2	0.3	0.2
Output:				
Area cultivated (ha.)	1.9	1.4	1.5	1.6
Revenue (1000 MZN/ha.)	24.9	18.7	22.6	22.0
Sold any produce (%)	84.4	65.8	78.7	76.0
Sales (1000 MZN)	19.5	6.3	10.2	12.3
Observations	623	624	396	1643

Staple crops include maize, rice, beans, peanuts, cassava, potato, sweet potato, and millet. Cash crops include the rest of the crops like sesame, soy, tomato, onion, etc. The hours spent by the household working in the field is the sum of hours spent preparing, growing, and harvesting the field by all the household members per plot-season. Area cultivated is the maximum area cultivated by the household across two seasons. Revenue is calculated as the total production value of the household across two seasons divided by the maximum area cultivated by the household across two seasons. Production value is quantity of the crop produced by the household multiplied by the median price of that crop.

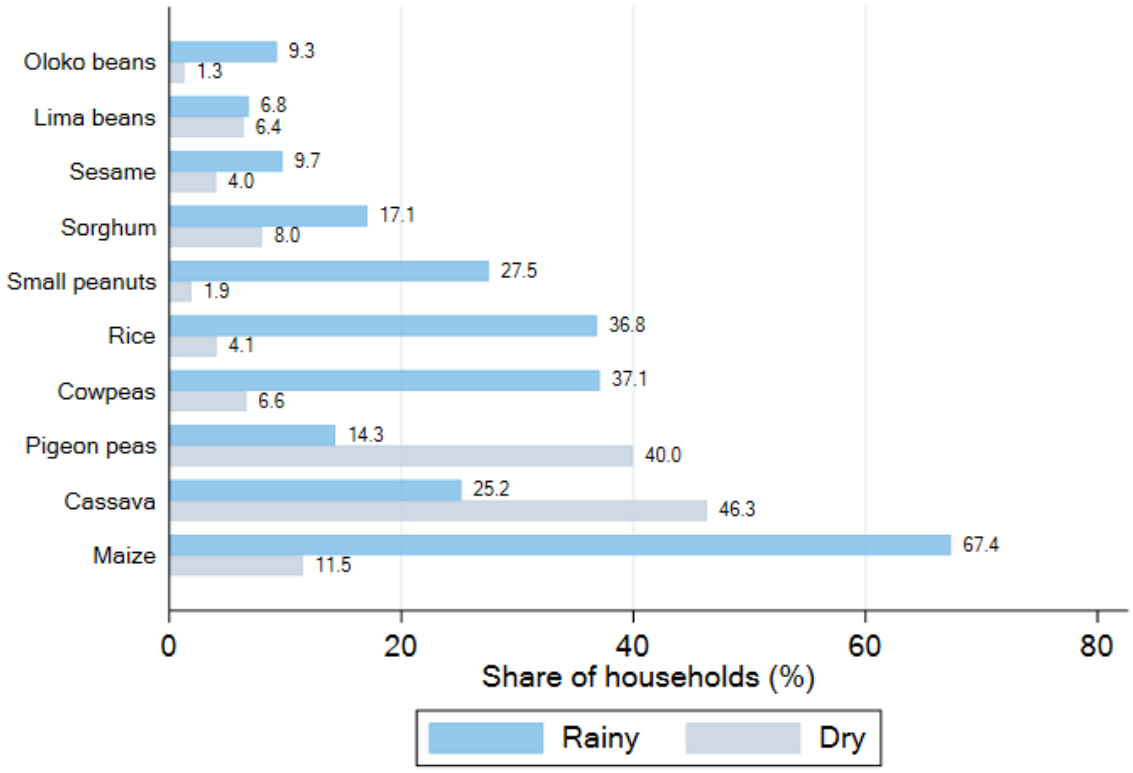
5.1 Crops

We begin the analysis on agriculture production by looking at the types of crops that are most commonly cultivated by the households in our sample. Figures 5.1 and 5.2 show the 10 most commonly cultivated crops in general and by hubs. Overall, staples like maize and cassava are the most cultivated crops in the rainy and dry season, respectively. Maize is produced by almost 70% and Cassava by 50% of

the households. The only cash crop among the top 10 crops is sesame, which is cultivated by less than 10% of the households. This trend varies a little across hubs. In Alto Molocue, maize is the most cultivated crop in the rainy season, and pigeon peas in the dry season. In Mocuba, rice is most cultivated crop in the rainy season, and cassava in the dry season. In Mogovolas, small peanut is the most cultivated in the rainy season, and cassava in the dry season.

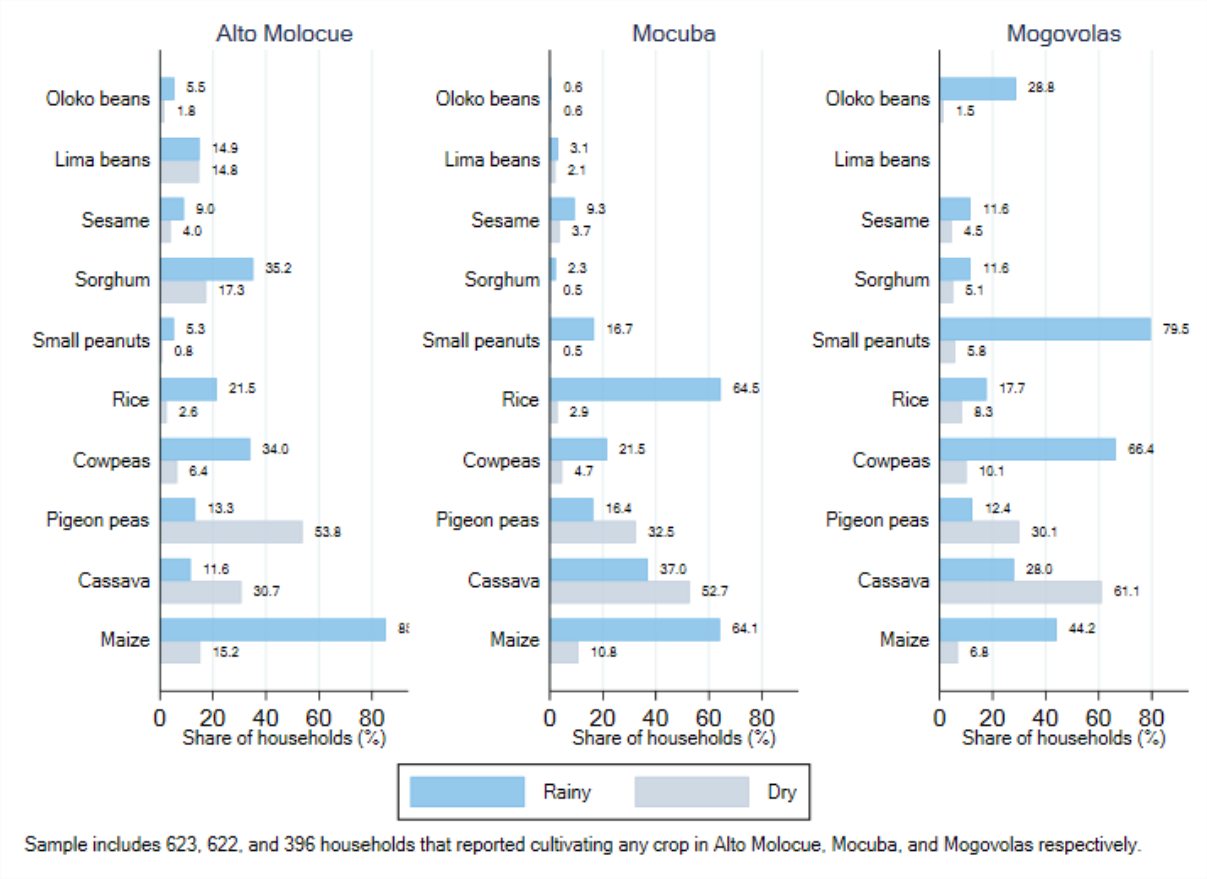
Figures 5.3 and 5.4 further show the share of land that is devoted to each crop by the households that cultivate that crop in the different seasons. This describes how important each crop is to the farmer. On average, none of the households devote 100% of their land to a single crop. The share varies from about 10-40% with the maximum share being devoted to rice in the rainy season, and cassava in the dry season.

Figure 5.1: Top 10 crop cultivated - by season



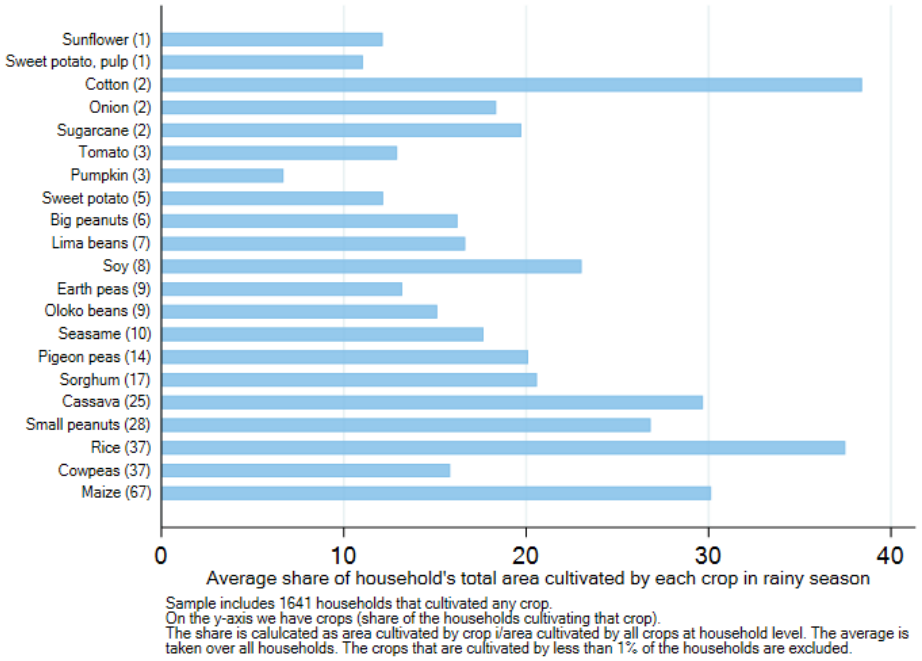
Sample includes 1641 households that cultivated any crop across 2 seasons.
1604 households cultivated in rainy season and 1211 households cultivated in dry season.

Figure 5.2: Top 10 crop cultivated - by hub



Sample includes 623, 622, and 396 households that reported cultivating any crop in Alto Molocue, Mocuba, and Mogovolas respectively.

Figure 5.3: Share of area devoted to each crop - rainy season



Sample includes 1641 households that cultivated any crop.
On the y-axis we have crops (share of the households cultivating that crop).
The share is calulcated as area cultivated by crop i/area cultivated by all crops at household level. The average is taken over all households. The crops that are cultivated by less than 1% of the households are excluded.

Figure 5.4: Share of area devoted to each crop - dry season

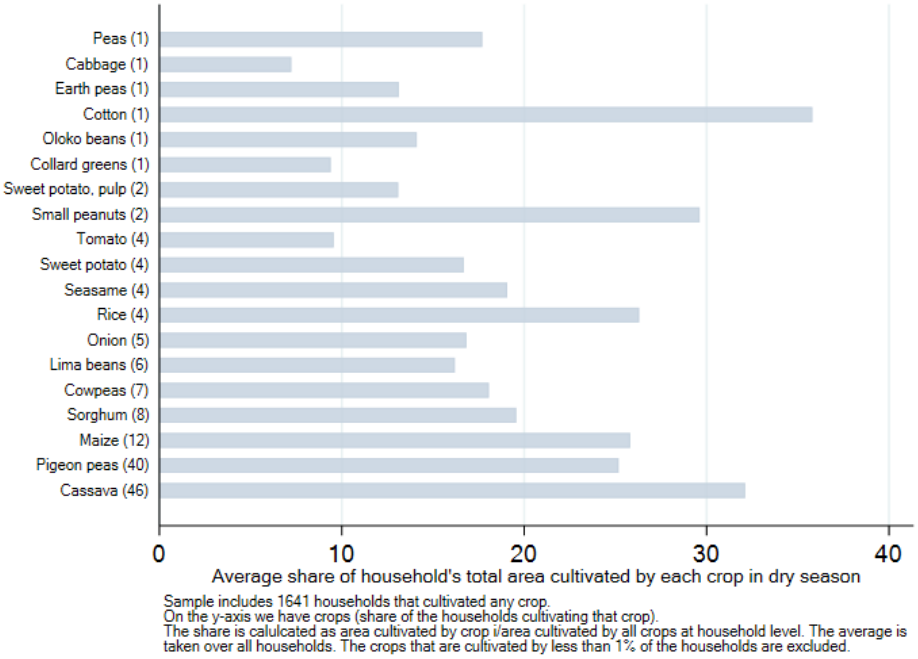


Figure 5.5 shows planting dates for primary crops. Maize and rice are typically planted in November or December, and cowpea a bit later. Pigeon peas and cassava are more typically planted in the off-season.

Figure 5.5: Planting months for top 5 crops

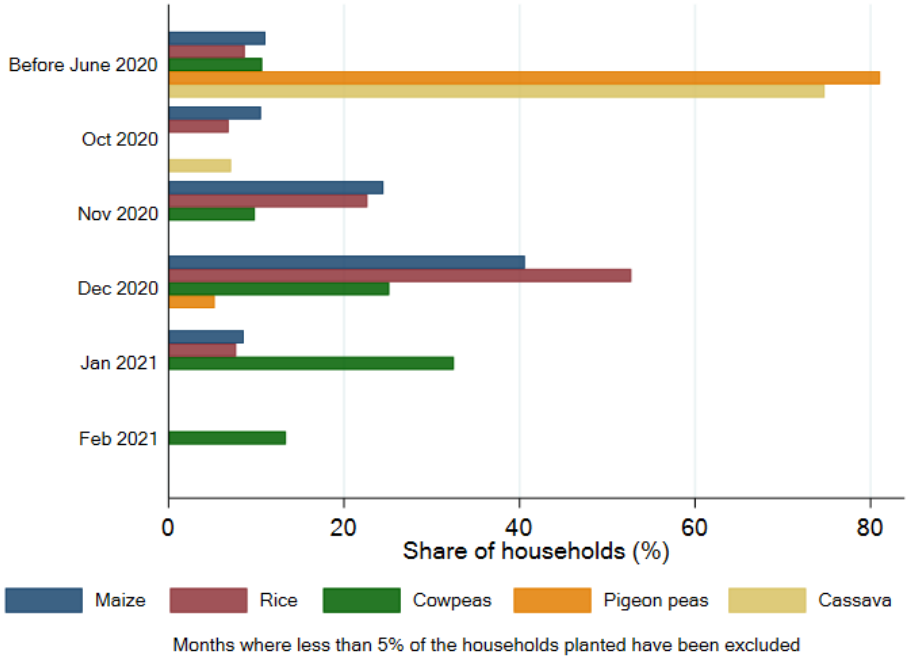
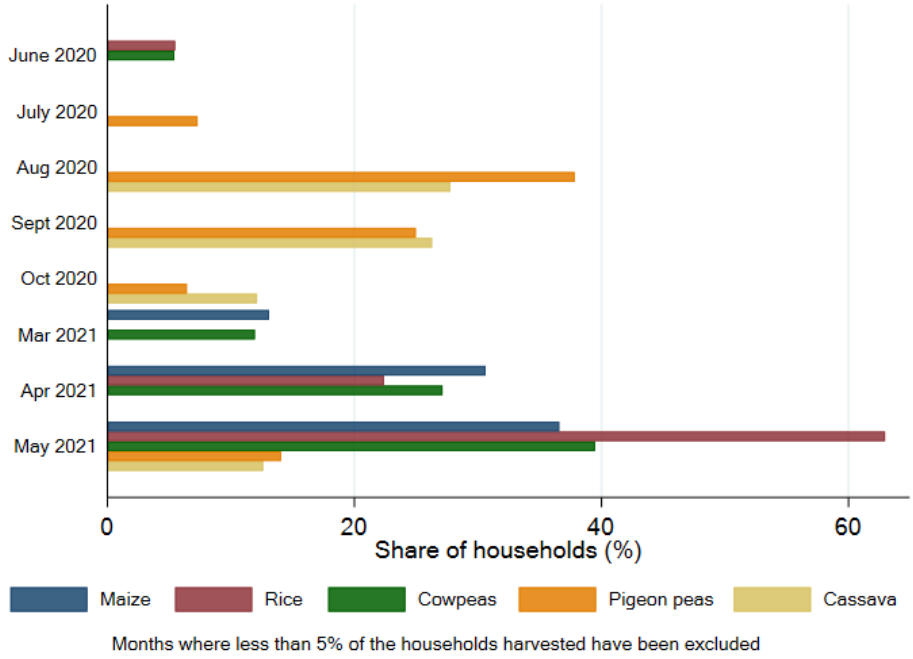


Figure 5.6 shows harvesting dates for primary crops. Maize, rice, and cowpea are

typically harvested in April and May, and cowpea a bit later. Pigeon peas and cassava are typically harvested off this cycle, in August and September.

Figure 5.6: Harvesting months for top 5 crops



5.2 Inputs

5.2.1 Agriculture inputs

A central objective of the project is to promote adoption of modern agriculture technologies and inputs to increase productivity. The overall adoption of these inputs is quite low, with only 9% of the households using improved seeds, and 5% of the households using chemical fertilizer. We observe some heterogeneity in use of these inputs by hubs, as shown in Figure 5.7. A higher share of households use inputs in Alto Molocue compared to Mocuba and Mogovolas.

Figure 5.8 shows the major sources of these inputs. The major source of improved seeds and chemical fertilizer is the local market. Only 20-30% of the households buy these inputs from an agrodealer. Access to extension services and eVouchers can help increasing the availability and adoption of high-quality inputs.

Figure 5.7: Types of inputs used - by hub

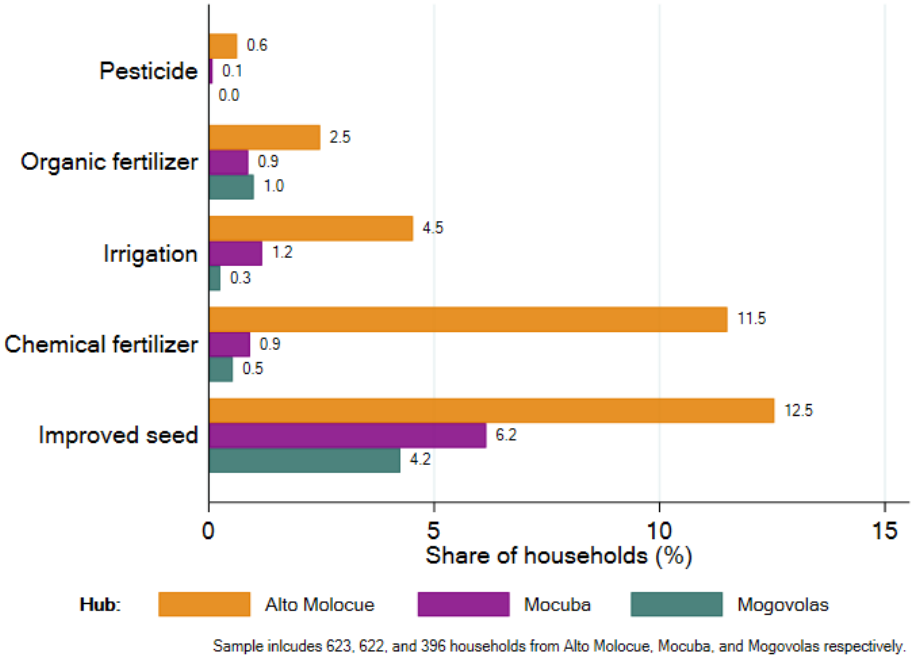
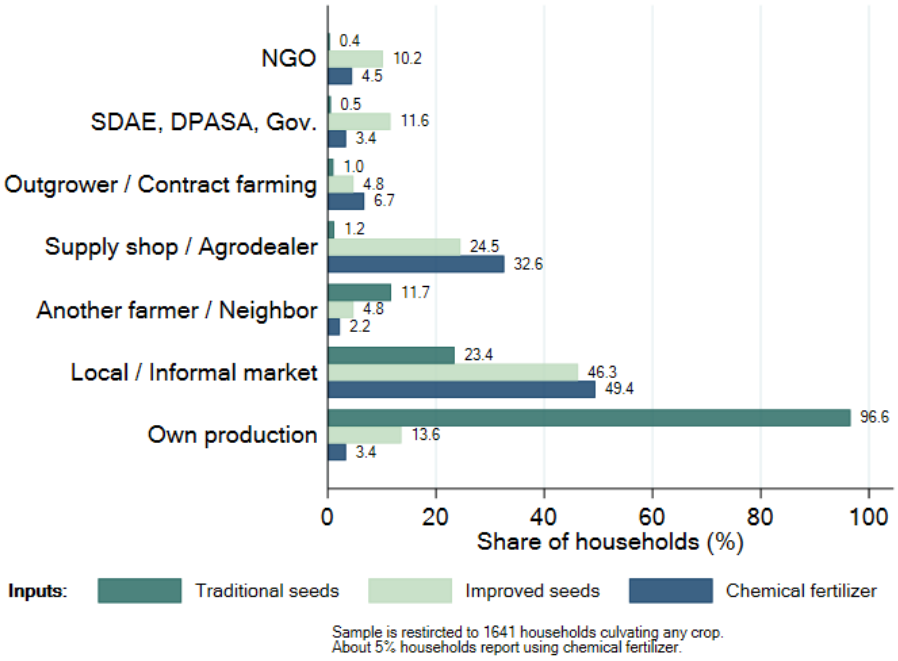


Figure 5.8: Source of inputs



One of the possible reasons for low adoption of inputs is their lack of availability in the surveyed communities. Table 5.2 reports the access to inputs at the community level. We can see that while the most common maize seeds can be found in around 82% of the communities interviewed, fertilizer, urea and pesticides are available in only around 5% of these villages.

Table 5.2: Access to inputs - community level

	In the community	Closest village	Administrative post	Dist capital	Prov capital
Most common corn seeds	0.82	0.71	0.57	0.38	0.16
	(0.39)	(0.45)	(0.50)	(0.49)	(0.37)
Improved corn seeds	0.19	0.21	0.61	0.68	0.43
	(0.40)	(0.41)	(0.49)	(0.47)	(0.50)
NPK fertilizer	0.04	0.04	0.29	0.37	0.35
	(0.21)	(0.19)	(0.45)	(0.48)	(0.48)
Urea	0.05	0.05	0.28	0.36	0.33
	(0.21)	(0.21)	(0.45)	(0.48)	(0.47)
Compost/manure	0.03	0.02	0.05	0.05	0.04
	(0.16)	(0.14)	(0.22)	(0.22)	(0.21)
Pesticide	0.04	0.02	0.25	0.34	0.34
	(0.18)	(0.16)	(0.43)	(0.48)	(0.47)
Herbicide	0.01	0.01	0.15	0.19	0.18
	(0.11)	(0.11)	(0.36)	(0.39)	(0.39)
Fungicide	0.00	0.00	0.05	0.06	0.06
	(0.00)	(0.00)	(0.22)	(0.24)	(0.24)

Source: Community survey. Sample mean with standard deviation in parenthesis. Number of observations: 370.

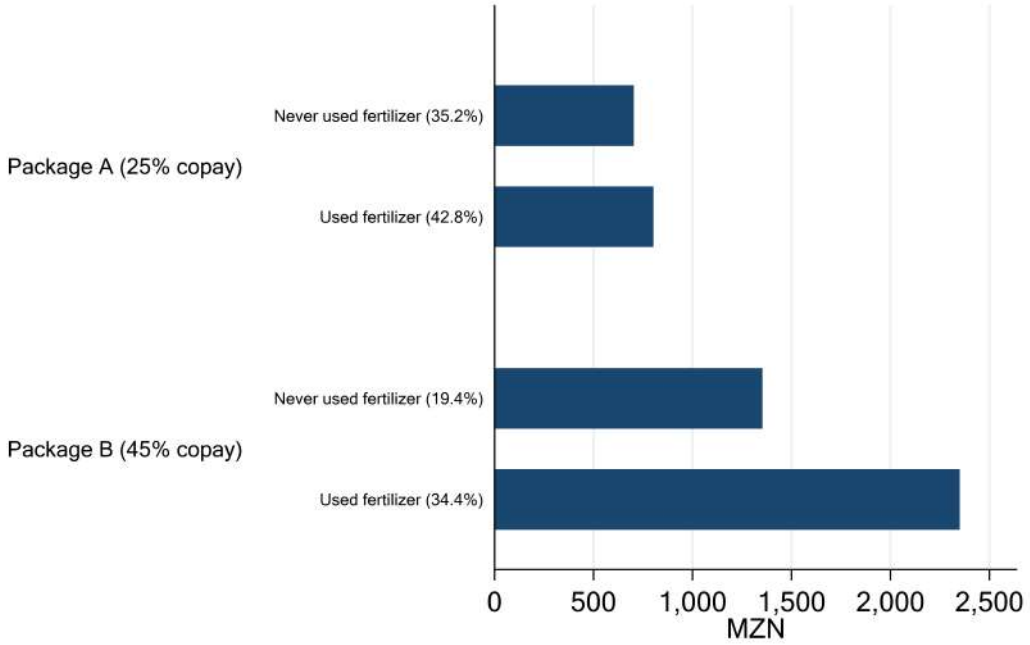
5.2.2 Willingness to pay for inputs

Households, extensionists, and agrodealers were asked about their willingness to pay (WTP) for two different packages of inputs of approximately the value of inputs subsidized by previous FAO and Government of Mozambique programs: package A, which includes only 17 Kgs of maize improved seeds (approximate cost is 2,000 MZN), and package B, which includes 30 Kgs of maize improved seeds, 50 Kgs of urea and 50 Kgs of NPK (approximate cost is 7,000 MZN). For each of the packages, they were also asked about each respondent's willingness to pay depending on the delivery and payment mode - which could be (1) buying it at the closest shop (2) having the package delivered at home and (3) paying after harvest.

When looking to the WTP between households that have never used fertilizer and households that have already done so, we see that the second group of households has a much greater WTP for the second package than the first one (Figure 5.9), which suggests that households that have already used fertilizer have a better knowledge of the price of package B and are more willing to pay for the inputs

included in it. However, we can not rule out that other characteristics of households, such as wealth or land, could explain both past experience with inputs and willingness to pay.[6] This suggestive result is a motivation for the input subsidy experiment, which will allow the evaluation to more rigorously establish whether experience with inputs increases future willingness to pay.

Figure 5.9: Willingness to pay for inputs - by fertilizer use

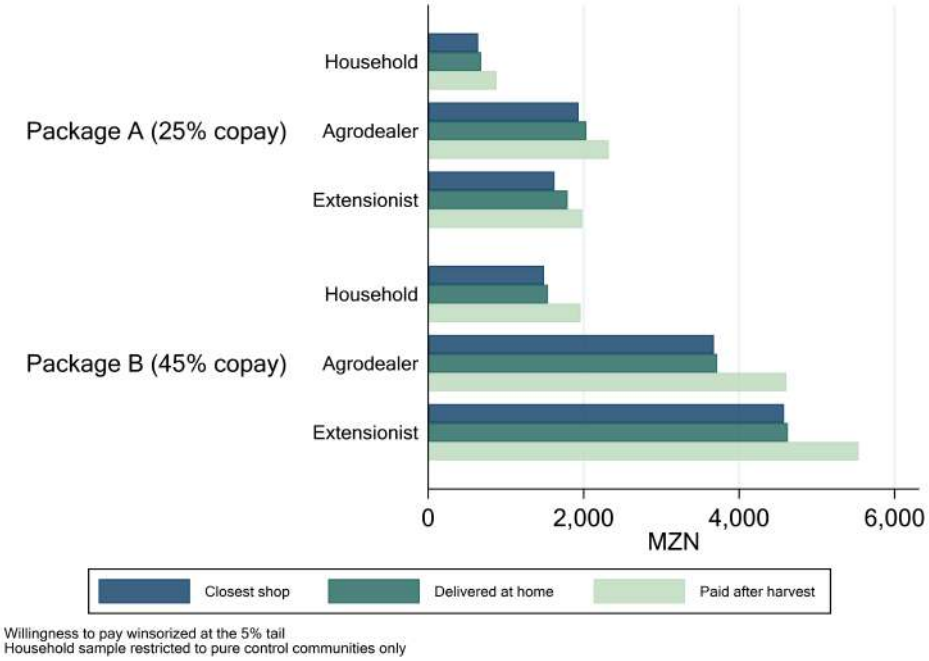


Value between parenthesis represents the share of the package approximate value
Figure reports average value for the three purchase modalities
Sample restricted to pure control communities only.
Share of households that used fertilizer: 16.08 %
Willingness to pay winsorized at the 5% tail

Lastly, we can compare the willingness to pay for inputs of households, agrodealers and extensionists according to the different delivery and payment conditions. A few points should be highlighted. Firstly, as expected, possibility of paying after harvest increases overall willingness to pay for both packages (difference between this modality and the other two is always significant at the 1% level). Secondly, while extensionists are the ones willing to pay the most for package B, this is true for agrodealers in the case of package A. Reasons for that might be several, such as the possibility that extensionists place greater value on fertilizer use.

[6] It should be noticed, however, that only 16.08% of the sample has ever used fertilizer.

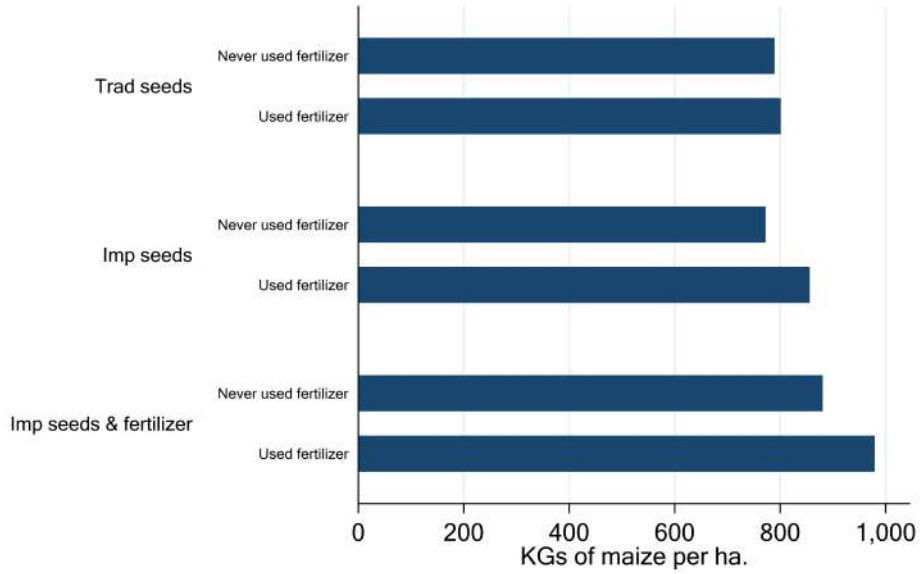
Figure 5.10: Households, agrodealers and extensionists - Willingness to pay for inputs



Perceived returns for inputs used: The last set of questions was dedicated to measuring the effects of the intervention in farmers beliefs regarding their perceived returns for inputs used. Once again, farmers, extensionists and agrodealers were asked how much maize they would expect to produce in their main plot depending on the type of inputs used: using traditional seeds, only improved seeds or combining improved seeds and fertilizer.

Figure 5.11 shows that, in general, households' expected potential production is larger when using improved seeds and fertilizer, but probably not as large as actual production would be in practice. Surprisingly, households have barely the same production expectations when using traditional or improved seeds.

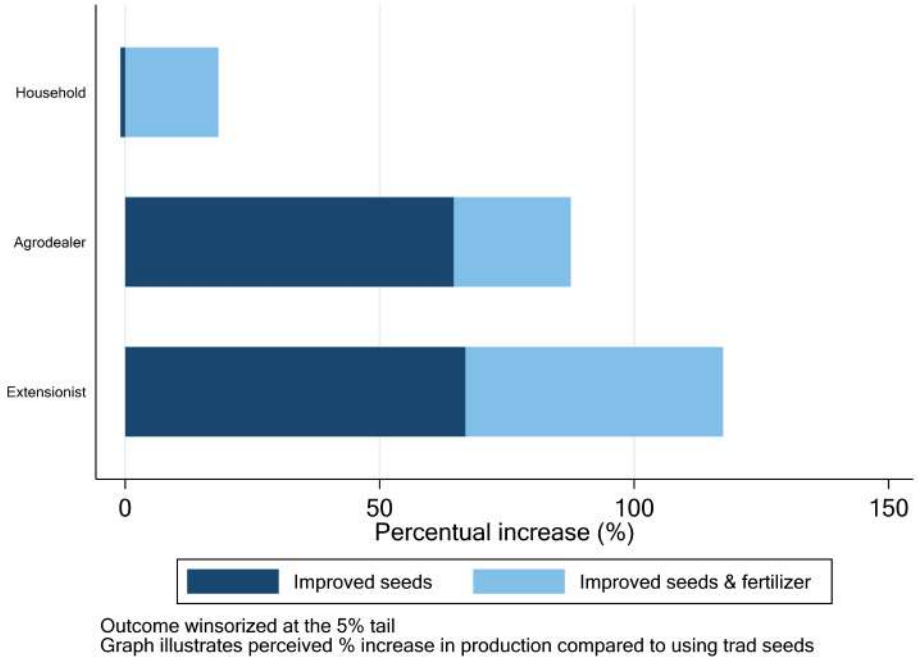
Figure 5.11: Potential production per hectare using different set of inputs



Outcome winsorized at the 5% tail
Sample restricted to pure control communities
Sample restricted to HHs that have ever cultivated maize (84%)
Share of households that have used fertilzer: 16.08%

One last interesting comparison is to see how expected maize production changes between households, agrodealers and extensionists. Whereas figure 5.11 reported expected production per hectare, figure 5.12 compares expected percentage increase in maize production using only improved seeds and using improved seeds together with fertilizer, in comparison to expected production using traditional seeds. Extensionists believe that using only improved seeds increases production by about 70%, and with fertilizer, it increases by another 60%. On the other hand, households' expected production increases by less than 25% when using both fertilizers and improved seeds. In fact, on average, households think that potential production using improved seeds is smaller than using traditional seeds.

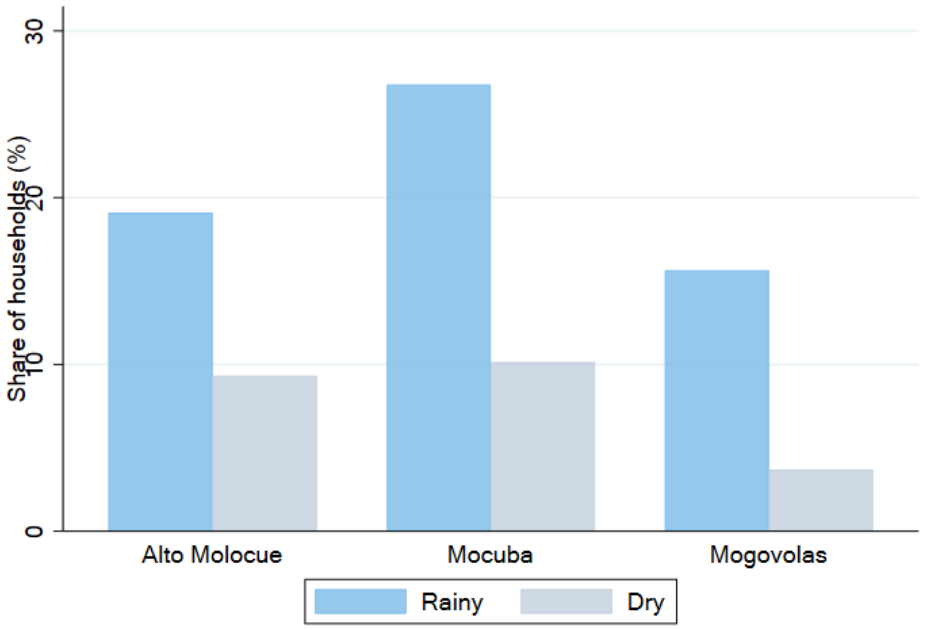
Figure 5.12: Household, agrodealers and extensionists - Cumulative potential production using different set of inputs



5.2.3 Hired labor

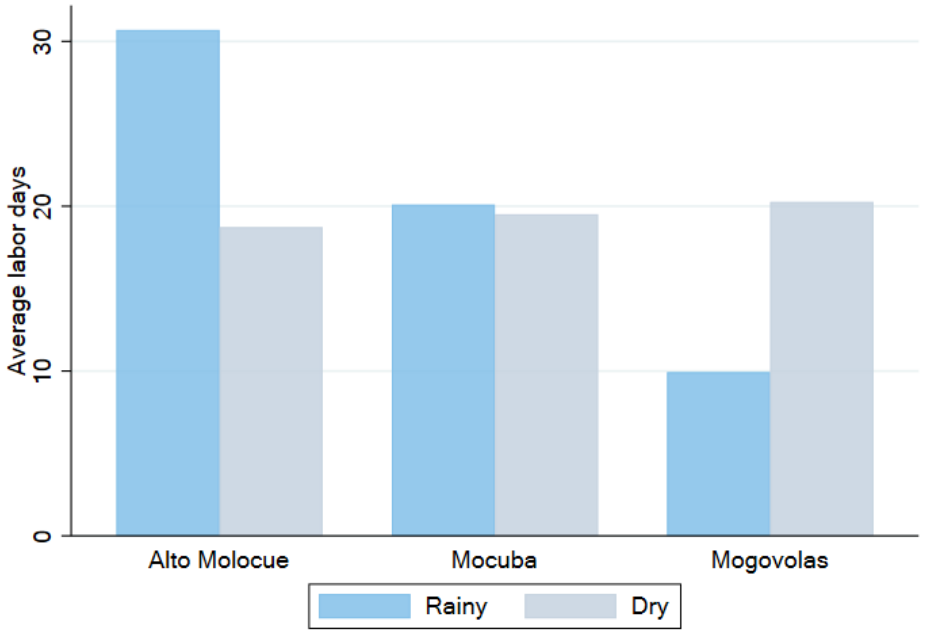
In addition to agricultural inputs, external labor plays an essential role in increasing the land productivity. Figures 5.13 and 5.14 show a summary of labor hired by hub. On average, a quarter of the households hires any labor, with a greater share hiring during rainy season. Across hubs, a fewer share of households in Alto Molocue hire any labor, but among the households that hire, labor was hired for a longer period of time compared to other hubs. This could be because the average land size and the number of plots are higher in Alto Molocue.

Figure 5.13: Hired labor - by hub and season



Sample inlcudes 623, 622, and 396 households from Alto Molocue, Mocuba, and Mogovolas respectively

Figure 5.14: Hired labor days - by hub and season



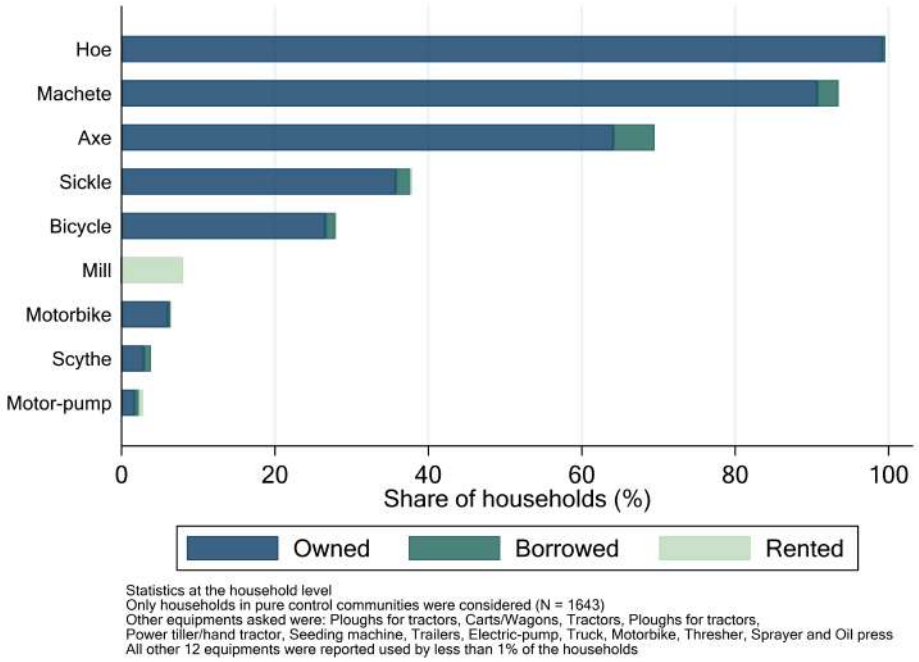
Sample inlcudes 131, 180, and 62 households from Alto Molocue, Mocuba, and Mogovolas respectively.

5.2.4 Equipment

Figure 5.15 shows that most of the equipment used is manual, and not mechanized. By far, the most used equipment are hoe and machete, which are used by

almost all our sample. Households mostly use equipment they own themselves, with the exception of the mill, which is always rented when used.

Figure 5.15: Types of equipments used



5.3 Output

5.3.1 Area cultivated

By facilitating access to improved technology and promoting its adoption, a program like the one under study can lead to both expansion in area cultivated and intensification of cultivation within a given area. Table 5.3 and Figure 5.16 show that there is room for expansion on both margins. A median household owns 1.5 hectares of land and cultivates 88% of the land in the rainy season, and only 50% of the land in the dry season.

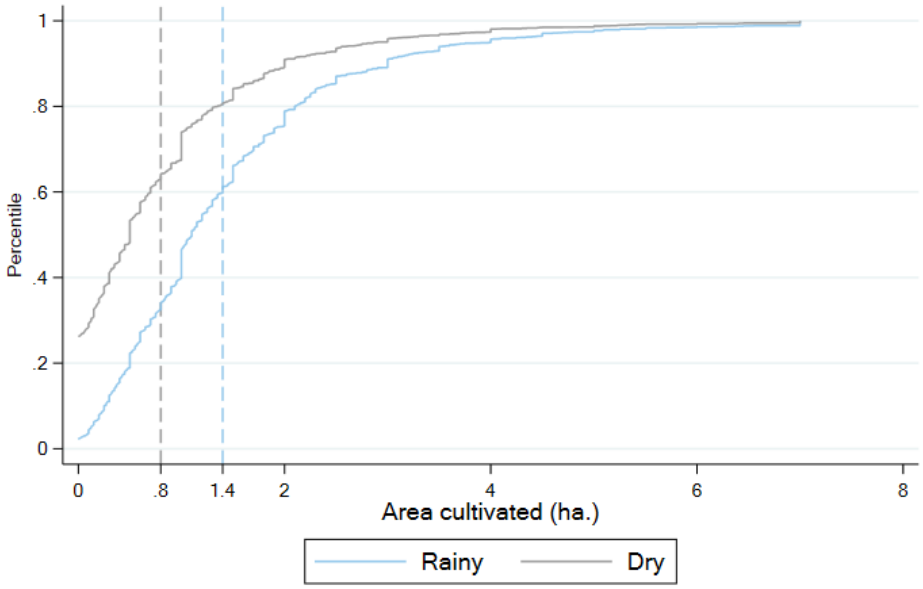
Figure 5.17 further shows the share of the plot area cultivated by season. In the rainy season, on average only 55% of the plots are almost fully cultivated, and in the dry season this number falls to only 25% of the plots. This shows that our sample is heavily dependent on rains for cultivation, and about half of the households do not utilize their available area fully.

Table 5.3: Area cultivated - summary

	p5	p25	p50	p75	p95
Total plot area (ha.)	0.40	1.00	1.54	2.50	5.00
Area cultivated (ha.)	0.25	0.76	1.25	2.00	4.00
Area cultivated (ha.) - Rainy season	0.13	0.60	1.10	1.92	4.00
Area cultivated (ha.) - Dry season	0.00	0.00	0.50	1.06	2.90
Share cultivated - Rainy season	0.22	0.60	0.88	1.00	1.00
Share cultivated - Dry season	0.00	0.00	0.50	1.00	1.00

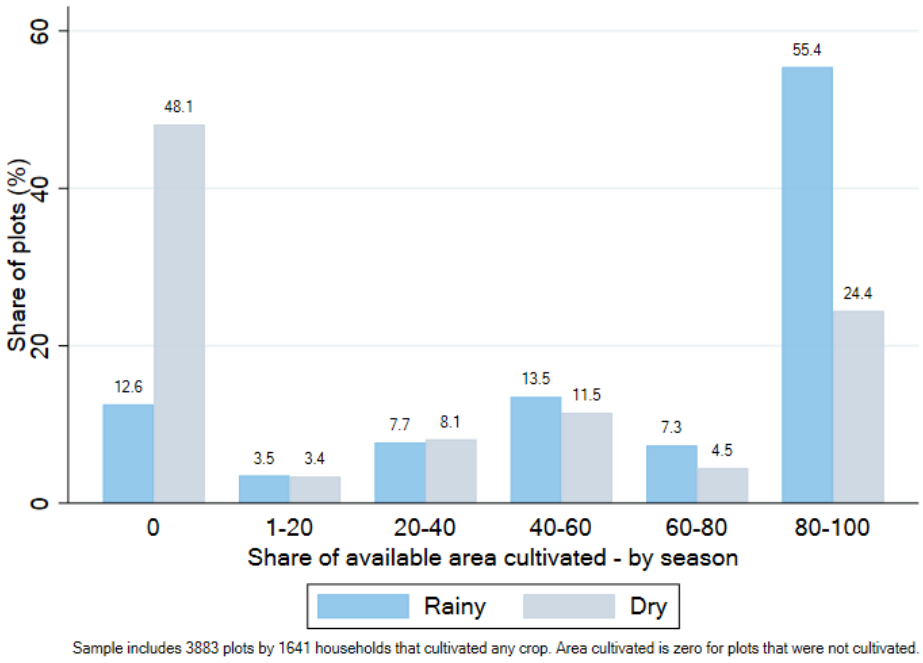
Sample includes 1641 households.

Figure 5.16: Cumulative distribution of area cultivated (ha.)



Sample includes 1641 Households. Dashed lines represent the mean of the outcome.
Area cultivated is zero if no crop was planted.
The average area cultivated conditional on cultivating for rainy and dry season is 1.5 and 1.1 ha.

Figure 5.17: Share of the plot size cultivated

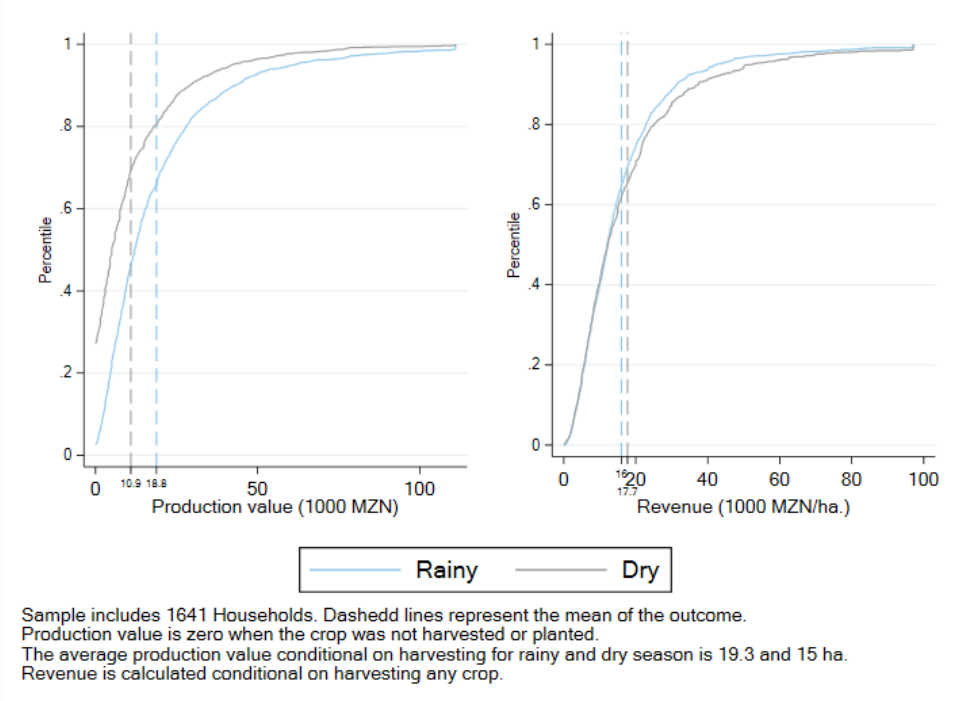


Sample includes 3883 plots by 1641 households that cultivated any crop. Area cultivated is zero for plots that were not cultivated.

5.3.2 Production

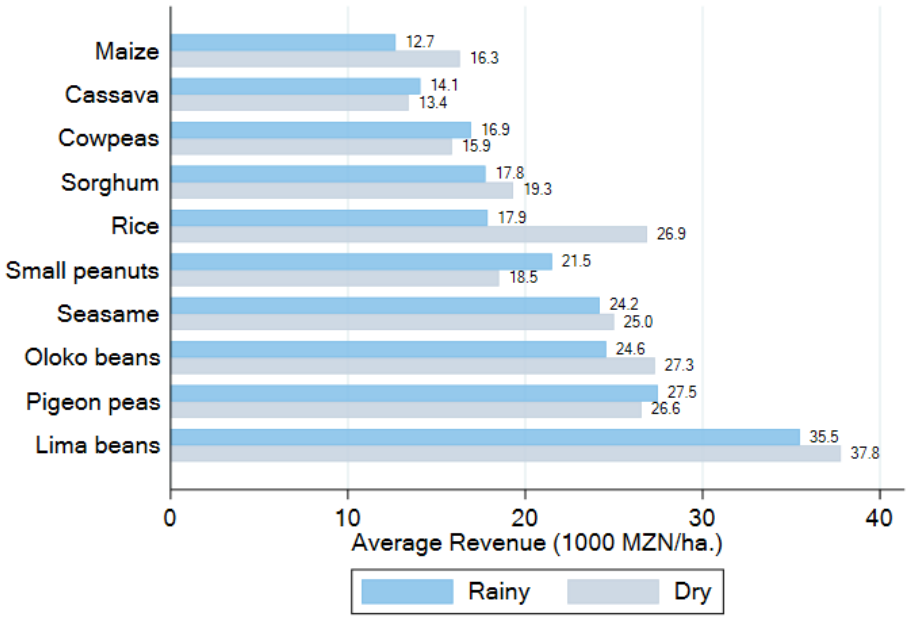
Figure 5.18 shows the distribution of the production value (MZN) and revenue (MZN/ha.). The production value (MZN) is higher in the rainy season with about 60% of the households producing less than the average of 18,800 MZN, whereas revenue is slightly higher in dry season with about 60% of the households producing less that average of 17,700 MZN per hectare. To get a sense of the return of each crop, Figure 5.19 summarizes the revenue of the 10 most commonly cultivated crops. Lima beans seem to be most profitable, followed by pigeon peas and sesame. Finally, in terms of the quantity produced per hectare, cassava seems to be most productive, producing on average 1.4 tons per hectare, followed by peanuts and maize (Figure 5.20).

Figure 5.18: Cumulative distribution of production value (1000 MZN) and revenue (1000 MZN/ha.)



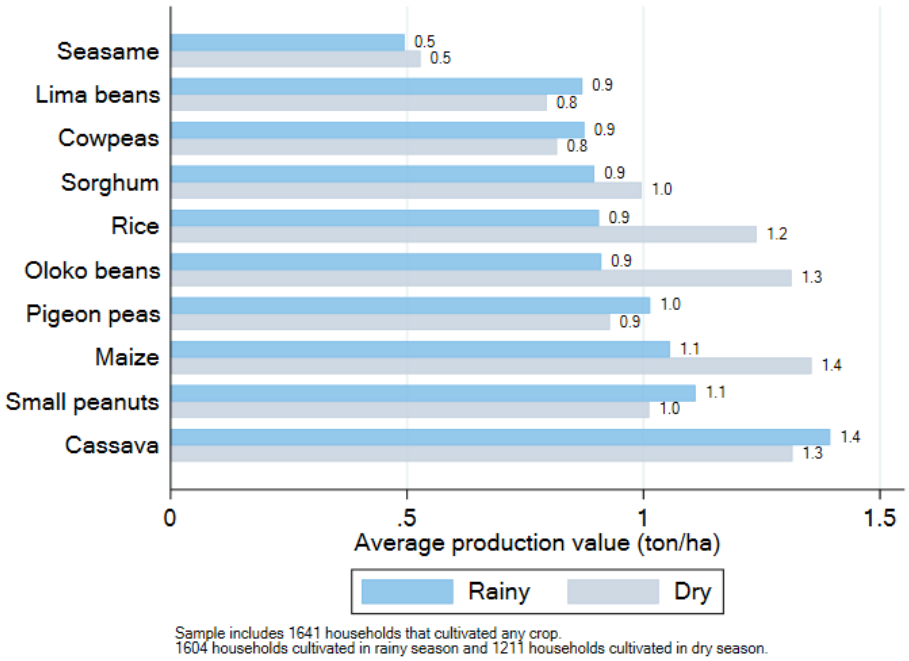
Sample includes 1641 Households. Dashedd lines represent the mean of the outcome.
Production value is zero when the crop was not harvested or planted.
The average production value conditional on harvesting for rainy and dry season is 19.3 and 15 ha.
Revenue is calculated conditional on harvesting any crop.

Figure 5.19: Revenue (MZN/ha.) of top 10 crops - by season



Sample includes 1641 households that cultivated any crop.
1604 households cultivated in rainy season and 1211 households cultivated in dry season.

Figure 5.20: Production value (ton/ha.) of top 10 crops - by season

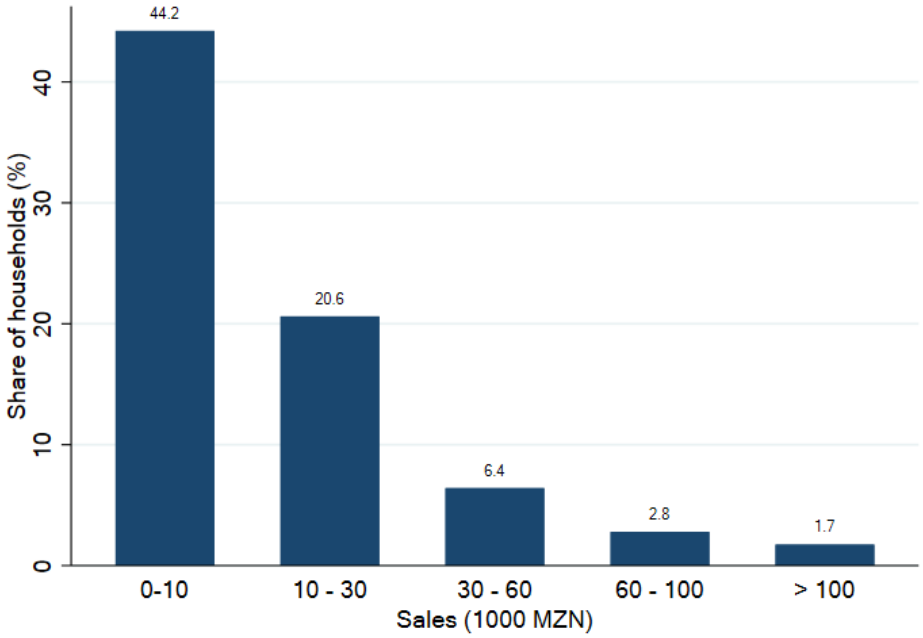


5.4 Commercialization

Improving commercialization is one of the goals of the project. 76% of the households report selling any of their production: Figure 5.21 shows the distribution of the total sales made by the households over the last year. The average sales value is 12,300 MZN, with about half of the households making less than 10,000 MZN from selling their production. Figure 5.22 further shows the 10 most commonly sold crops. Maize is the most sold crop in the rainy season, and pigeon peas is the most sold crop in the dry season. The only difference by hub is seen in Mogovolas, where small peanuts and oloko beans are the most sold crops. Cash crops like soy and sesame are sold by only 10% of the households. However, in terms of share of produce sold, 90% of the cash crops produced are sold, and for staples only about half of the crops produced are sold.

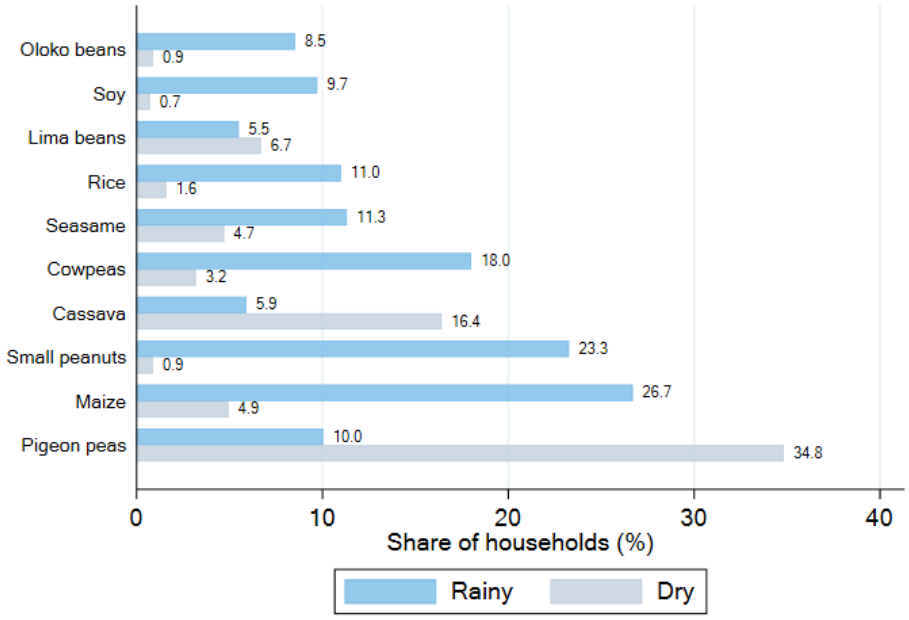
We also asked the households who buys their produce (Figure 5.24) and where do they sell them (5.25). The selling practices vary a little by hub. Most of the households in Alto Molocue and Mogovolas sell their produce to merchants, whereas households in Mocuba sell their produce directly to the consumer. The majority of the households sell their produce at their own house, indicating the absence of formal markets.

Figure 5.21: Distribution of total sales (1000 MZN)



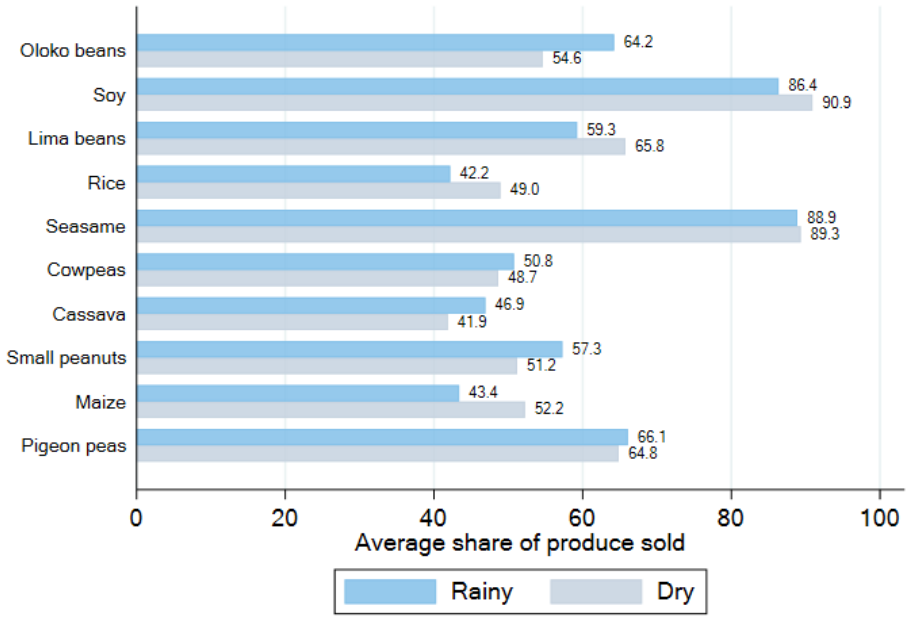
Sample includes 1641 households, out of which 1255 sold any produce.

Figure 5.22: Top 10 crops sold - by season



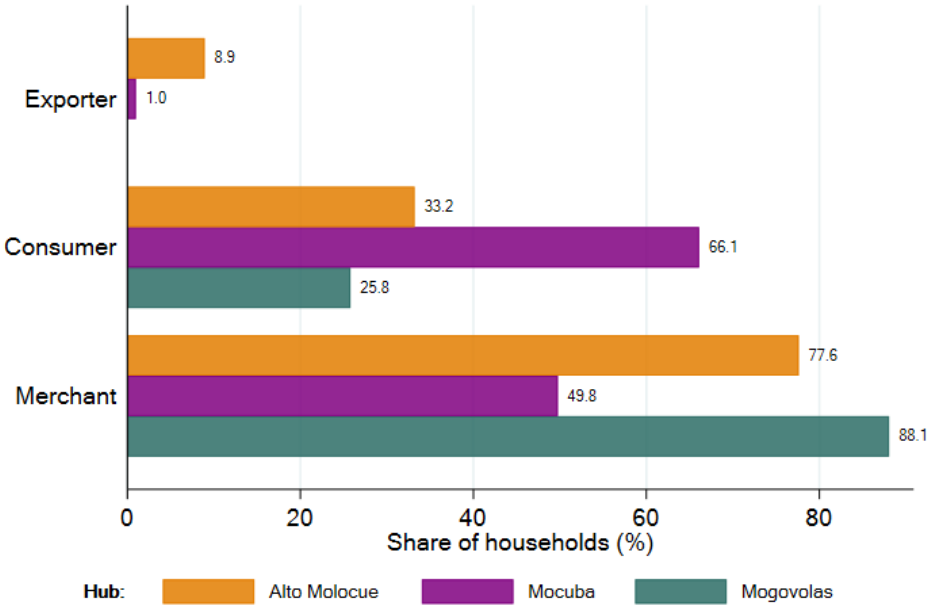
Sample includes 1255 households that sold any crop across 2 seasons.
1064 households sold in rainy season and 749 households sold in dry season.

Figure 5.23: Share of produce sold for top 10 crops - by season



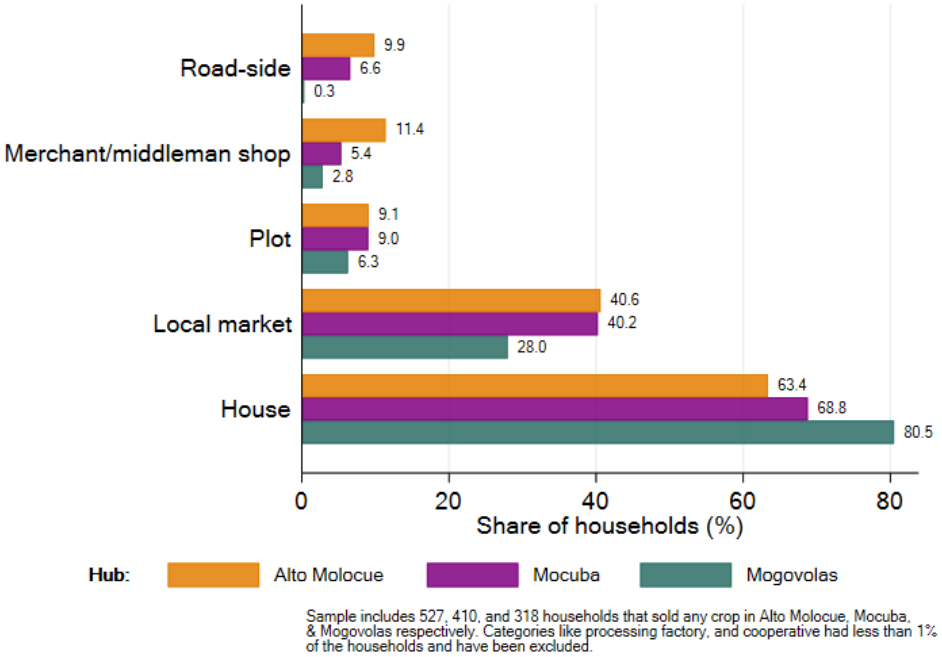
Sample includes 1255 households that sold any crop across 2 seasons.
1064 households sold in rainy season and 749 households sold in dry season.

Figure 5.24: Produce was sold to - by hub



Sample includes 527, 410, and 318 households that sold any crop in Alto Molocue, Mocuba, and Mogovolas respectively.
Categories like processor and input/other company had less than 1% of the households and have been excluded.

Figure 5.25: Where was the produce sold - by hub



Sample includes 527, 410, and 318 households that sold any crop in Alto Molocue, Mocuba, & Mogovolas respectively. Categories like processing factory, and cooperative had less than 1% of the households and have been excluded.

6 Household income

The survey also asked the households about incomes derived from various business activities. The average household income is 17,720 MZN, with about half of the households making less than 10,000 MZN (Figure 6.1). The major source of income is the sales of the crops that were produced. Figure 6.3 shows that as the income bracket increases, the share of income that comes from formal and informal activities, and transfers, decreases. This suggests that increasing agricultural productivity for households with lower incomes can result in an inclusive economic growth and less reliance on transfers or informal income sources.

Figure 6.1: Distribution of household income (1000 MZN)

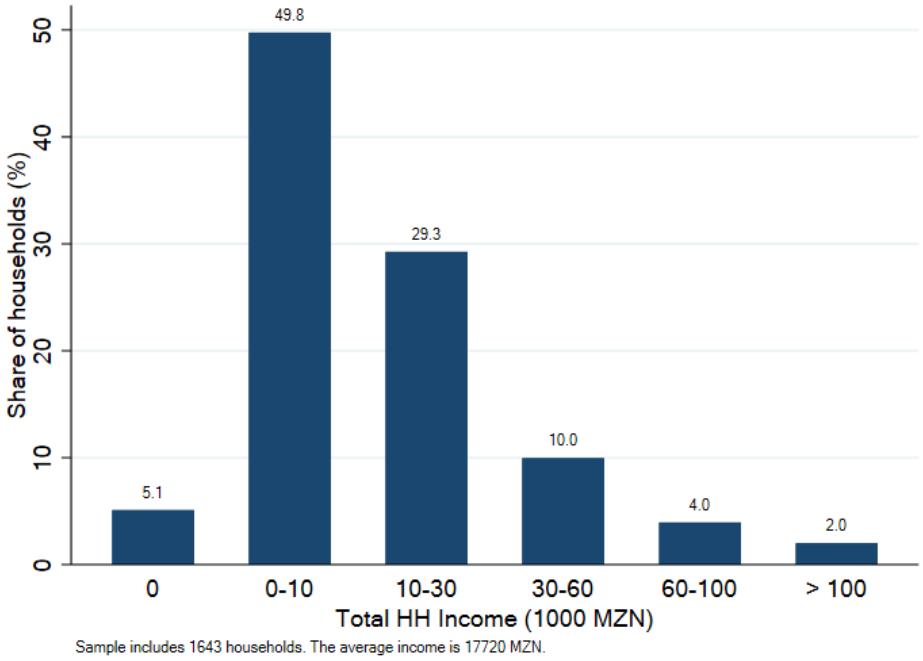
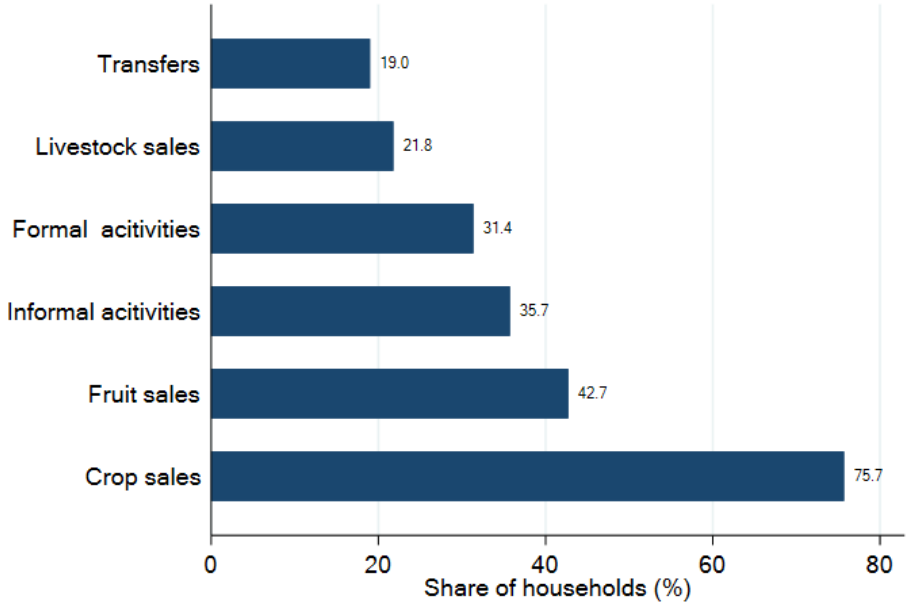
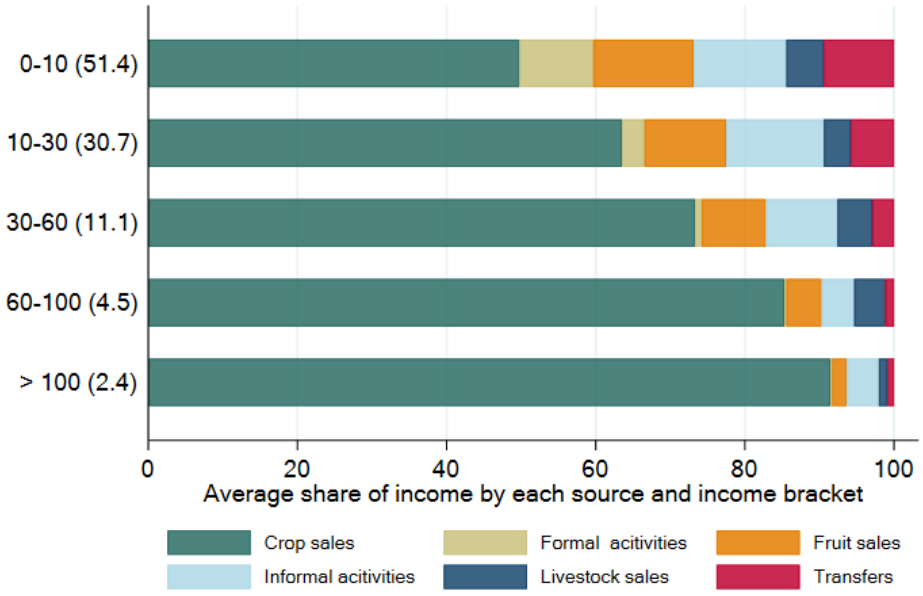


Figure 6.2: Sources of household income



Sample includes 1643 households.
Formal activities refers to any kind of work done for someone else.
Informal activities refers to self-employed work.

Figure 6.3: Distribution of household income and sources of income



Sample is restricted to 1562 households that make any income.
y-axis shows the income brackets (1000 MZN) with the share of households earning that income in paranthesis.
Formal activities refers to any kind of work done for someone else. Informal activities refers to self-employed work.

7 Access to extension and adoption of practices

One of the main objectives of the FFS is to encourage the diffusion of innovative farming practices and modern inputs in rural communities. This section presents data on current access to extension, knowledge and adoption of agricultural practices and the result of knowledge tests in baseline control communities.

7.1 Access to extension services

Access to extension services by farmers in our sample of interest is, in general, low. Figure 7.1 shows that almost half of the households did not received any technical advice during the last or current agricultural campaign, while around 40% of the farmers that did received advice, received it from either friends or neighbors or family members. Only around one quarter received advice from an extensionist, community leader or association.

Figure 7.1: Source of the technical advice received

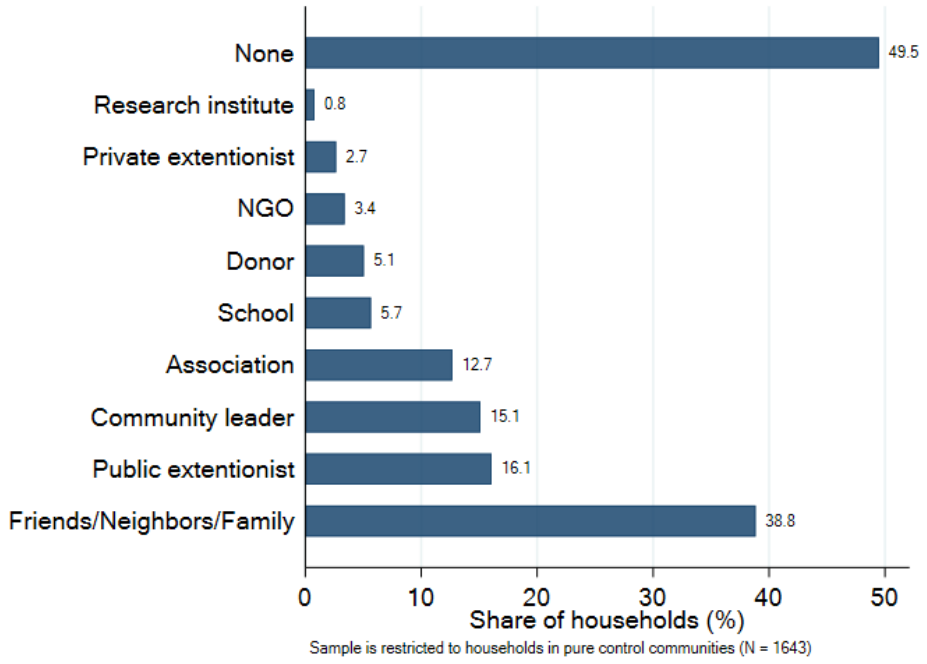
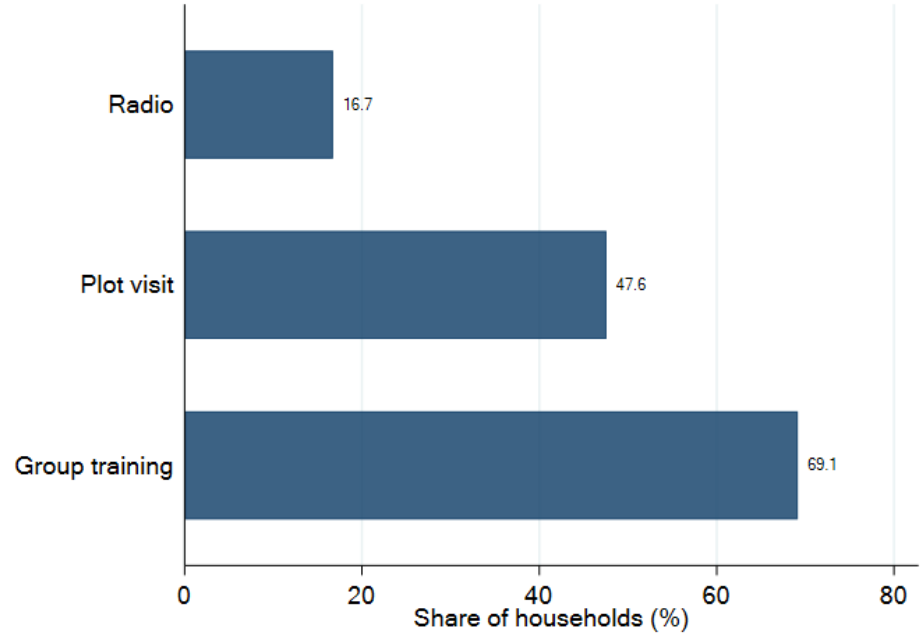


Figure 7.2 shows that support from extension agents is often organized through group trainings. About half of those working with an extension agent report that some form of plot visit was part of the methodology used.

Figure 7.2: Source of the technical advice received by public extensionist

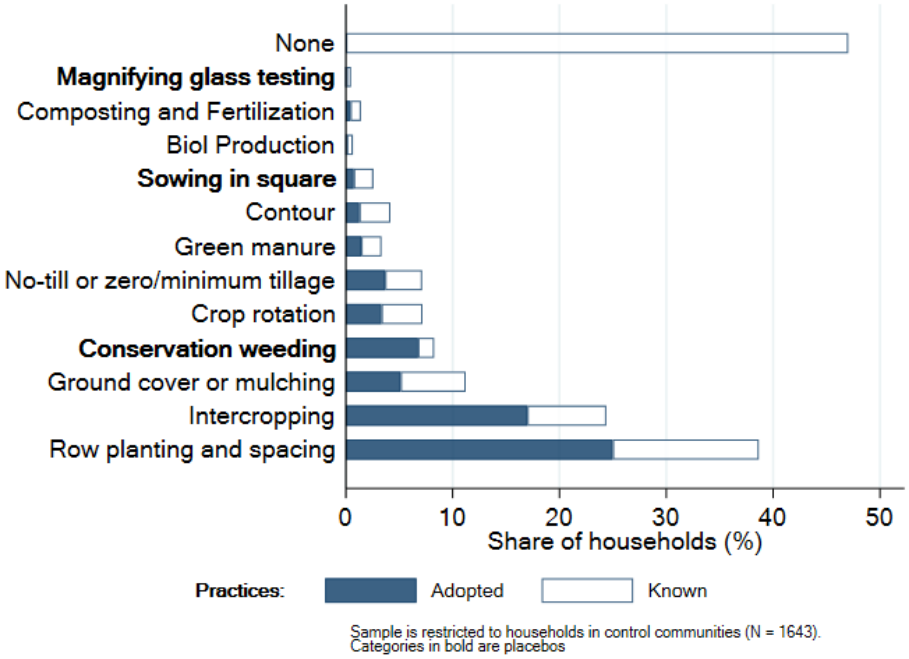


Sample is restricted to 287 households in control communities that reported receiving advice from public extensionist

7.2 Awareness/Adoption of agricultural practices

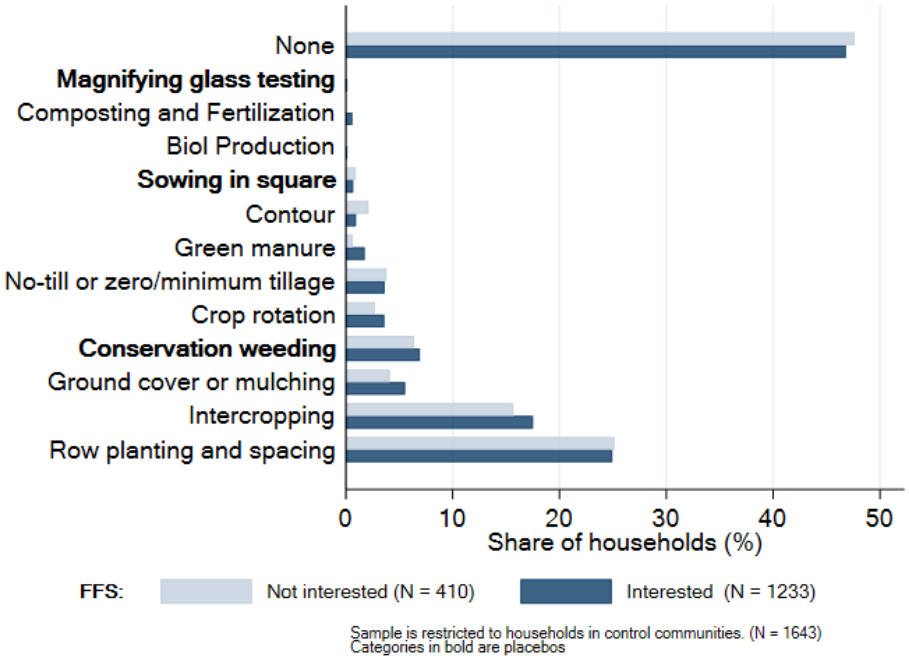
General awareness and adoption of the FAO promoted sustainable land management practices is low (Figure 7.3). Households were asked about their knowledge and usage of nine different agricultural practices as well as three *placebo* practices (i.e., not real agricultural practices). More than 40% of the respondents reported not having heard about any of these practices. By far, the practice mostly commonly known and adopted is row planting and spacing, with almost 40% of the farmers reporting knowing of the practice. Among the group that is aware of the practice, nearly two thirds adopt it. The second most adopted practice is intercropping. While awareness is in general low, the relative proportion between households that know the practice and use it are similar to row planting one, although there is much less basic awareness of the other practices. Overall, about half of the farmers know any techniques, and only 40% of those adopt at least one technique on their plots.

Figure 7.3: Awareness of practices/adoption by households



While the previous figure shows averages in the community, we see that awareness and adoption is slightly higher amongst those community members that expressed interest in participating in the FFS, about 8 percentage points overall.

Figure 7.4: Practices adopted

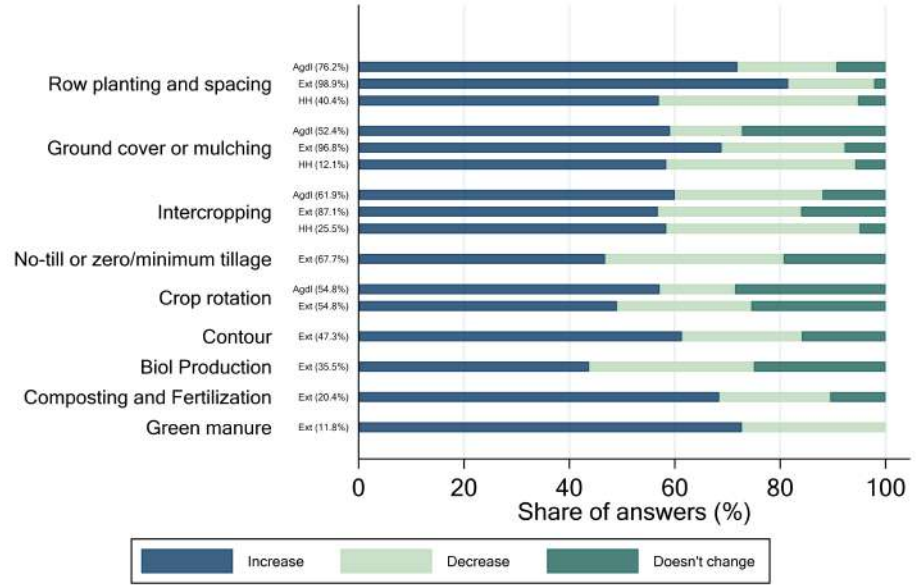


7.2.1 Beliefs on returns to agriculture practices

Part of the objective of the FFS is generating awareness as well as update farmers beliefs about the returns to the promoted agricultural practices by testing them in real conditions in farmer's communities.

Generally households believe that the adoption of the promoted practices would increase the hours they spend working at a plot. Answers are restricted to respondents who report knowing the practice - the share of these respective respondents is reported between parentheses. The same question was asked to extensionists and agrodealers, and Figure 7.5 illustrates the difference in their beliefs to households' ones. In general, it seems that a higher share of agrodealers and extensionists believe that time spent would increase. At the first follow-up survey we will include measures in terms of yields and ask how the practices might affect the uncertainty of production.

Figure 7.5: Households, agrodealers and extensionists - believed return to agricultural practices - working hours



Question refers to difference in working hours spent at the plot
Household sample restricted to pure control communities only
Sample restricted to respondents who know the practice
Bars graphed only if at least 10% of the respondents know the practice

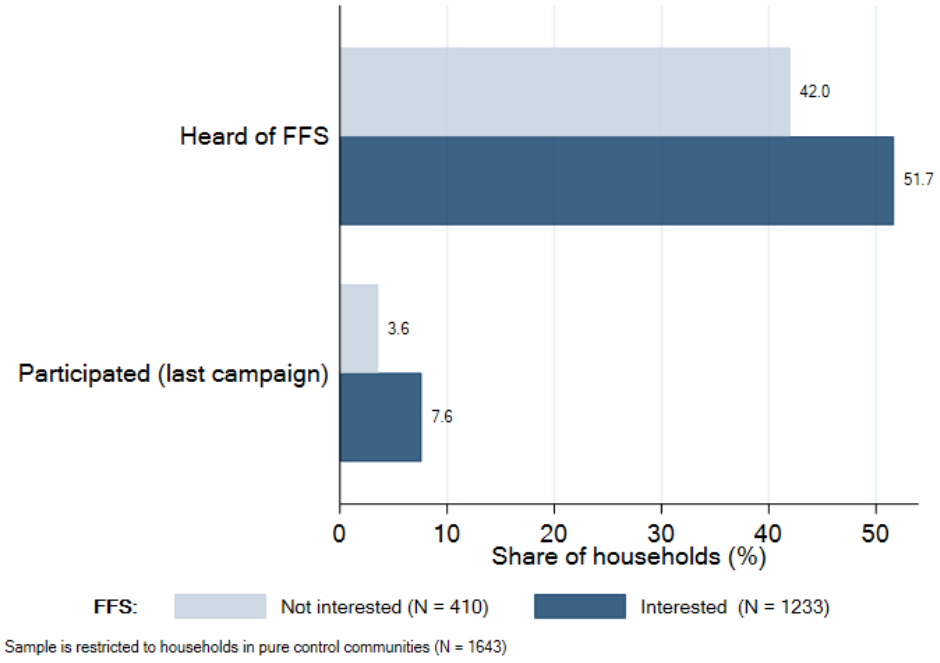
7.3 Access to FFS

By rolling-out the FFS intervention, the program seeks to increase access to extension services and technical expertise available in the community. To have a

benchmark of awareness and participation of previous FFS programs households are asked whether they have ever heard about FFS ("heard of FFS") and if they participated in the program previously.

Overall many households report having heard of the FFS approach. When looking at access to FFS at the household level, we can divide over FFS interested and FFS not interested households. Figure 7.6 reveals that interested households tend to have a higher awareness of FFS, having heard more often about the program and showing a significantly higher participation rate the during last campaign.

Figure 7.6: Access to FFS



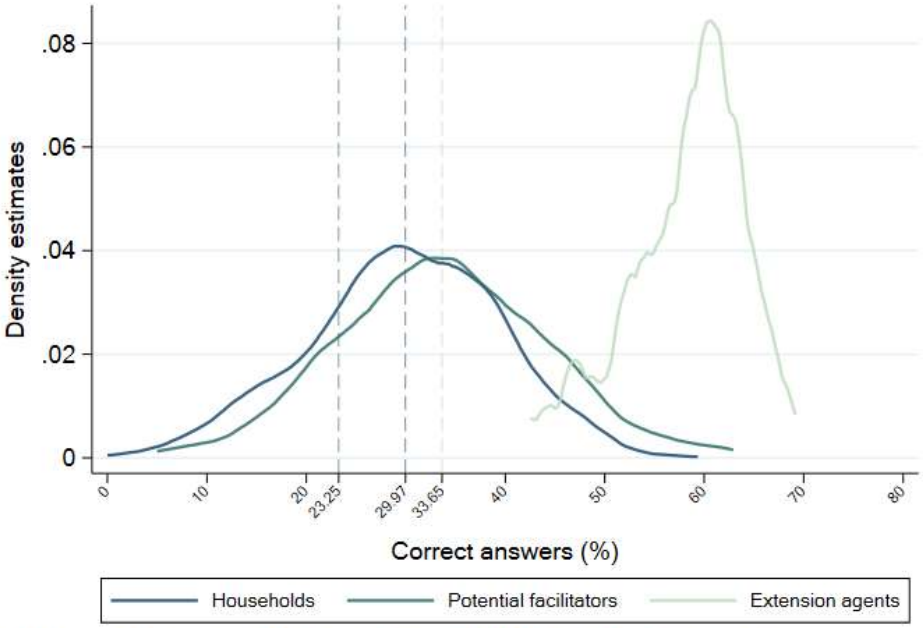
7.4 Knowledge tests

A necessary step along the theory of change envisioned for the intervention is that extension agents are able to effectively disseminate information on agricultural technologies through the FFS model. This relies on EAs mastering these practices and having the pedagogical tools to train the farmers participating in the FFS. In order to measure knowledge gains over time, one section of the household and extensionist agents surveys has been dedicated to a knowledge test of agricultural best-practices, developed based on the knowledge test used in Kondylis et al. (2017). The test was further adapted with master trainers from FAO to the FFS cur-

riculum. The test uses multiple-choice questions and captures the core curriculum of promoted practices, such as row planting, mulching, intercropping, rotation, fallowing, zero-tillage, contour farming, composting and organic fermented fertilizer. The final score is expressed on a scale of 0-100.[7]

Figure 7.7 shows that, as expected, EAs' score is much higher than households and likely FFS facilitators: average EA test score is 58.1%, almost the double the average farmer score. The distribution also shows that the bottom 10% EAs are only outperformed by the top 2% farmers. The results also indicate that facilitators appear to be on average more knowledgeable.

Figure 7.7: Distribution of test scores - households, facilitators and extensionists



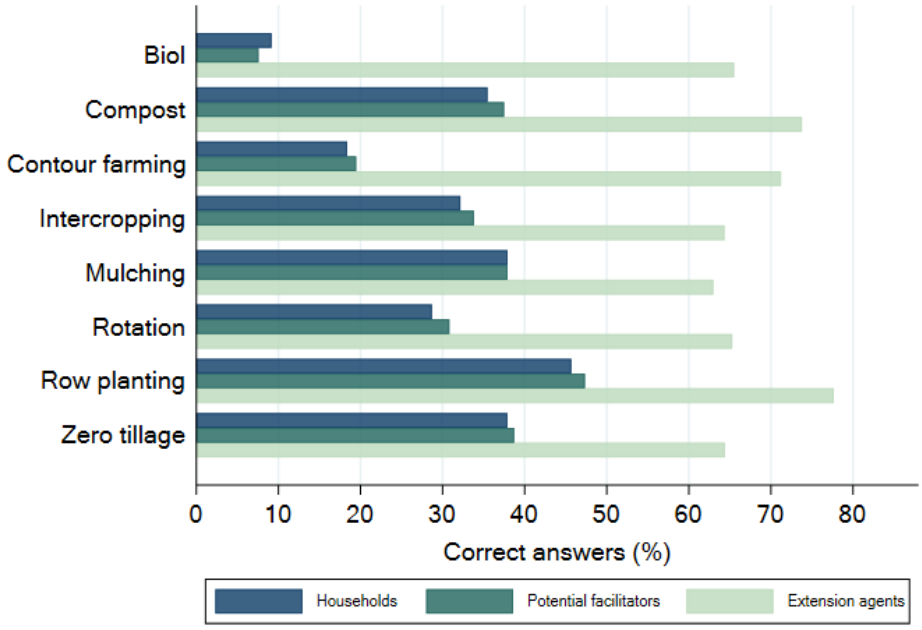
Only households and potential facilitators from pure control communities were considered

There is also a distinct difference between EAs and farmers when comparing scores by topic. While EAs score quite consistently across topics, farmers' score varies more (Figure 7.8). The test approaches eight different topics like intercropping, row planting and crop rotation. Households are relatively familiar with row planting, mulching, compost and zero tillage, while they know little about Biol. We do note that each topic is composed by a different number and style of questions, which

[7]The test has a total of 40 questions from which 16 are multiple-choice multiple-answer (MA), 14 are multiple-choice singe-answer (SA) and 10 are true or false (TF) questions. For multiple-choice question, partial points were given to each correct answer, and deducted for each wrong answer.

slightly affects the possible distribution of scores. While crop rotation, for example, is composed by one multiple-choice multiple-answer question, one multiple-choice single-answer and one true or false question, intercropping is made of four multiple-choice multiple-answer and four multiple-choice single-answer questions.

Figure 7.8: Average test score by topic - households, facilitators and extensionists

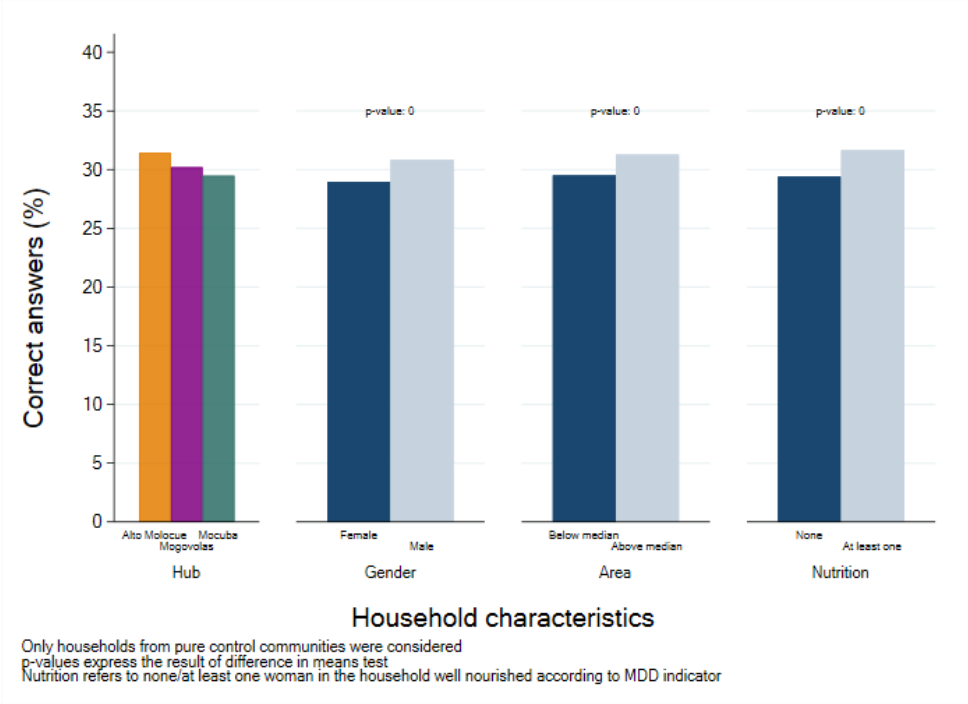


Only households and potential facilitators from pure control communities were considered

The average household scores mask some noteworthy differences by specific household characteristics. Figure 7.9 shows that households headed by a male, with a total plot area above the median, and with at least one woman well nourished according to the MDD-W indicator[8] present significantly higher test scores.

[8]This indicator will be presented in detail in the next section.

Figure 7.9: Average test score - by household characteristics



Only households from pure control communities were considered
p-values express the result of difference in means test
Nutrition refers to none/at least one woman in the household well nourished according to MDD indicator

8 Nutrition

Besides being a key quality of life indicator, nutrition was one of the topics approached during FFS sessions. In order to measure the evolution of the nutritional status of families that are part of the intervention, the applied household survey had a section dedicated to this topic.

To standardize the measurement of such a broad topic, the minimum dietary diversity in women (MDD-W) index was adopted, a food group diversity indicator that has been shown to reflect one key dimension of diet quality: micronutrient adequacy. The MDD-W is a dichotomous indicator of whether or not women 15–49 years of age have consumed at least five out of ten defined food groups during the previous day or night.

According to the MDD-W, women who have consumed at least 5 of the 10 possible food groups over a 24-hour recall period are classified as having minimally adequate diet diversity.

Figure 8.1 illustrates which of the food groups are more consumed by women in our sample. The most consumed group is by far the one that includes grains, roots and tubers, with almost all women (around 95%) having consumed at least one food item of this group in the 24 hours before the survey. This is followed by meat, poultry and fish, dark leafy greens and vegetables and other vitamin-A rich fruits and vegetables. The less consumed group is dairy, with less than 5% of the interviewed women having consumed from such food group.

Figure 8.1: Food consumption - by food group

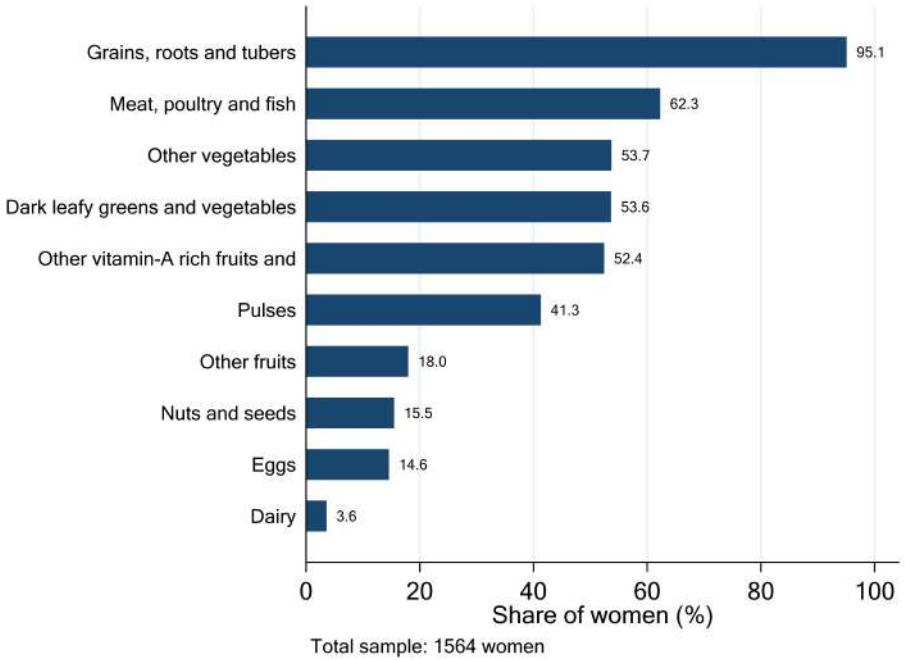


Figure 8.2 shows from how many food groups women interviewed have consumed in general.[9] Interesting to notice that almost a thousand women (22.6% of the sample) are not well nourished enough according to the indicator, due to only consuming 4, and not 5, out of the 10 food groups. Across hubs, 37% of the women interviewed show to have micronutrient adequacy.

[9] 12 women have reported not having consumed from any of the groups. Either this person has barely not eaten in the 24 hours before, or this might also be caused by a misunderstanding of the questions, and which foods are included in each group. However, this last possibility is mitigated by the fact that enumerators give food examples when each question is posed.

Figure 8.2: Number of food groups consumed

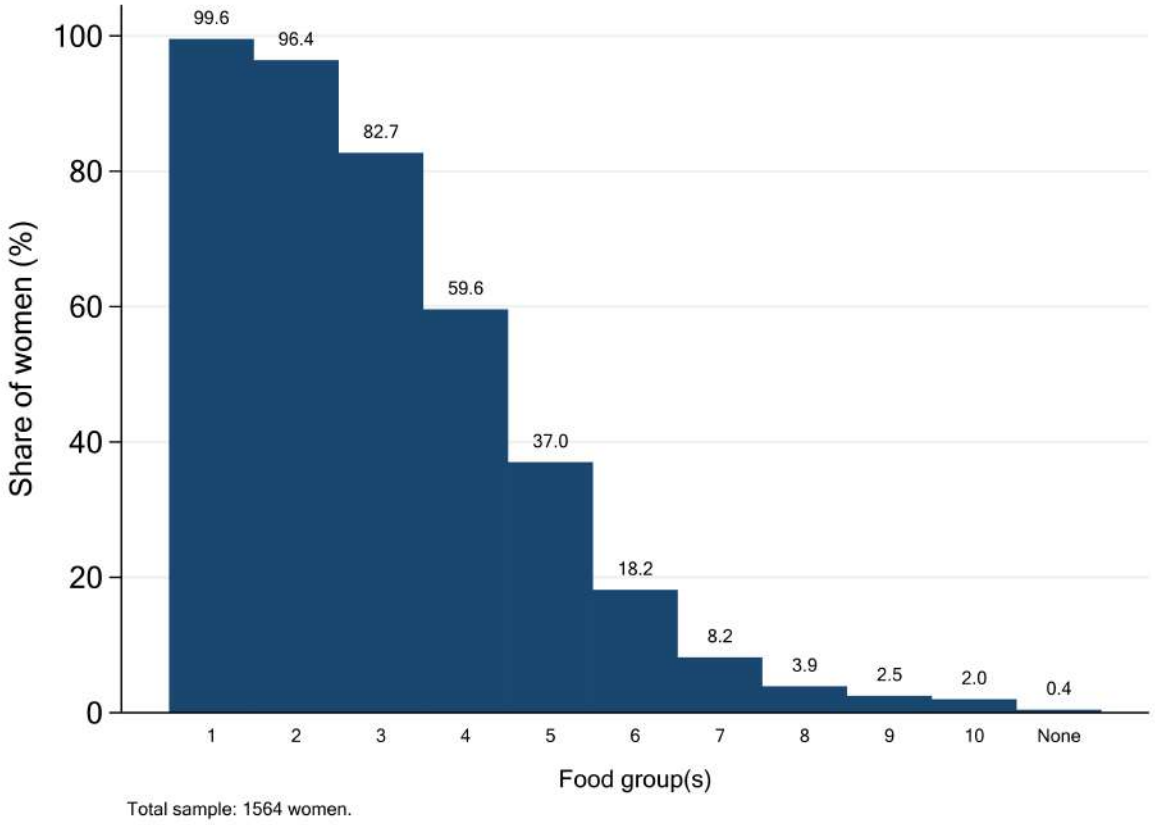


Figure 8.3 reveals the percentage of women in each hub that have consumed from at least 5 out of 10 food groups, and thus are considered “well nourished” by the indicator. Surprisingly, Mogovolas is the hub that presents the highest indicator, with 44.8% of the women interviewed being well nourished. Nonetheless, it should be highlighted that some of the differences between hubs might be due to the timing of the survey. Household surveys in Mogovolas, for example, have been done around end of November and the whole month of December, while surveys in Alto Molocue were realized from mid July to September.

Figure 8.3: MDD indicator - by hub

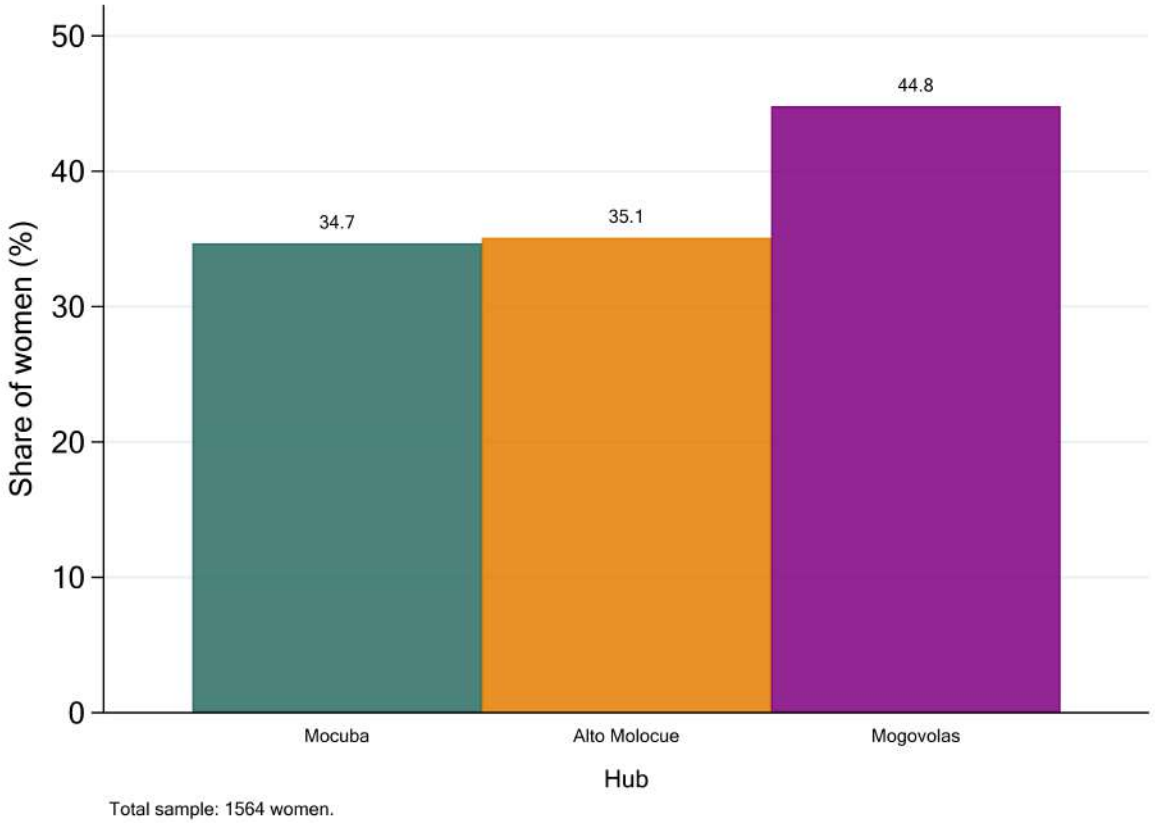


Table 8.1 reports the correlation between the number of food groups consumed by women in the household and household characteristics that relate to or could be affected by the intervention. Having ever participated in a FFS has a positive correlation with the number of food groups consumed by the women in the household, with an increase of almost 0.5 group, on average, significant at the 5% level. The number of crops cultivated by the household also correlates significantly (at the 1% level) with the average number of food groups consumed by the women in the household, while the number of plots owned by the household and having received advice from a public extensionist are not significant.

Table 8.1: Regression - Household characteristics

	No. of food groups consumed
Someone from	0.504**
the household has ever participated in a FFS	(0.210)
Number of	-0.0215
plots owned by the household	(0.0472)
Number of	0.111***
different crops cultivated by the household	(0.0244)
Household	0.0663
has received advice from a public extensionist	(0.199)
N	1264
adj. R^2	0.021

Standard errors in parentheses

Sample restricted to households with at least one woman between 15 and 49 years old.

Regression at the household level.

Standard errors clustered at the community level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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A Appendix

Table A.1: Household summary - by hub

	Alto Molocue Mean/SD	Mocuba Mean/SD	Mogovolas Mean/SD
Household characteristics			
Household size	5.31	5.51	5.45
	(2.24)	(2.48)	(2.13)
Household head is male	0.80	0.74	0.86
	(0.40)	(0.44)	(0.34)
Agriculture characteristics			
No. of plots	2.43	2.88	2.15
	(1.02)	(1.38)	(0.90)
Total plot area (ha.)	2.71	1.95	1.89
	(1.94)	(1.63)	(1.25)
No. of plots irrigated	0.17	0.04	0.03
	(0.42)	(0.21)	(0.18)
No. of crops planted	4.63	3.88	4.63
	(1.95)	(1.78)	(1.87)
Planted crops other than maize/rice/beans	0.90	0.88	0.98
	(0.30)	(0.32)	(0.13)
Used inputs	0.21	0.03	0.05
	(0.41)	(0.16)	(0.22)
Used improved seeds	0.14	0.08	0.04
	(0.34)	(0.27)	(0.21)
Hired any labor	0.23	0.26	0.13
	(0.42)	(0.44)	(0.34)
Sold or planning to sell	0.86	0.68	0.78
	(0.35)	(0.47)	(0.41)
Stored any produce	0.90	0.90	0.87
	(0.30)	(0.30)	(0.34)
Have cashew trees	0.15	0.68	0.72
	(0.36)	(0.47)	(0.45)
No. of fruit trees	1.70	3.01	1.65
	(1.53)	(2.08)	(1.23)
No. of livestock animals	0.86	1.11	0.88
	(0.80)	(0.81)	(0.96)
Used mechanized equipments	0.23	0.11	0.08
	(0.42)	(0.32)	(0.28)
Observations	1773	1701	1152

The sample includes all the households that have been surveyed till date. Plot area, production value, and yields are winsorized at 99th percentile. Inputs include to chemical/organic fertilizers, pesticides, herbicides, and fungicide.

Table A.2: Balance - household level - by FFS treatment

	(1)		(2)		T-test
	FFS - Treatment		FFS- Control		Difference
Variable	N/[Clusters]	Mean/SE	N/[Clusters]	Mean/SE	(1)-(2)
Household size	2313	5.336	2313	5.502	-0.166*
	[193]	(0.058)	[193]	(0.068)	
Household head is male	2313	0.783	2313	0.805	-0.021
	[193]	(0.010)	[193]	(0.011)	
No. of plots	2313	2.540	2313	2.515	0.025
	[193]	(0.043)	[193]	(0.046)	
Total plot area (ha.)	2313	2.183	2313	2.272	-0.089
	[193]	(0.054)	[193]	(0.062)	
No. of plots irrigated	2313	0.085	2313	0.096	-0.012
	[193]	(0.010)	[193]	(0.013)	
Hired any labor	2313	0.210	2313	0.221	-0.011
	[193]	(0.012)	[193]	(0.013)	
Sold or planning to sell	2313	0.773	2313	0.776	-0.003
	[193]	(0.015)	[193]	(0.015)	
Stored any produce	2313	0.893	2313	0.888	0.005
	[193]	(0.009)	[193]	(0.008)	
Have cashew trees	2313	0.473	2313	0.501	-0.028
	[193]	(0.024)	[193]	(0.026)	
No. of fruit trees	2313	2.141	2313	2.198	-0.058
	[193]	(0.067)	[193]	(0.070)	
No. of livestock animals	2313	0.934	2313	0.985	-0.051
	[193]	(0.025)	[193]	(0.027)	
Used mechanized equipments	2313	0.142	2313	0.159	-0.017
	[193]	(0.010)	[193]	(0.010)	
F-test of joint significance (p-value)					0.717
F-test, number of observations					4626

Notes: The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are p-values. Standard errors are clustered at variable com. Observations are weighted using variable weight_com as probability weights.***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

The sample includes all the households in FFS treatment and control communities that have been surveyed till date.

Table A.3: Balance - household level - by eVoucher treatment

	(1)		(2)		(3)		T-test		
	No coverage		EV - Control		EV - Treatmemt		Difference		
Variable	N/[Clusters]	Mean/SE	N/[Clusters]	Mean/SE	N/[Clusters]	Mean/SE	(1)-(2)	(1)-(3)	(2)-(3)
Household size	1955	5.416	1332	5.519	1339	5.324	-0.103	0.092	0.195*
	[163]	(0.073)	[111]	(0.081)	[112]	(0.077)			
Household head is male	1955	0.776	1332	0.805	1339	0.810	-0.029	-0.034*	-0.005
	[163]	(0.012)	[111]	(0.014)	[112]	(0.012)			
No. of plots	1955	2.566	1332	2.488	1339	2.511	0.077	0.054	-0.023
	[163]	(0.054)	[111]	(0.047)	[112]	(0.059)			
Total plot area (ha.)	1955	2.213	1332	2.257	1339	2.220	-0.045	-0.007	0.037
	[163]	(0.065)	[111]	(0.079)	[112]	(0.072)			
No. of plots irrigated	1955	0.069	1332	0.109	1339	0.103	-0.039**	-0.034	0.005
	[163]	(0.009)	[111]	(0.018)	[112]	(0.019)			
Hired any labor	1955	0.218	1332	0.208	1339	0.219	0.009	-0.002	-0.011
	[163]	(0.013)	[111]	(0.017)	[112]	(0.016)			
Sold or planning to sell	1955	0.756	1332	0.791	1339	0.784	-0.035	-0.028	0.007
	[163]	(0.016)	[111]	(0.019)	[112]	(0.021)			
Stored any produce	1955	0.892	1332	0.887	1339	0.891	0.005	0.000	-0.004
	[163]	(0.009)	[111]	(0.012)	[112]	(0.012)			
Have cashew trees	1955	0.497	1332	0.471	1339	0.487	0.025	0.009	-0.016
	[163]	(0.027)	[111]	(0.032)	[112]	(0.033)			
No. of fruit trees	1955	2.253	1332	2.030	1339	2.187	0.223*	0.067	-0.156
	[163]	(0.072)	[111]	(0.092)	[112]	(0.093)			
No. of livestock animals	1955	0.903	1332	0.988	1339	1.012	-0.085*	-0.109**	-0.024
	[163]	(0.026)	[111]	(0.036)	[112]	(0.035)			
Used mechanized equipments	1955	0.158	1332	0.148	1339	0.142	0.010	0.016	0.006
	[163]	(0.011)	[111]	(0.014)	[112]	(0.013)			
F-test of joint significance (p-value)							0.095*	0.016**	0.824
F-test, number of observations							3287	3294	2671

Notes: The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are p-values. Standard errors are clustered at variable com. Observations are weighted using variable weight_com as probability weights.***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table A.4: Balance - FFS interested farmers in FFS treatment and control communities

	(1) FFS - Treatment		(2) FFS- Control		T-test Difference
Variable	N/[Clusters]	Mean/SE	N/[Clusters]	Mean/SE	(1)-(2)
Household size	1740	5.438	1738	5.584	-0.146
	[193]	(0.066)	[193]	(0.074)	
Household head is male	1740	0.794	1738	0.812	-0.018
	[193]	(0.012)	[193]	(0.012)	
No. of plots	1740	2.584	1738	2.560	0.024
	[193]	(0.047)	[193]	(0.050)	
Total plot area (ha.)	1740	2.247	1738	2.338	-0.091
	[193]	(0.061)	[193]	(0.067)	
No. of plots irrigated	1740	0.084	1738	0.097	-0.013
	[193]	(0.011)	[193]	(0.014)	
Hired any labor	1740	0.221	1738	0.232	-0.011
	[193]	(0.014)	[193]	(0.014)	
Sold or planning to sell	1740	0.776	1738	0.780	-0.004
	[193]	(0.016)	[193]	(0.016)	
Stored any produce	1740	0.891	1738	0.894	-0.003
	[193]	(0.010)	[193]	(0.008)	
Have cashew trees	1740	0.491	1738	0.512	-0.021
	[193]	(0.025)	[193]	(0.027)	
No. of fruit trees	1740	2.208	1738	2.273	-0.065
	[193]	(0.074)	[193]	(0.076)	
No. of livestock animals	1740	0.965	1738	1.036	-0.072*
	[193]	(0.028)	[193]	(0.029)	
Used mechanized equipments	1740	0.137	1738	0.171	-0.034**
	[193]	(0.011)	[193]	(0.011)	
F-test of joint significance (p-value)					0.478
F-test, number of observations					3478

Notes: The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are p-values. Standard errors are clustered at variable com. Observations are weighted using variable weight_com as probability weights.***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Sample is restricted to farmers listed (interested farmers) during listing.

Table A.5: Balance - FFS interested vs not interested farmers

	(1)		(2)		T-test
	FFS - interested		FFS- not interested		Difference
Variable	N/[Clusters]	Mean/SE	N/[Clusters]	Mean/SE	(1)-(2)
Household size	3478	5.511	1148	5.189	0.322***
	[386]	(0.050)	[383]	(0.074)	
Household head is male	3478	0.803	1148	0.772	0.032**
	[386]	(0.009)	[383]	(0.013)	
No. of plots	3478	2.572	1148	2.417	0.154***
	[386]	(0.034)	[383]	(0.039)	
Total plot area (ha.)	3478	2.293	1148	2.065	0.227***
	[386]	(0.045)	[383]	(0.057)	
No. of plots irrigated	3478	0.090	1148	0.091	-0.001
	[386]	(0.009)	[383]	(0.012)	
Hired any labor	3478	0.226	1148	0.189	0.037***
	[386]	(0.010)	[383]	(0.013)	
Sold or planning to sell	3478	0.778	1148	0.766	0.011
	[386]	(0.011)	[383]	(0.015)	
Stored any produce	3478	0.893	1148	0.884	0.008
	[386]	(0.007)	[383]	(0.011)	
Have cashew trees	3478	0.501	1148	0.450	0.051***
	[386]	(0.018)	[383]	(0.022)	
No. of fruit trees	3478	2.240	1148	1.994	0.246***
	[386]	(0.053)	[383]	(0.062)	
No. of livestock animals	3478	1.001	1148	0.856	0.144***
	[386]	(0.020)	[383]	(0.028)	
Used mechanized equipments	3478	0.154	1148	0.143	0.011
	[386]	(0.008)	[383]	(0.012)	
F-test of joint significance (p-value)					0.000***
F-test, number of observations					4626

Notes: The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are p-values. Standard errors are clustered at variable com. Observations are weighted using variable weight_com as probability weights.***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table A.6: Balance - FFS interested vs not interested farmers (FFS control communities)

	(1)		(2)		T-test
	FFS - interested		FFS- not interested		Difference
Variable	N/[Clusters]	Mean/SE	N/[Clusters]	Mean/SE	(1)-(2)
Household size	1738	5.611	575	5.320	0.291***
	[193]	(0.070)	[192]	(0.105)	
Household head is male	1738	0.814	575	0.781	0.033
	[193]	(0.012)	[192]	(0.018)	
No. of plots	1738	2.569	575	2.449	0.120**
	[193]	(0.049)	[192]	(0.059)	
Total plot area (ha.)	1738	2.437	575	2.109	0.328***
	[193]	(0.068)	[192]	(0.082)	
No. of plots irrigated	1738	0.107	575	0.094	0.013
	[193]	(0.014)	[192]	(0.016)	
Hired any labor	1738	0.243	575	0.202	0.041**
	[193]	(0.013)	[192]	(0.018)	
Sold or planning to sell	1738	0.787	575	0.769	0.018
	[193]	(0.015)	[192]	(0.020)	
Stored any produce	1738	0.896	575	0.873	0.023
	[193]	(0.008)	[192]	(0.015)	
Have cashew trees	1738	0.509	575	0.477	0.033
	[193]	(0.026)	[192]	(0.029)	
No. of fruit trees	1738	2.280	575	2.071	0.208**
	[193]	(0.073)	[192]	(0.091)	
No. of livestock animals	1738	1.051	575	0.877	0.175***
	[193]	(0.029)	[192]	(0.041)	
Used mechanized equipments	1738	0.181	575	0.136	0.046***
	[193]	(0.012)	[192]	(0.016)	
F-test of joint significance (p-value)					0.002***
F-test, number of observations					2313

Notes: The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are p-values. Standard errors are clustered at variable com. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table A.7: Balance - eVoucher green status in eVoucher treatment and control communities

	(1)		(2)		T-test
	EV - Treatment		EV - Control		Difference
Variable	N/[Clusters]	Mean/SE	N/[Clusters]	Mean/SE	(1)-(2)
Household size	898	5.359	888	5.468	-0.110
	[112]	(0.089)	[111]	(0.089)	
Household head is male	898	0.815	888	0.796	0.019
	[112]	(0.014)	[111]	(0.016)	
No. of plots	898	2.506	888	2.492	0.014
	[112]	(0.061)	[111]	(0.053)	
Total plot area (ha.)	898	2.226	888	2.236	-0.010
	[112]	(0.086)	[111]	(0.082)	
No. of plots irrigated	898	0.103	888	0.109	-0.005
	[112]	(0.020)	[111]	(0.020)	
Hired any labor	898	0.231	888	0.202	0.029
	[112]	(0.018)	[111]	(0.019)	
Sold or planning to sell	898	0.784	888	0.785	-0.001
	[112]	(0.022)	[111]	(0.020)	
Stored any produce	898	0.890	888	0.885	0.006
	[112]	(0.014)	[111]	(0.012)	
Have cashew trees	898	0.486	888	0.482	0.005
	[112]	(0.034)	[111]	(0.033)	
No. of fruit trees	898	2.151	888	2.036	0.115
	[112]	(0.093)	[111]	(0.099)	
No. of livestock animals	898	1.016	888	0.952	0.064
	[112]	(0.040)	[111]	(0.038)	
Used mechanized equipments	898	0.151	888	0.145	0.006
	[112]	(0.015)	[111]	(0.016)	
F-test of joint significance (p-value)					0.936
F-test, number of observations					1786

Notes: The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are p-values. Standard errors are clustered at variable com. Observations are weighted using variable weight_com as probability weights.***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Sample is restricted to households with green eVoucher status within coms covered by eVoucher

Table A.8: Balance - eVoucher green vs red households in eVoucher covered communities

	(1) EV - Green		(2) EV - Red		T-test Difference
Variable	N/[Clusters]	Mean/SE	N/[Clusters]	Mean/SE	(1)-(2)
Household size	1786	5.413	885	5.437	-0.024
	[223]	(0.063)	[223]	(0.090)	
Household head is male	1786	0.805	885	0.812	-0.006
	[223]	(0.011)	[223]	(0.015)	
No. of plots	1786	2.499	885	2.501	-0.002
	[223]	(0.040)	[223]	(0.047)	
Total plot area (ha.)	1786	2.231	885	2.254	-0.024
	[223]	(0.060)	[223]	(0.069)	
No. of plots irrigated	1786	0.106	885	0.105	0.001
	[223]	(0.014)	[223]	(0.015)	
Hired any labor	1786	0.216	885	0.209	0.007
	[223]	(0.013)	[223]	(0.016)	
Sold or planning to sell	1786	0.785	885	0.794	-0.009
	[223]	(0.015)	[223]	(0.018)	
Stored any produce	1786	0.887	885	0.892	-0.005
	[223]	(0.009)	[223]	(0.012)	
Have cashew trees	1786	0.484	885	0.470	0.014
	[223]	(0.024)	[223]	(0.026)	
No. of fruit trees	1786	2.093	885	2.139	-0.046
	[223]	(0.068)	[223]	(0.082)	
No. of livestock animals	1786	0.984	885	1.034	-0.050
	[223]	(0.027)	[223]	(0.036)	
Used mechanized equipments	1786	0.148	885	0.139	0.009
	[223]	(0.011)	[223]	(0.012)	
F-test of joint significance (p-value)					0.930
F-test, number of observations					2671

Notes: The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are p-values. Standard errors are clustered at variable com. Observations are weighted using variable weight_com as probability weights.***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Sample is restricted to households in coms covered by eVoucher

Table A.9: Balance - eVoucher green vs red households in eVoucher control communities

	(1) EV - Green		(2) EV - Red		T-test Difference
Variable	N/[Clusters]	Mean/SE	N/[Clusters]	Mean/SE	(1)-(2)
Household size	888	5.468	444	5.621	-0.153
	[111]	(0.089)	[111]	(0.131)	
Household head is male	888	0.796	444	0.823	-0.028
	[111]	(0.016)	[111]	(0.019)	
No. of plots	888	2.492	444	2.480	0.013
	[111]	(0.053)	[111]	(0.054)	
Total plot area (ha.)	888	2.236	444	2.301	-0.065
	[111]	(0.082)	[111]	(0.108)	
No. of plots irrigated	888	0.109	444	0.108	0.001
	[111]	(0.020)	[111]	(0.020)	
Hired any labor	888	0.202	444	0.221	-0.019
	[111]	(0.019)	[111]	(0.023)	
Sold or planning to sell	888	0.785	444	0.803	-0.018
	[111]	(0.020)	[111]	(0.024)	
Stored any produce	888	0.885	444	0.891	-0.007
	[111]	(0.012)	[111]	(0.018)	
Have cashew trees	888	0.482	444	0.451	0.030
	[111]	(0.033)	[111]	(0.036)	
No. of fruit trees	888	2.036	444	2.020	0.016
	[111]	(0.099)	[111]	(0.110)	
No. of livestock animals	888	0.952	444	1.062	-0.110**
	[111]	(0.038)	[111]	(0.054)	
Used mechanized equipments	888	0.145	444	0.154	-0.008
	[111]	(0.016)	[111]	(0.019)	
F-test of joint significance (p-value)					0.493
F-test, number of observations					1332

Notes: The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are p-values. Standard errors are clustered at variable com. Observations are weighted using variable weight_com as probability weights.***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Sample is restricted to households in coms covered by eVoucher

Figure A.1: Farmer field schools

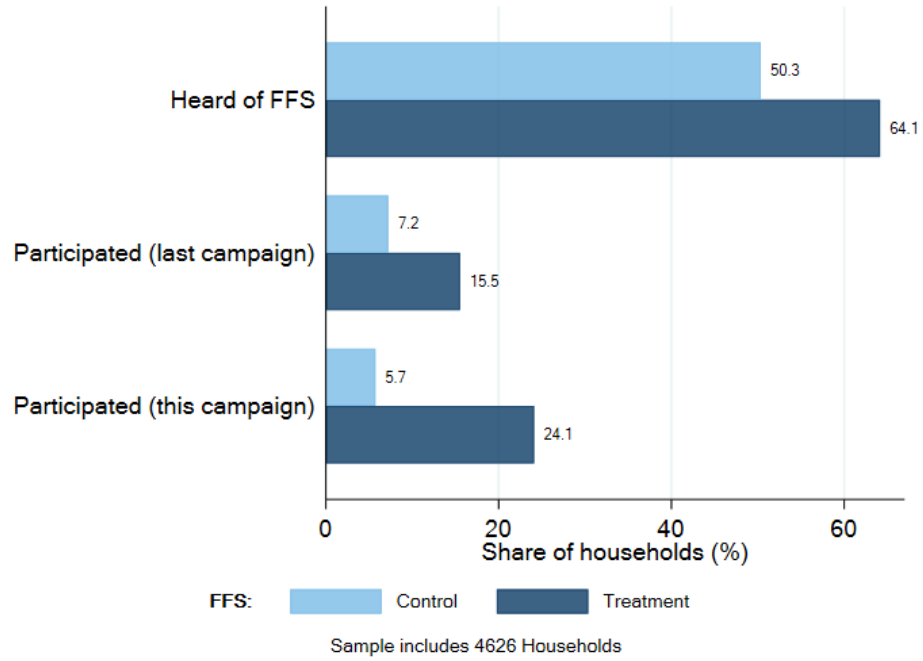


Figure A.2: Farmer field schools

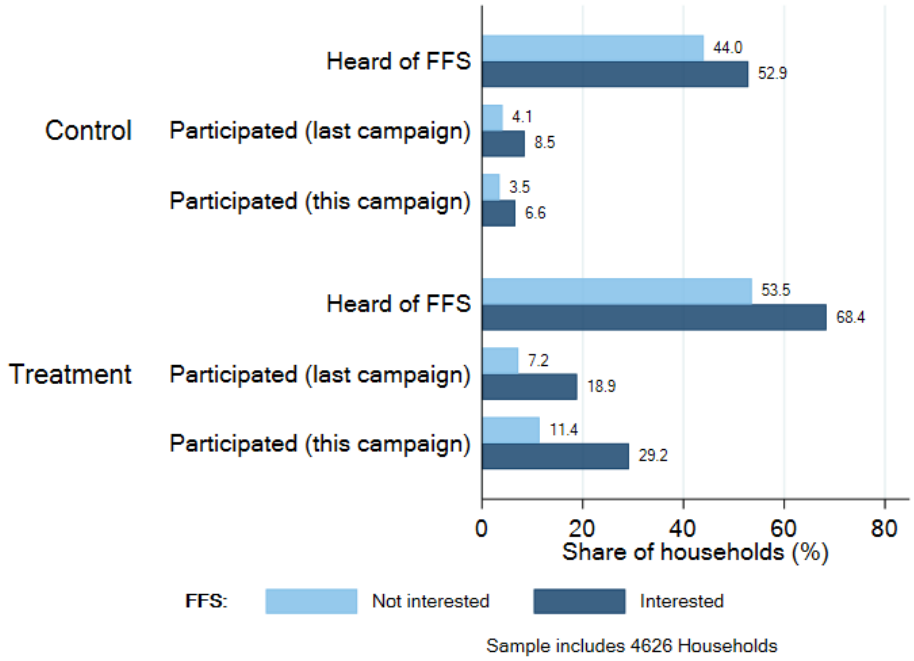


Figure A.3: Practices known to households

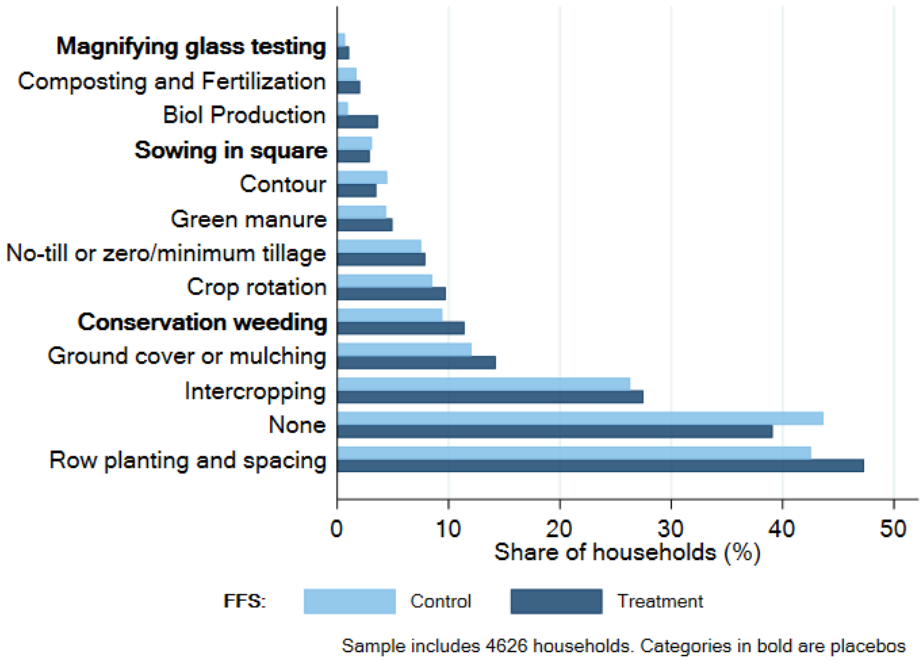


Figure A.4: Source of the technical advice received

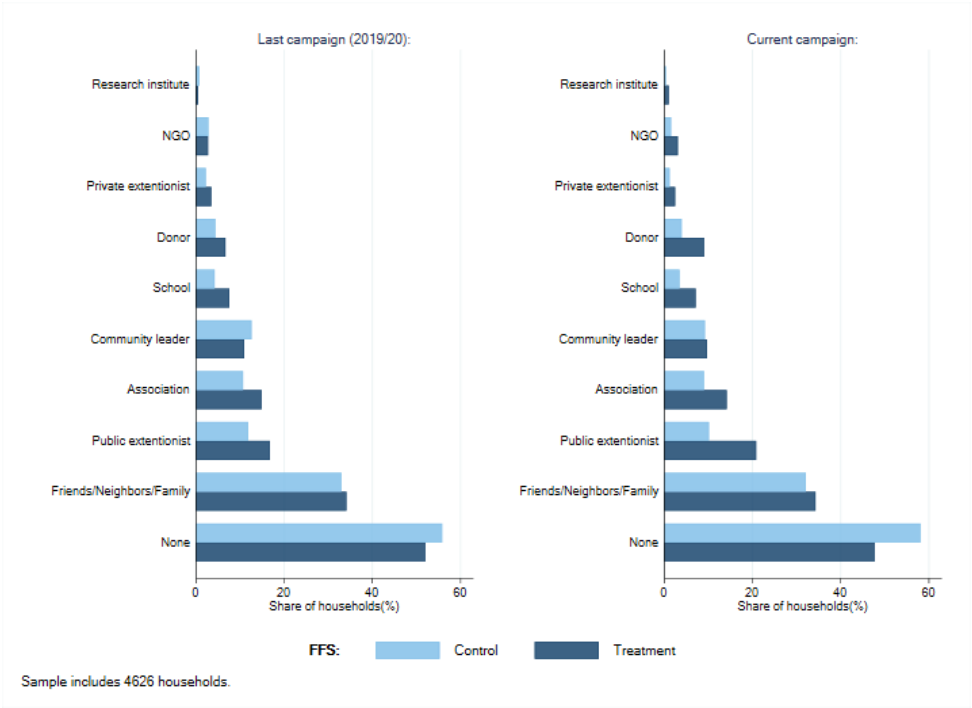


Figure A.5: Source of the technical advice by public extensionist

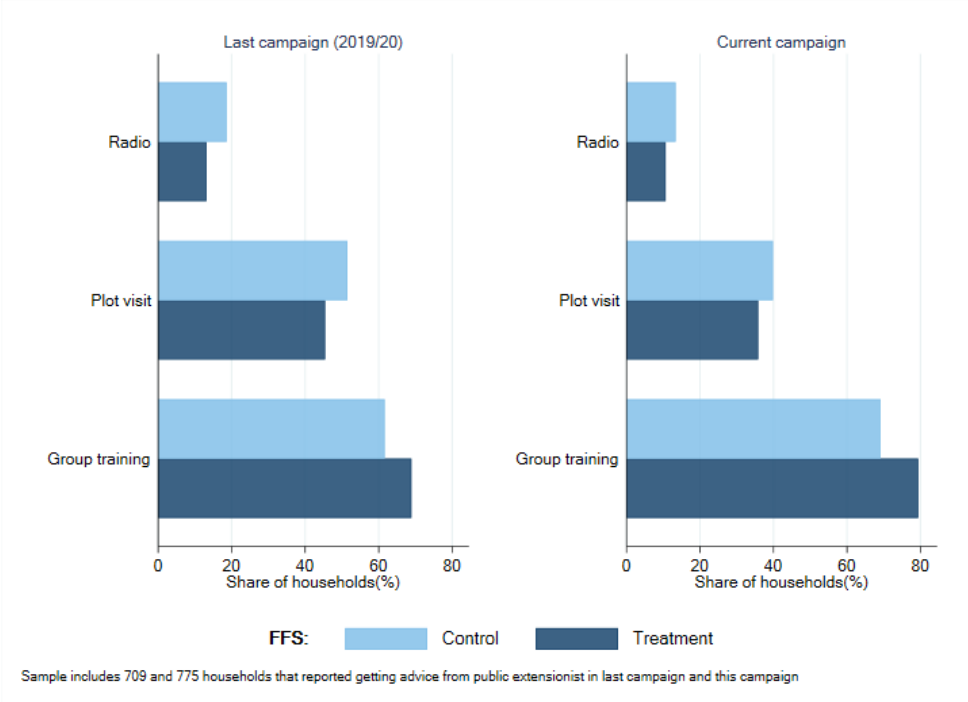
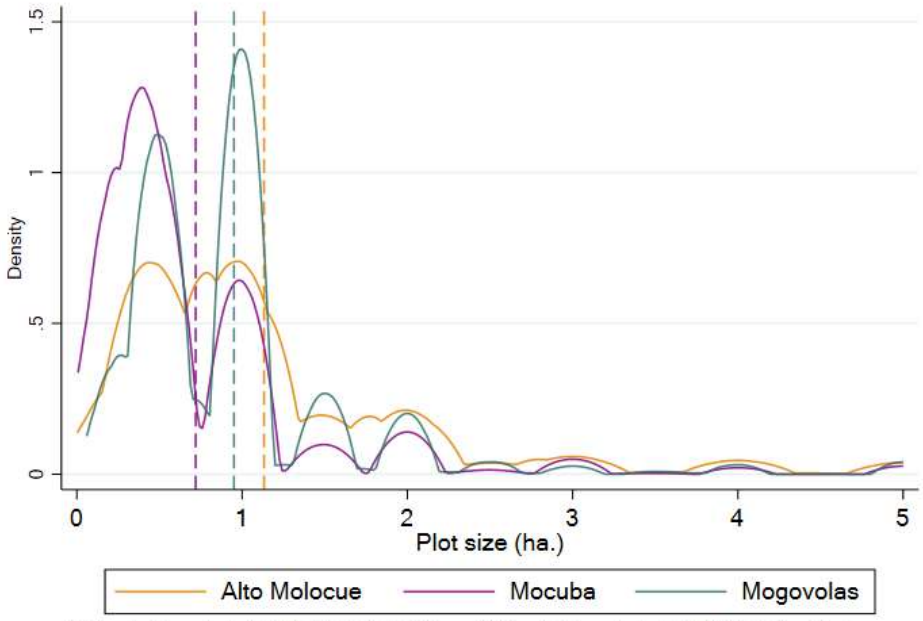


Table A.10: Plot summary - by hub

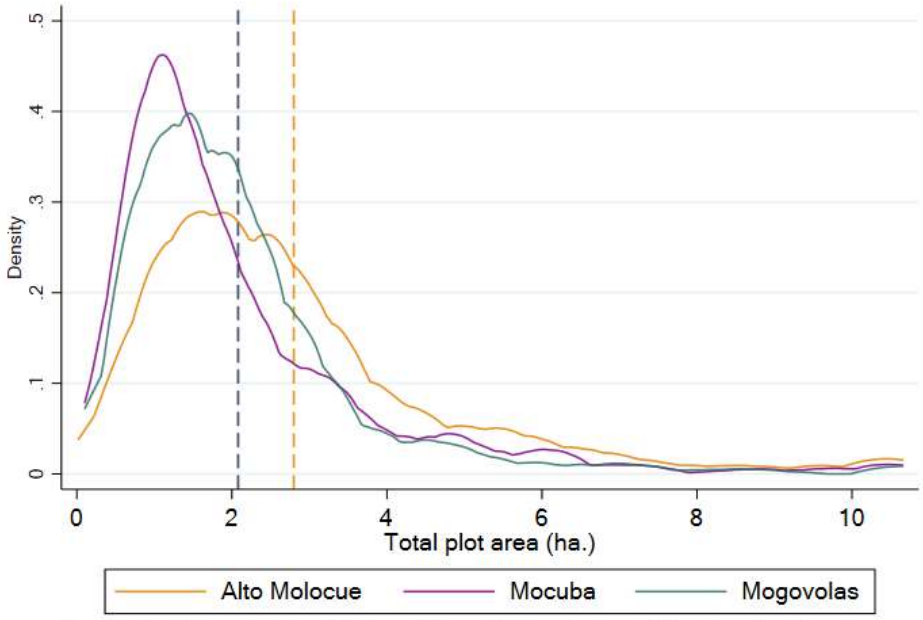
	Alto Molocue	Mocuba	Mogovolas	Total
No. of HHs	623	624	396	1643
No. of plots	1527	1798	866	4191
No. of plots cultivated in rainy season	1211	1473	719	3403
No. of plots cultivated in dry season	837	727	447	2011

Figure A.6: Distribution of plot size - by hub



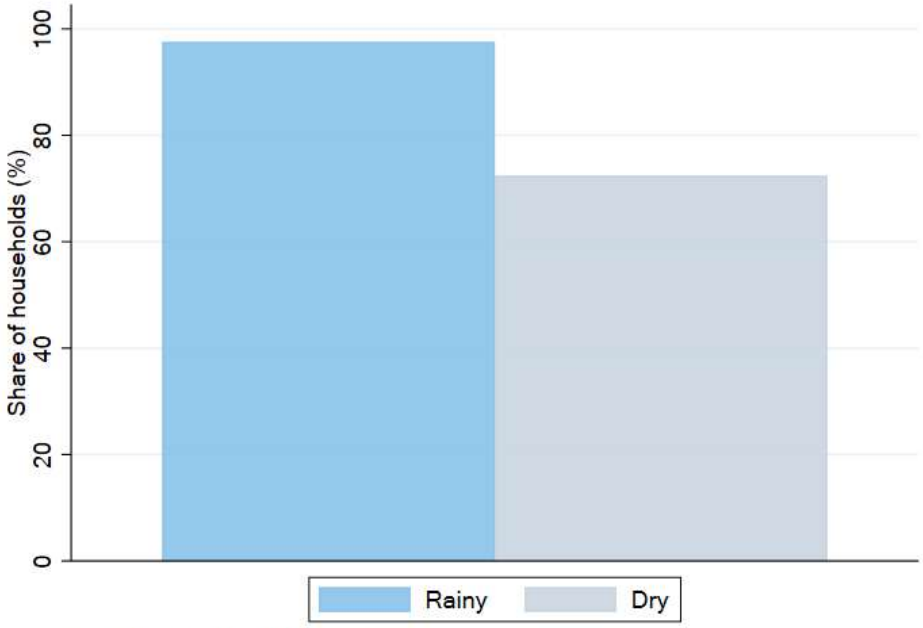
623 households reported a total of 1527 plots in Alto Molocue. 624 households reported a total of 1798 plots from Mocuba. 396 households reported a total of 866 plots from Mogovolas. Dashed vertical lines denote the average plotsize by hub.

Figure A.7: Distribution of total plot area - by hub



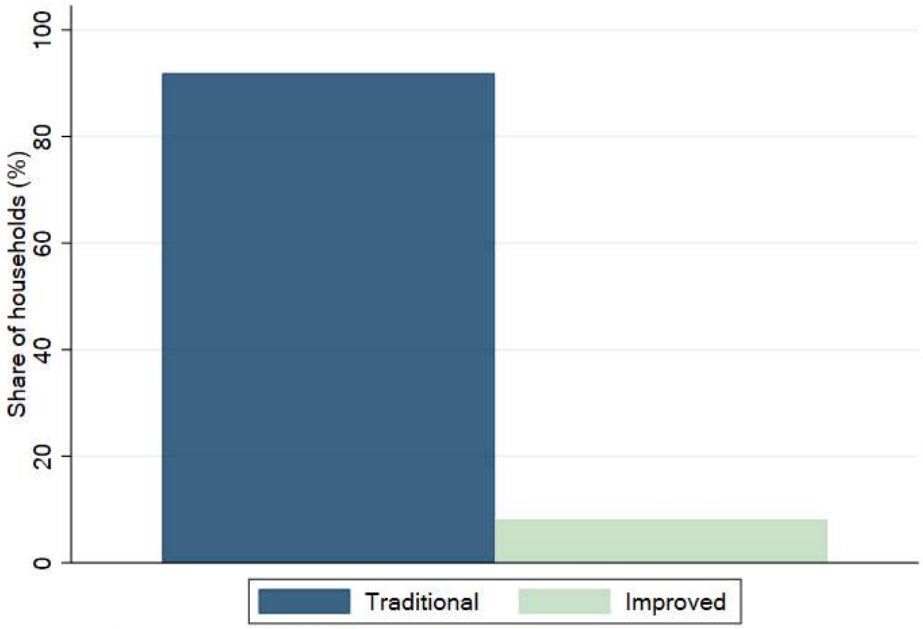
Sample includes 623 households from Alto Molocue, 624 households from Mocuba, and 396 households from Mogovolas. Dashed vertical lines denote the average plotsize by hub.

Figure A.8: Cultivated any crops



Sample includes 1643 Households

Figure A.9: Types of seeds used - overall



Note: Sample restircted to 1641 HHs culvating any crop.

Figure A.10: Types of inputs used - overall

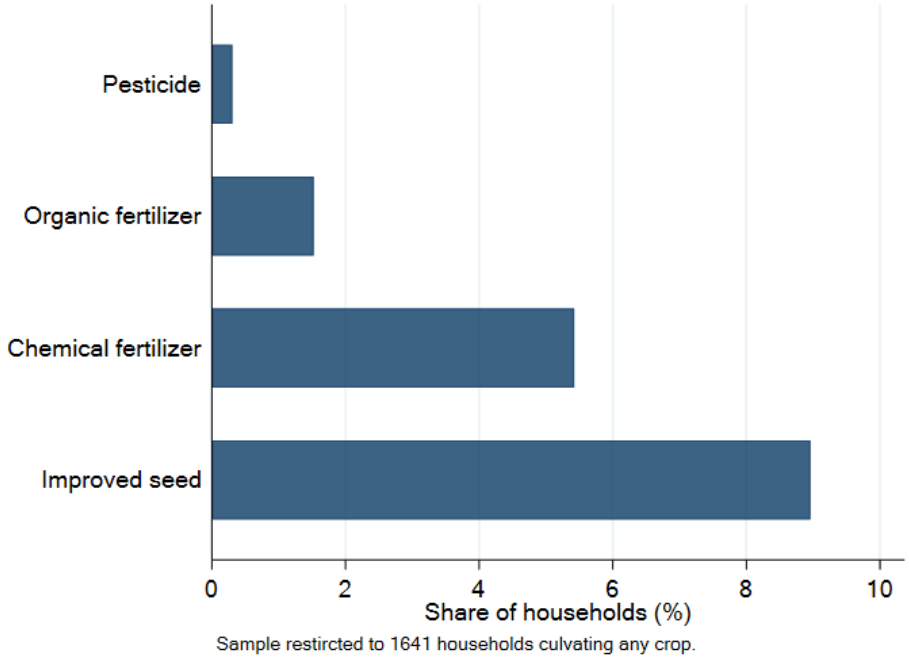


Figure A.11: Source of inputs

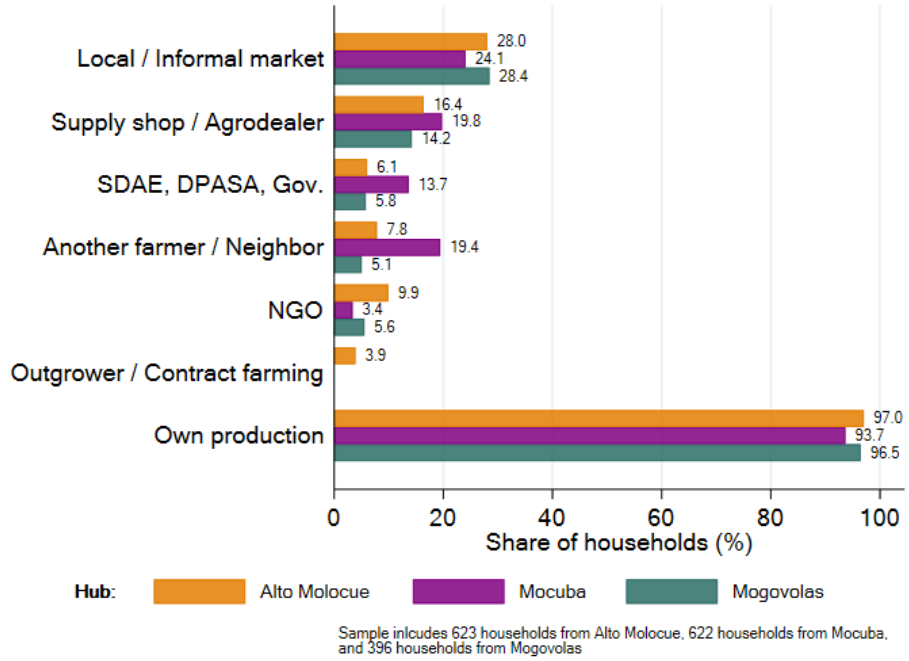
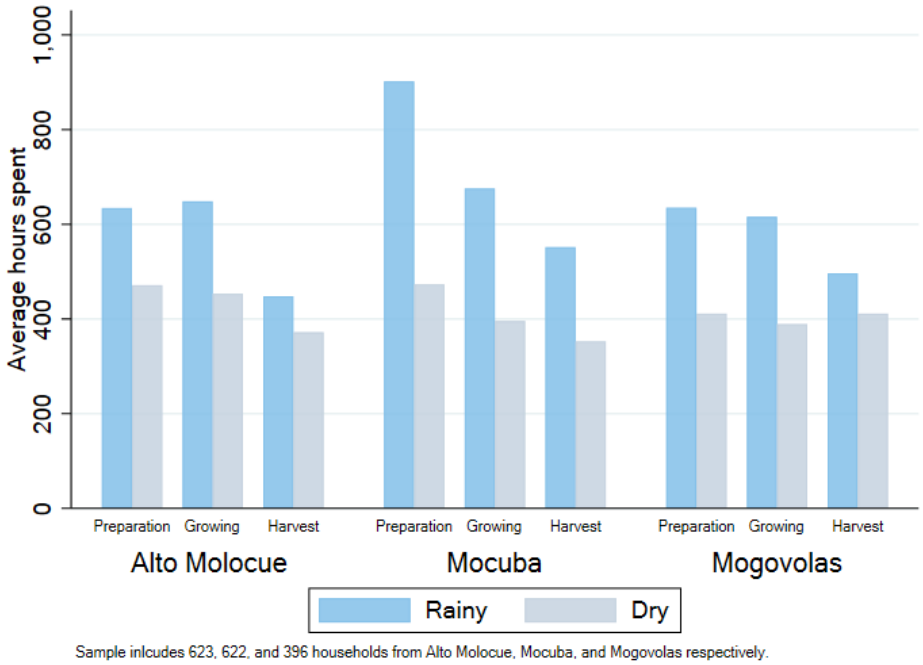


Table A.11: Household labor hours - by plot type and season

	Rainy Season			Dry Season		
	Preparation Mean/SD	Growing Mean/SD	Harvest Mean/SD	Preparation Mean/SD	Growing Mean/SD	Harvest Mean/SD
Main plots	589.398	528.175	394.031	392.099	359.900	319.391
	(543.13)	(442.03)	(428.19)	(455.16)	(394.18)	(384.96)
Other plots	448.933	375.806	320.133	345.606	309.512	287.617
	(467.49)	(390.23)	(426.01)	(423.33)	(418.26)	(438.83)
All plots	736.666	650.838	499.514	457.610	417.947	374.402
	(710.74)	(568.47)	(559.85)	(575.09)	(504.97)	(498.38)
Observations	1604	1604	1604	1208	1208	1208

Main plots are plots 1 and 2 of the households.

Figure A.12: Household labor hours - by season and hub



Sample inlcudes 623, 622, and 396 households from Alto Molocue, Mocuba, and Mogovolas respectively.

Figure A.13: Hired labor - by season

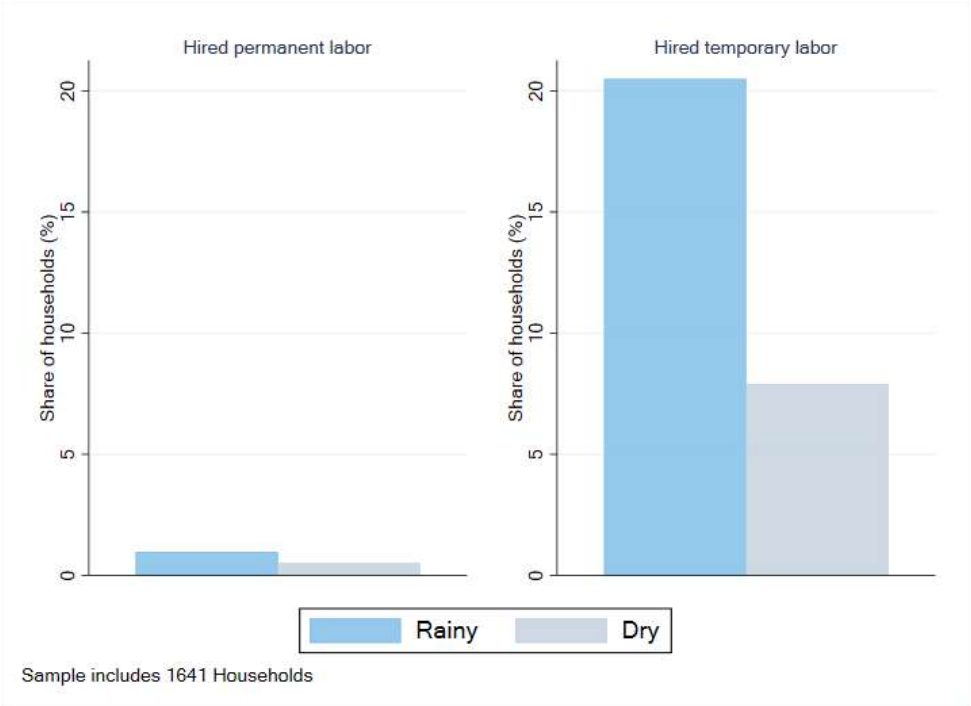
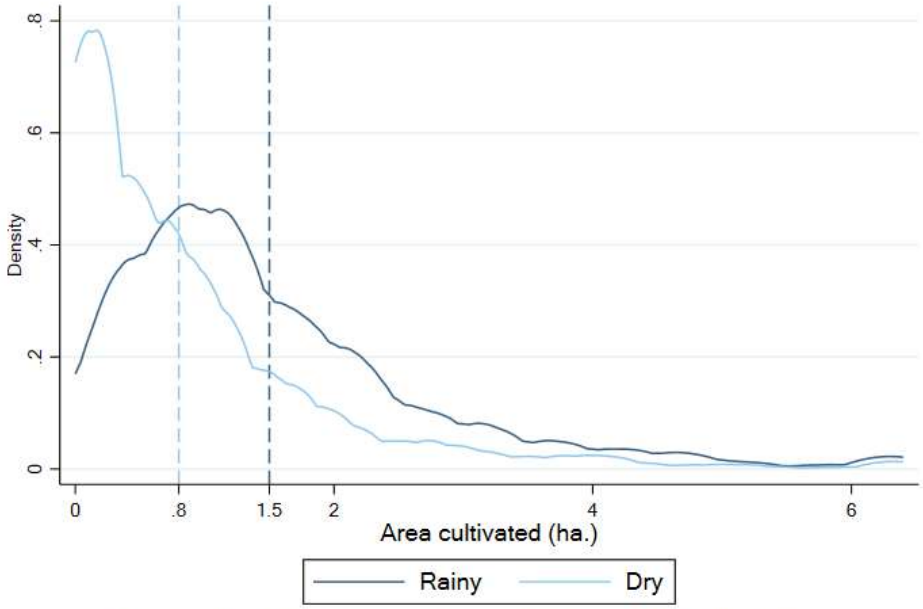
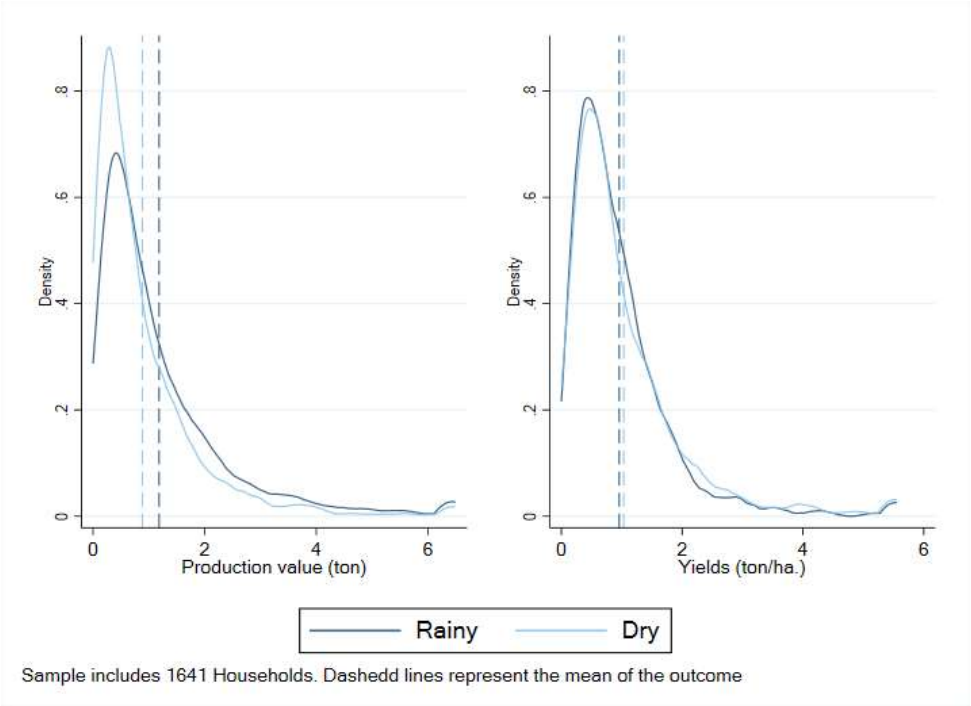


Figure A.14: Distribution of area cultivated (Ha.)



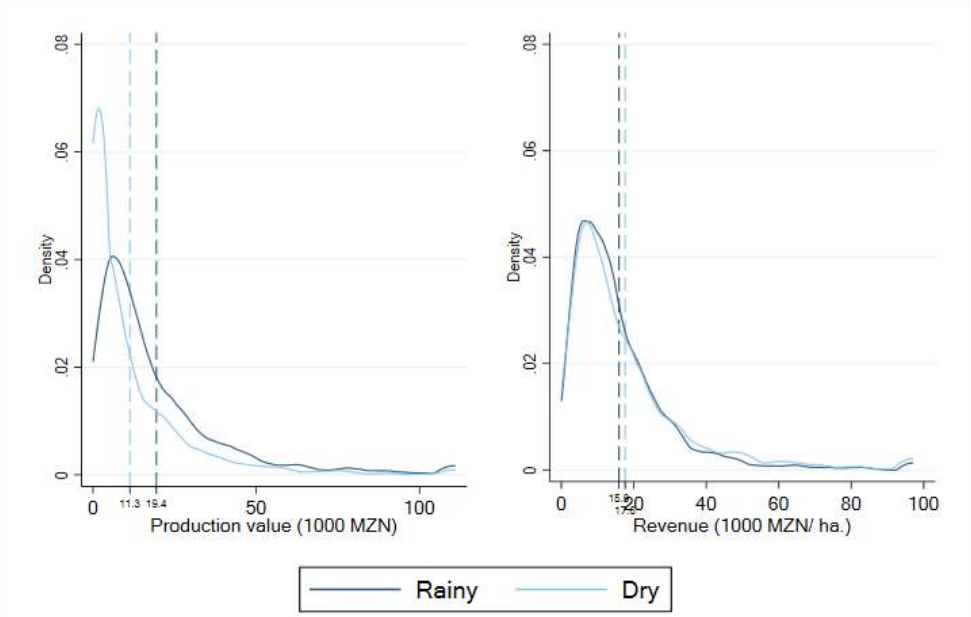
Sample includes 1643 Households. Dashedd lines represent the mean of the outcome.
The average area cultivated conditional on cultivating for rainy and dry season is 1.5 and 1.1 ha.

Figure A.15: Distribution of production value and yields



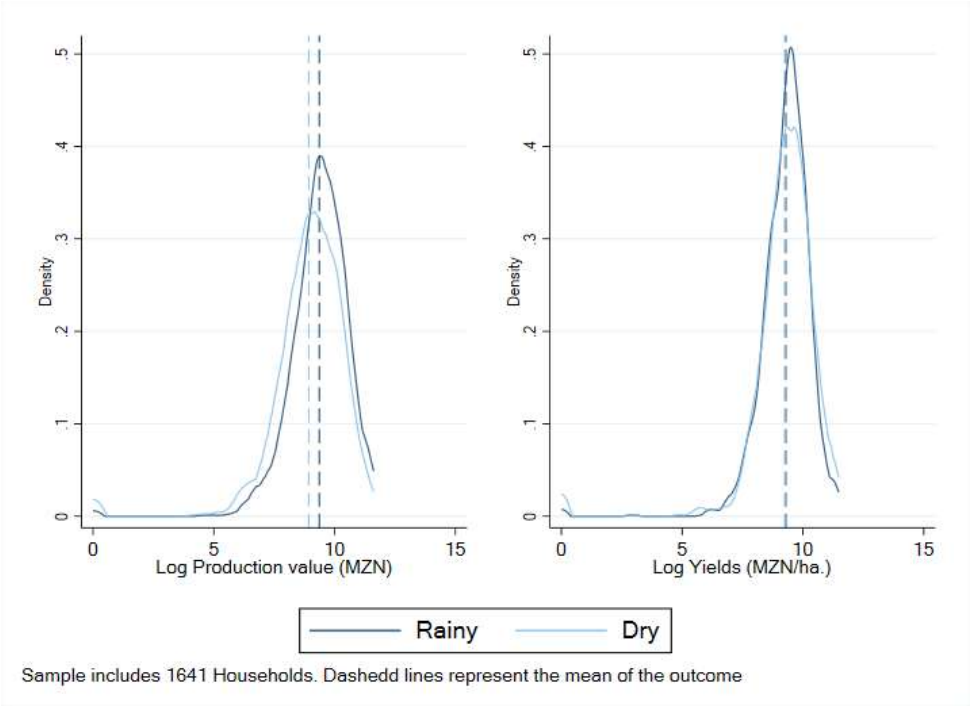
Sample includes 1641 Households. Dashedd lines represent the mean of the outcome

Figure A.16: Distribution of production value and yields



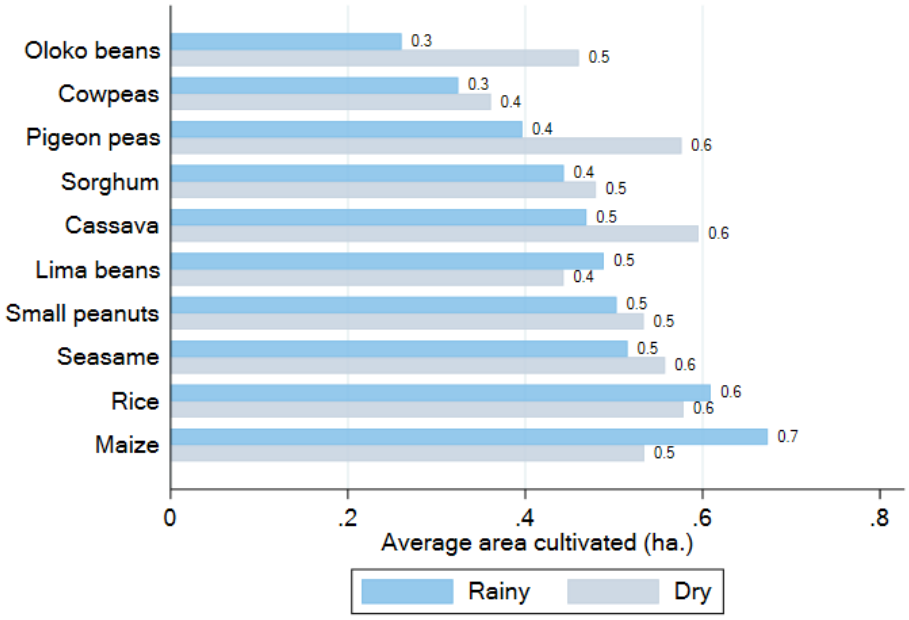
Sample includes 1641 Households. Dashedd lines represent the mean of the outcome.
The average production value conditional on harvesting for rainy and dry season is 19.9 and 15.5 ha.
Revenue is calculated conditional on harvesting any crop.

Figure A.17: Distribution of log production value and yields



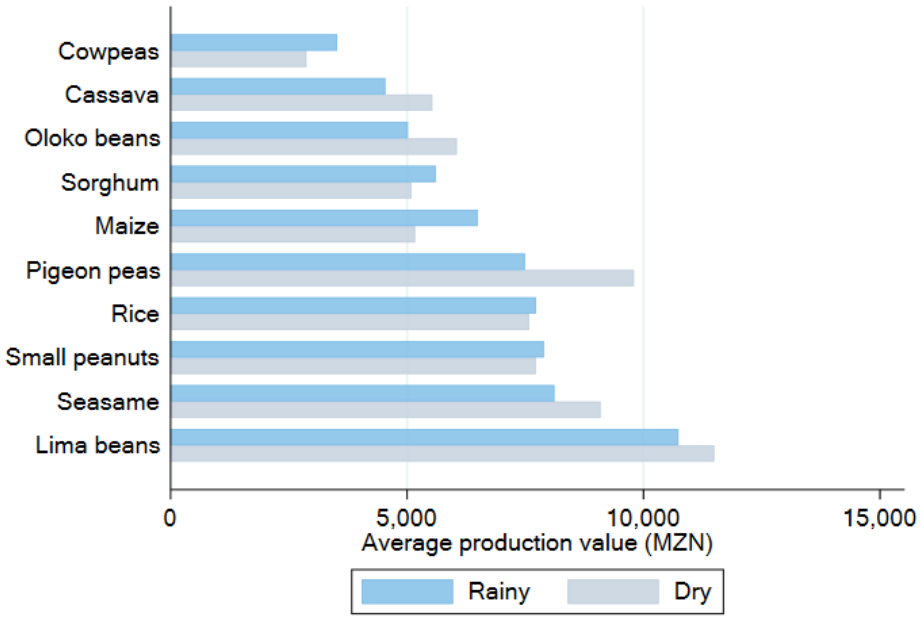
Sample includes 1641 Households. Dashedd lines represent the mean of the outcome

Figure A.18: Area cultivated by top 10 crops - by season



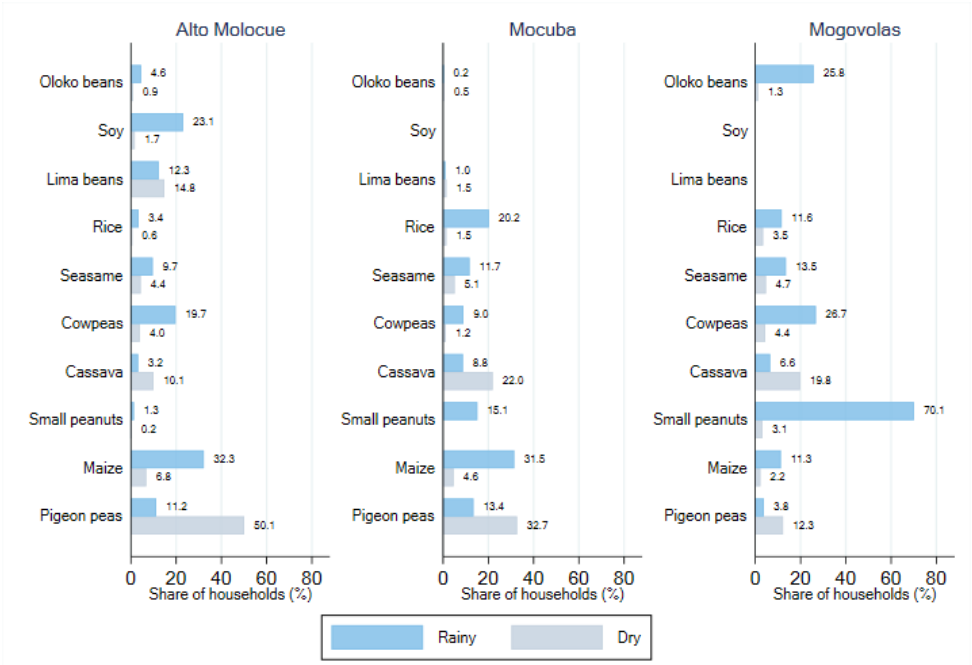
Sample includes 1641 households that cultivated any crop.
1604 households cultivated in rainy season and 1211 households cultivated in dry season.

Figure A.19: Production value by top 10 crops - by season



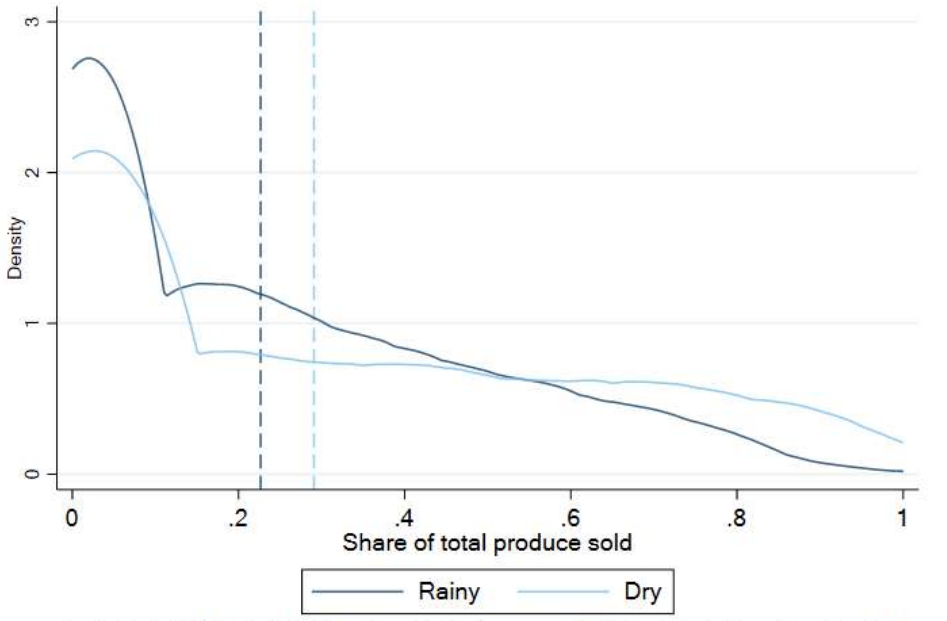
Sample includes 1641 households that cultivated any crop.
1604 households cultivated in rainy season and 1211 households cultivated in dry season.

Figure A.20: Top 10 crops sold



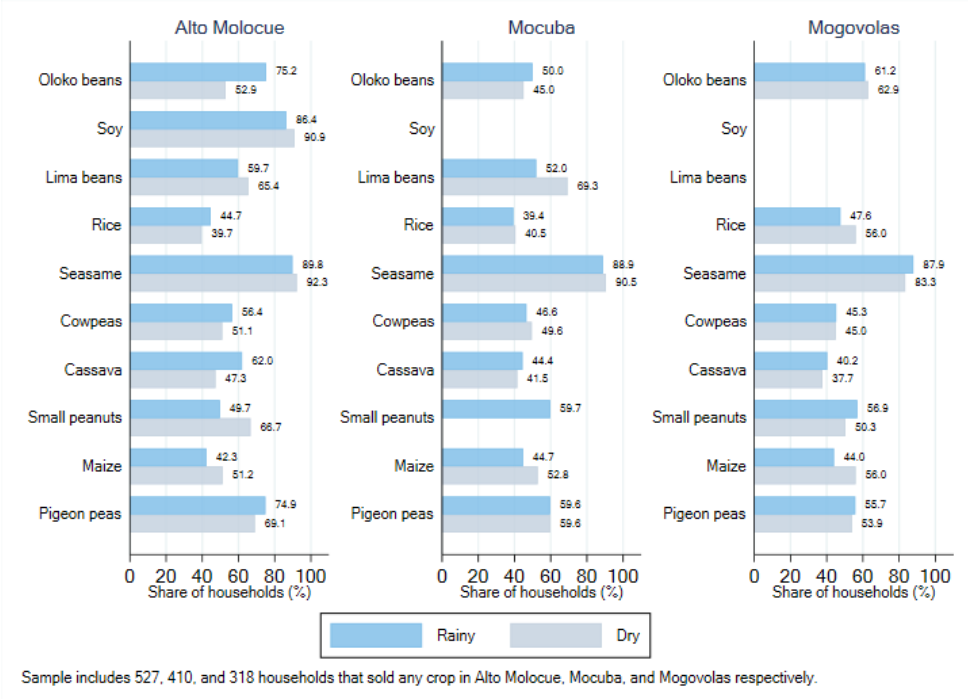
Sample includes 527, 410, and 318 households that sold any crop in Alto Molocue, Mocuba, and Mogovolas respectively.

Figure A.21: Share of total produce sold



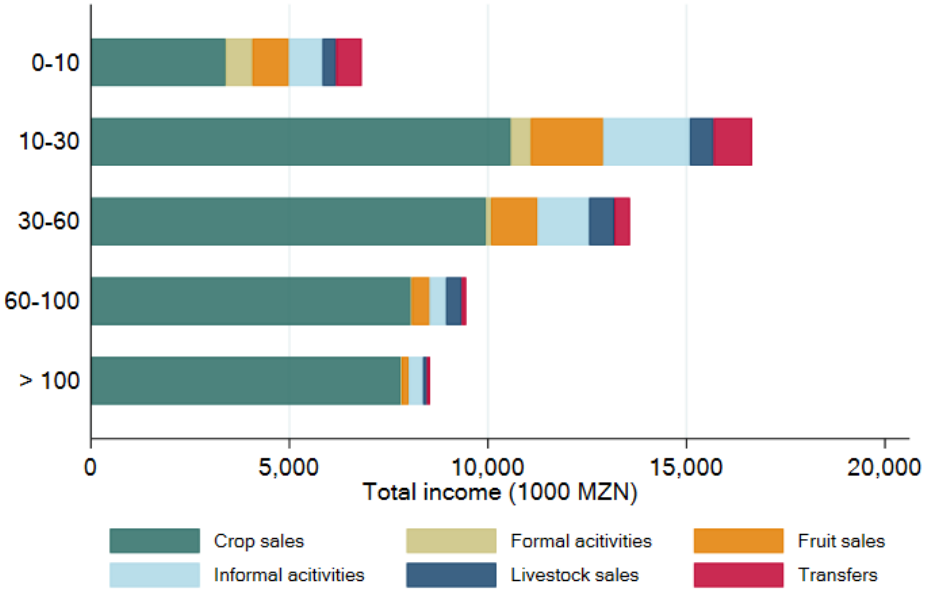
Sample includes 1598 households that harvested anything in rainy season, and 1195 households that harvested anything in dry seaso
Dashedd lines represent the mean of the outcome

Figure A.22: Share of produce sold for top 10 crops - by hub



Sample includes 527, 410, and 318 households that sold any crop in Alto Molocue, Mocuba, and Mogovolas respectively.

Figure A.23: Distribution of household income and sources of income



Sample includes 1643 households.
y-axis shows the income brackets (1000 MZN). Formal activities refers to any kind of work done for someone else.
Informal activities refers to self-employed work.