Baseline Study of the FIOVANA Resilience Food Security Activity in Madagascar

October 2021 | Volume I

IMPEL | Implementer-Led Evaluation & Learning Associate Award

USAID FROM THE AMERICAN PEOPLE

CAUSAL DESIGN

Save the Children®

ABOUT IMPEL

The Implementer-Led Evaluation & Learning (IMPEL) Associate Award works to improve the design and implementation of Bureau for Humanitarian Assistance (BHA)-funded resilience food security activities (RFSAs) through implementer-led evaluations and knowledge sharing. Funded by the United States Agency for International Development (USAID) BHA, IMPEL will gather information and knowledge in order to measure performance of RFSAs, strengthen accountability, and improve guidance and policy. This information will help the food security community of practice and USAID to design projects and modify existing projects in ways that bolster performance, efficiency, and effectiveness. IMPEL is a seven-year activity (2019-2026) implemented by Save the Children (lead), TANGO International, Tulane University, Causal Design, and Innovations for Poverty Action.

RECOMMENDED CITATION

IMPEL. (2021). *Baseline Study of the FIOVANA Resilience Food Security Activity in Madagascar* (Vol. 1). Washington, DC: The Implementer-Led Evaluation & Learning Associate Award

PHOTO CREDITS

Save the Children / Charlie Forgham-Bailey.

DISCLAIMER

This report is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the Implementer-Led Evaluation & Learning (IMPEL) award and do not necessarily reflect the views of USAID or the United States Government.

CONTACT INFORMATION

IDEAL Activity
c/o Save the Children
899 North Capitol Street NE, Suite #900
Washington, DC 20002
www.fsnnetwork.org
IMPEL@savechildren.org

PREPARED BY:

CAUSAL DESIGN

ACKNOWLEDGMENTS

The Causal Design research team would like to recognize several individual's instrumental in creating and refining this document. This includes Emanuel da Costa, Tsarafidy Rasendraharison, Joseph Menakuntuala, Fahim Safi, and Jacques Zily with ADRA, and Mohamoud Ahmed, Emily Marshall, and Tom Spangler with IMPEL. Special thanks also to Mara Mordini, Justin Mupeyiwa, Benita O'Colmain, Arif Rashid, and Adam Trowbridge with USAID for their ongoing technical support.

TABLE OF CONTENTS

VOLUME II

Annex C: Pre-Analysis Plan
Annex D: Data Collection Tool

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

ADRA	Adventist Development Relief Agency
ANC	Antenatal care
ARI	Acute respiratory infection
BHA	Bureau for Humanitarian Assistance
BL	Baseline
CNA	Child no adult
F&M	Female and male adult
FAO	Food and Agriculture Organization
FCS	Food Consumption Score
FIES	Food Insecurity Experience Scale
FNM	Adult female no adult male
HAZ	Height-for-Age Z-Score
ICC	Intraclass Correlation Coefficient
IE	Impact evaluation
IMPEL	Implementer-Led Evaluation & Learning
MAD	Minimum acceptable diet
MDD	Minimum dietary diversity
MDD-C	Minimum dietary diversity–children
MMF	Minimum meal frequency
MNF	Adult male no adult female
N	Sample size
NGO	Non-governmental organization
ORT	Oral rehydration therapy
PPP	Purchasing power parity
RFSA	Resilience Food Security Activity
SE	Standard error
USAID	United States Agency for International Development
WASH	Water, sanitation, and hygiene
WAZ	Weight-for-Age Z-Score
WHZ	Weight-for-Height Z-Score
WRA	Women of reproductive age

EXECUTIVE SUMMARY

This report captures baseline round data and observations collected from May to June 2021 of the FIOVANA Resilience Food Security Activity (RFSA) that is being implemented by the Adventist Development Relief Agency (ADRA) in eastern Madagascar. This activity attempts to address and mitigate acute levels of food insecurity experienced by communities in this region of Madagascar. Apart from general demographics, study indicators include food security; child nutrition and health; women's maternal nutrition and reproductive health; water, sanitation, and hygiene practice; agricultural practice and production; poverty measurement; gender dynamics; and resilience. A complimentary endline survey is anticipated to be conducted from May to June of 2025.

Baseline Study Methodology

The impact evaluation (IE) of the FIOVANA RFSA relies on a clustered randomized controlled trial design to analyze differences between treatment and control groups. In the case of the FIOVANA RFSA IE, the intervention allowed for randomization at the commune level to create a set of treatment and control communes. As a result, the analysis will focus on the effect of the full RFSA on food security and other development outcomes across treatment households. Overall, analysis at baseline suggests that the IE is well placed to estimate these differences at endline, and that treatment and control groups are similar enough on key characteristics.

Study Limitations

Several factors posed potential challenges that the research team will adjust for or monitor throughout the course of the IE activity, such as the presence of several other large development organizations working in the region, which could present challenges in identifying the effects of the FIOVANA RFSA. This is complicated by the challenges imposed by the coronavirus that will potentially increase the involvement of outside aid groups. The research team will work closely with implementing partners to gauge this issue and take steps ahead of endline data collection to mitigate, if necessary. Finally, safety protocols that limited contact with beneficiaries and enforced social distancing measures ruled out the possibility of collecting some baseline indicators, specifically height measurements for women of reproductive age (WRA) and children.

Key Findings

Demographic Profiles

By the end of data collection efforts, 4,300 households had been surveyed. There were little to no observed trends of variance between the treatment and control groups on both the individual and household level, suggesting that the two groups are similar in terms of overall demographic characteristics. Self-reported household head characteristics follow a similar trend as other individual indicators in showing little difference between treatment and control households.

Food Security

Reported severe drought conditions in the area suggest reduced food security across the entire region of the study. Food security was estimated using two standard measurement approaches, the Food Insecurity Experience Scale (FIES) and the Food Consumption Score (FCS) index. Based on the FIES, 18% of the population is facing severe food insecurity, and over 81% are at least moderately food insecure. The FCS, which calculates overall consumption levels across food groups while accounting for cultural

and regional weights for food preference and importance, finds that fewer than 31% of all households have an acceptable FCS, and just under 7% of households are considered to have a poor FCS. Disaggregation by household adult type shows some differences as well, with 21% of households with an adult female and no adult male having an acceptable score, compared to 33% of households with both male and female adults present.

Child Nutrition and Health

Overall quality of diet for children 6 to 23 months of age appears to be poor across the survey population. Only 5% of all children aged 6 to 23 months met Minimum Dietary Diversity (MDD) criteria, and only 3% met minimum acceptable diet standards. Approximately 11% of children under 5 are reported to have experienced diarrhea within the last 2 weeks. Of those that experienced diarrhea, only 22% reported the use of oral rehydration therapy to treat symptoms. Of those that experienced fever, diarrhea, or acute respiratory infection, 58% report being treated at a health facility within 24 hours of symptoms. Given the ongoing COVID-19 pandemic, weight of children under 5 years of age was the only anthropometric indicator captured in the baseline round of surveys. More than a quarter of children are classified as underweight, and approximately 8% are severely underweight. Roughly 38% of children were within normal weight ranges.

Women's Health, Maternal Nutrition, and Reproductive Health

Observations around the health and reproductive decisions of women of reproductive age among surveyed households suggest poor food consumption diversity but minimally acceptable levels of access to health personnel during pregnancy. Altogether, 9% of women consumed a diet that meets the MDD criteria. Nearly 65% of women consumed three or fewer food groups. On average, 75% of women received the recommended number of antenatal care visits (at least four) during their most recent pregnancies, with the majority of these (80%) being with midwives. Additionally, 33% of women report using a modern method of birth control.

Water, Sanitation, and Hygiene (WASH) Practices

Based on indicator criteria, 16% of all households have access to basic drinking water services. While most water sources are available year-round and within 30 minutes of a residence, only 19% of households have access to an improved source. Regarding treatment, sanitation, and hygiene practice, only 4% of households were observed to have handwashing facilities available in the home, and half report treating water with filtering or disinfecting processes. Most households (66%) practice open defecation, and only 3% have household-level improved sanitation facilities. Among those not practicing open defecation, 84% utilize unimproved technology (uncovered pit latrine), and 48% share the facility with other households.

Agriculture

More than 94% of households are engaged in raising crops. Reported crops of focus include cassava, rice, and cloves. Of these, cassava and rice are grown by the large majority of farmers in the sample, 84% and 92%, respectively. A little more than a quarter (28%) grow cloves as a cash crop. The average yield for cassava is slightly over 5,000 kg/ha. Rice yield is approximately 3,900 kg/ha. Clove yield is estimated to be 670 kg/ha. Regarding other support practices, the use of credit and savings is not common among farmers, and crop insurance is almost non-existent. Value chain participation activity suggests that 32% of farmers participate in at least one value chain activity.

Livestock of focus in the baseline includes poultry, bees, and fish. In the baseline sample, 67% of farmers raised poultry, with only 27% reporting egg production in the past week. Of significant note is that 67% of poultry farmers report poultry dying in the last year, with most farmers (94%) reporting that they had not used any modern livestock raising practices such as vaccinations. Responses around beekeeping suggest that the practice is not widespread. Only 68 individuals in the survey reported raising bees, and a small number (15) utilized modern hives. Fishing was reported by 287 individuals, with the majority ((97%) indicating that fish would be consumed in the home compared to 55% indicating that at least some of the fish would be brought to market for sale.

Poverty Measurement

Based on daily per capita expenditures of less than $1.90 per day (2011 purchasing power parity (PPP), the poverty rate among households surveyed is approximately 72%. The depth of poverty of the poor is 33%, which means that the average poor person is 33% below the poverty line. In monetary terms, this means it would require an additional $0.63 per person per day to bring every poor person out of poverty.

Gender Dynamics

Gender dynamics are captured through the eight indicators in this section. Among women who are earning cash, a large majority (84%) reported that they participate in decisions about how to use the cash, whether solely or jointly with others. Women and men in a union report borrowing at similar rates across any source (36%). However, men in a union participate in decisions about credit at a much higher rate than women in a union (p-value = 0.00), with 87% of men reportedly making credit decisions, which is consistent across age groups.

Resilience

Resilience indicators were captured through several questions, including indices that were constructed to assess overall resilience capacities. Generally, households perceive their ability to meet their current needs as worse than the previous year and suspect that their future ability to meet these needs will deteriorate. A large share of households (80%) listed the drought as one of the shocks affecting them. Other common shocks listed included rising food prices, livestock disease, and crop pests. Out of the average of 2.3 shocks experienced across the sample, households perceived those shocks to be severe in nature, likely impacting perceived ability to recover. There does seem to be an overall trend that households with male adults both perceive a higher ability to recover from shocks and lower exposure and intensity of experienced shocks.

This page is intentionally left blank.

1. INTRODUCTION

The primary objective of the impact evaluation is to measure the impact of the Resilience Food Security Activity (RFSA) package of interventions on improving health, nutrition, and income in the targeted communities and to determine possible attribution to changes in key indicators. The Adventist Development Relief Agency (ADRA) FIOVANA activities aim to achieve sustainable improvement of food and nutrition security and resilience of vulnerable populations in Atsimo Atsinanana and Vatovavy-Fitovinany regions.[1] Figure 1 below shows the regions and communes where the intervention will be taking place. The activity serves a large population of households in southeastern Madagascar with interventions designed to improve maternal and infant health and nutrition, increase incomes, and improve resilience capacities. This report summarizes the results of the baseline study conducted in May–June 2021.

Figure 1. FIOVANA regions and communes [2]

Vatovavy Fitovinany Region

Atsimo Atsinanana Region

[1] https://adra.mg/our-projects/fiovana/

[2] https://adra.mg/our-projects/fiovana/

The evaluation seeks to inform the larger conversation around the efficacy of RFSA interventions among vulnerable populations. The impact evaluation of the activity uses a randomized controlled trial design which randomized communities into both treatment and control groups.

The baseline study relies on quantitative methods to measure baseline indicators collected in the RFSA target areas, as well as control areas in the same region. The survey provides baseline estimates on the status of communities and households across the United States Agency for International Development's (USAID) Bureau for Humanitarian Affairs (BHA) standard indicators. Causal Design has worked closely with BHA and relevant stakeholders to identify key learning objectives and to ensure that the baseline survey and study are able to contribute to this learning where possible.

2. METHODOLOGY AND LIMITATIONS

The impact evaluation of the FIOVANA RFSA uses a randomized controlled trial design at the commune level. A baseline survey of households was conducted in May–June 2021. The endline survey is planned for the second quarter of 2025. Below we describe an overview of the evaluation design. A more detailed description of the methodology can be found in Volume II, Annex C.

2.1 Evaluation Design

After discussion with the ADRA team, researchers deemed village or fokontany (village)-level randomization infeasible because (1) there are a number of planned commune-level interventions, and (2) there are logistical and political complications that arise when excluding some fokontany from activities within a commune. The communes are large, with an average population of over 11,000, which would generally be considered too large for randomization. In this case, however, numerous communes meet ADRA's inclusion criteria (124)—roughly double the number of communes in which ADRA had planned to work. Therefore, the best solution was to randomize at the commune level and later sample fokontany within the commune for the baseline survey. Based on our initial calculations, this commune-level randomization would be adequately powered to detect most impacts of interest.

2.1.1 Randomization Strategy

Selection Criteria

ADRA shared the criteria they used to determine if communes in the districts of Farafangana, Manakara, Mananjary, Vangaindrano, Vohipeno, and Vondrozo would be eligible for intervention. Based on these criteria, ADRA concluded that 124 communes of the 178 analyzed were eligible. We used these same criteria for our matching procedure. The selection criteria included population, level of poverty, length of the hungry season ("soudure"), remoteness, security, and access to a health clinic.

Matched Pairs

We chose a matched pair randomization approach to ensure better balance prior to baseline data collection compared to what could be achieved through stratified random sampling. In matched pair randomization, we first match units based on variables related to outcomes. In other words, we pair together communes that look "similar" based on available data. We then randomly assigned one unit from each pair to treatment and the other unit to control. Using ADRA's selection criteria, we put 124 communes into pairs or small groups of similar communes.

We made the groupings based on (1) being in the same district, (2) having similar population totals, (3) having similar distances to the district capital, and (4) having an ongoing United States Agency for International Development activity. We considered other criteria, but there was little variation in other factors such as poverty levels or soudure (hungry season) length. Three communes were unmatched due to outlier values on one or more of the characteristics. ADRA accidentally included the commune of Manakara in the list of selected communes and was not considered.

We shared the groupings with ADRA during our January 2020 trip. We asked the ADRA team to review our groupings and modify them as needed based on additional knowledge, including geographic location

(for example, coastal versus inland) or other characteristics deemed relevant for the types of interventions that might be carried out. We also suggested that they flag any communes they would not want to be considered for randomization for programmatic or logistical reasons. These would be taken out of consideration for pairing and assignment.

ADRA's revised groupings resulted in minor adjustments to the list and produced groups of two to four communes. We made one additional change before randomization; we dropped the commune of Analavory in the district of Manakara, which was an outlier within its group in terms of population. This final list gave us a maximum of 54 pairs, meaning 54 communes each in treatment and control. After further investigation, ADRA found that at least two of the treatment communes were too remote to consider for implementation. The finalized list has 50 communes in treatment and 50 in control.

Sampling Calculation

We used the following assumptions to calculate the needed sample size for the baseline:

- We calculated sample size based on a cluster randomized design.
- Intra-class correlation. We used an intra-class correlation coefficient (ICC) of 0.12. The ICC estimate comes from height-for-age Z-scores (HAZ) in the Madagascar Enquête Anthropométrique et Développement de l'Enfant 2011 household data.
- Significance level of 5%.
- Power level of 80%.
- Expected reduction in stunting over the life of the activity of 8 percentage points.
- Inflation Factor for the number of households with children under 5 years old to sample. From the aforementioned 2011 data set, 24% of the population is under 5 years old in the provinces of Toliara and Fianarantsoa. This implies an inflation factor of 1.2.
- Non-response factor between baseline and endline. We used 5%.

To capture sufficient children under 5 years old and to account for attrition, we would need at least 2 * 1,600 * 1.18 * 1.05 = 3,965 households total, or 20 households per cluster.

2.1.2 Sampling Frame

Fokontany within each commune were sampled using the 2018 INSTAT census, which was deemed to be the most consistent and updated data source available at the time. Researchers sampled Fokontany with probabilities proportional to size. Researchers sampled two fokontany in communes with under 15,000 residents, three were sampled in communes with more than 15,000 residents, and one commune (Ambandrika) only had one fokontany. The number of communes in each category and the resulting sample size are summarized below.

Table 1. Number of fokontany and households surveyed

Number of fokontany sampled in each commune	Number of communes	Total number of fokontany to be surveyed	Number of households to be surveyed (20 per fokontany)
1	1	1	20
2	83	166	3,320
3	16	48	960
Totals	100	215	4,300

Table 2. Individual response rate

Outcomes	Number in roster	Number surveyed	Response rate	Average age (years)
Women of reproductive age	5,214	4,885	93.7%	28.4
Children under 5 years old	4,916	4,211	85.7%	2.0
Farmers	4,192	4,135	98.6%	43.9
Women in a union	3,342	3,078	92.1%	36.4

Three of the sampled fokontany were replaced after teams discussed the local conditions with the commune mayor. Two fokontany were replaced because of security concerns, and one was replaced because it was very remote and would have required nearly a week's travel on foot to reach all the hamlets. Replacement fokontany were randomly sampled from the remaining fokontany.

2.1.3 Questionnaire Development

The baseline survey was developed using previous baseline surveys used by BHA and refined in consultation with BHA and the implementing partners.

The following survey modules were included:

- Module A: Household identification.
- Module B: Roster.
- Module C: Food access.
- Module D: Child nutrition and health.
- Module E: Women's nutrition and health.
- Module F: Water, Sanitation, and Hygiene (WASH).
- Module G: Agriculture.
- Module H: Household expenditure.
- Module J: Gender and cash use.
- Module K: Gender and credit.
- Module R: Resilience.

In addition, we created a short commune-level survey to capture community-level variables such as public service availability, the activities of development or aid projects, and the presence of local community groups.

2.1.4 Field Preparation

Travel restrictions during the COVID-19 pandemic prevented international travel. The team conducted training in the town of Manakara. Because most of the team had also worked on the nearly identical baseline survey for the Maharo RFSA, training was conducted over a shorter period. The team conducted full practice sessions over 3 days and conducted pilot surveys in two fokontany near Manakara. The training was interrupted by a 2-week quarantine after a possible COVID-19 case among the enumerators.

Dates of training:

6–13 April 2021, and 29 April–2 May (after quarantine).

Organization of teams:

There were 35 enumerators, 11 controllers, and 13 supervisors. There were 11 teams, 10 of which were assigned to specific communes, and one mobile team that joined other teams as needed. The controllers verified data quality, and one person from each team was charged with collecting weights of children.

2.1.5 Data Collection

Data collection began on May 4, 2021 and ended June 12, 2021. There were 4,300 households surveyed in the FIOVANA baseline. Table 3 depicts the household response rate.

Table 3. Household response rate[3]

	Total households sampled	Refused or absent	Total households surveyed	Response rate
Control	2,345	185	2,160	92.10%
Treatment	2,266	126	2,140	94.40%
All	4,611	311	4,300	93.30%

Household sampling

As household lists were not reliably available, field teams used the following method to sample households. First, working with fokontany leaders, the team would list each hamlet[4] and the approximate number of households in each. The number of households to be surveyed in each hamlet was determined by a field method equivalent to sampling by probability proportional to size. Finally, at the hamlet level, random numbers were chosen, for example, 5, 7, and 19, and the 5th, 7th, and 19th homes were surveyed by following the same direction around the hamlet.

Data quality control

Each enumerator was introduced to a household by a supervisor or controller. The supervisor assisted at the beginning of the interview to ensure that the interview began well and that the interviewer recorded key household data (number of households, number of children, number of women of

[3] Total sampled is the number of people who were contacted by the enumeration team (including replacements for refusals or absent households). Refused or absent account for people who were not available or were unable to be reached. Total surveyed are the people who were actually surveyed which aligns with our target sample.

[4] Hamlets are groups of houses within the fokontany. This is not an additional level of sampling because hamlets are not sampled. Rather it is a way to randomly sample households in the absence of lists of names.

childbearing age, number of cash-earners in the household, etc.) in their notebook in addition to recording the data in the tablets. The notes confirmed that data was properly entered and that the correct numbers of people were included in the different modules. All data was collected via the mobile data collection software SurveyCTO.

Two lead supervisors permanently monitored the field teams until the end of the surveys to verify the data and to solve problems promptly. Each team supervisor was asked to complete a fokontany information survey on their tablet to track the number of households sampled, number absent or refused, and number surveyed. In the case of households with unusual responses (case of 0 expenses, for example), the lead supervisors confirmed responses in person. Each team was visited by the lead supervisors at least twice during the field. This was necessary not only for the survey conduct but also to troubleshoot technical issues with the tablets, which was a collective problem for all teams. Five supervisors also listened to 5-minute recordings from the enumerators. These recordings covered the first 5 minutes of module H, household expenditures. However, most of the recordings were unusable due to various timing issues at the beginning of the module.

2.2 Challenges and Limitations

2.2.1 Survey Challenges

The start of the survey was initially delayed due to potential positive COVID-19 cases among the team members. The positive COVID-19 cases necessitated last-minute replacements of a supervisor and several enumerators. Ultimately, the COVID-19 protocols established for the baseline worked. We did not detect further illnesses or potential exposures once the team was in the field, and data quality should not have been affected.

Because of problems with some of the tablets and issues with uploading survey data, we found some duplicate surveys in the raw data, and initially, some surveys we did not upload. We identified and dropped duplicates, and we identified and uploaded missing surveys. One tablet did not update the survey version successfully, so an older version was used for 38 surveys. However, we made only minor updates after this version, which should not affect the validity of these surveys.

2.2.2 Limitations

- There are several other large development organizations working in the region. This could present challenges in identifying the effects of the FIOVANA RFSA. We are collecting information at the commune level at both the baseline and endline. This information will help us to control for other interventions.
- Yield calculations using recall data are necessarily rough estimates.
- The survey was conducted during the COVID-19 pandemic, and to maintain distance between enumerators and respondents and to minimize contact, only one anthropometric measure was collected at baseline. After discussions with BHA and the implementing partner, we determined that child weight could be safely measured if the caretaker was asked to weigh the child. Thus, we can calculate the weight-for-age z-score (WAZ) for children under 5 years old. We did not collect height for adults and children. However, because of the randomized design, collecting these measures at the endline will still be informative.

3. FINDINGS

3.1 Characteristics of the Study Population

This section provides the basic demographic information for the baseline sample. As mentioned previously, we surveyed 4,300 households. Table 4 shows that most households have both a male and female adult present. For the whole sample, 16% of households have only an adult female present, and nearly 2% have only an adult male present. The average household has 5.8 people, including two children under the age of 5 years old. Results are not reported for cells with less than 30 observations and are denoted with an n/a for not available.

Table 4. Basic household-level statistics

	Control	Treatment	All
Percent households with adult male and female	83.1%	82.7%	82.9%
Percent households with adult female only	15.8%	16.7%	16.3%
Percent households with adult male only	1.1%	0.6%	0.9%
Household size	5.77	5.92	5.84
Percent of households engaged in farming	94.6%	93.7%	94.1%
Percent responding as head of household*	48.5%	45.3%	47.0%

** This is based on who responded to module F, a section that asks to speak to an adult or the head of household or a responsible adult. All other sections asked specifically for the head of household or other members of the family (e.g. farmers, caretakers of children under 2)*

Table 5 provides the basic individual demographic information of the sample. The household sample represents over 25,000 individuals. The average age is 21 years old, and approximately 51% of those in the sample are female. Figure 2 shows the population by age and gender.[5] Among those 15 years old and over, 33% engage in some type of farming or livestock activity. For those over 10 years old, 67% worked for cash in the previous year. Slightly more than half of those school-age or older have at least some schooling.

Table 5. Baseline individual-level demographic information

	Control			Treatment			All		
Outcome	Mean	Standard Error (SE)	N	Mean	SE	N	Mean	SE	N
Age	20.8	(0.19)	12,535	20.9	(0.20)	12,555	20.85	(0.14)	25,090
Percent of sample who are female	51.1%	(0.52)	12,535	51.4%	(0.52)	12,557	51.2%	(0.37)	25,092
Percent of adults 15 years and older who are farmers	34.6%	(0.70)	6,324	31.5%	(0.68)	6,415	33.0%	(0.49)	12,739
Percent of school age persons with at least some schooling	65.9%	(0.54)	10,409	68.9%	(0.52)	10,409	67.4%	(0.38)	20,818
Percent of adults 15 years and older who worked for cash	63.4%	(0.71)	6,253	61.7%	(0.71)	6,361	62.5%	(0.50)	12,614

[5] The figure shows the age distribution across the full sample

	Control			Treatment			All		
Outcome	Mean	Standard Error (SE)	N	Mean	SE	N	Mean	SE	N
Percent of sample women of reproductive age	30.4%	(0.48)	12,535	30.4%	(0.48)	12,557	30.4%	(0.34)	25,092
Percent of sample under 5 years old	16.5%	(0.38)	12,535	17.1%	(0.39)	12,557	16.8%	(0.27)	25,092
Percent of sample 5–14 years old	33.2%	(0.49)	12,535	31.9%	(0.49)	12,557	32.6%	(0.34)	25,092
Percent of sample 10-24 years old	34.1%	(0.00)	12535	33.6%	(0.00)	12,557	33.9%	(0.00)	25,092

Figure 2. Age and gender composition (unweighted) of the sample

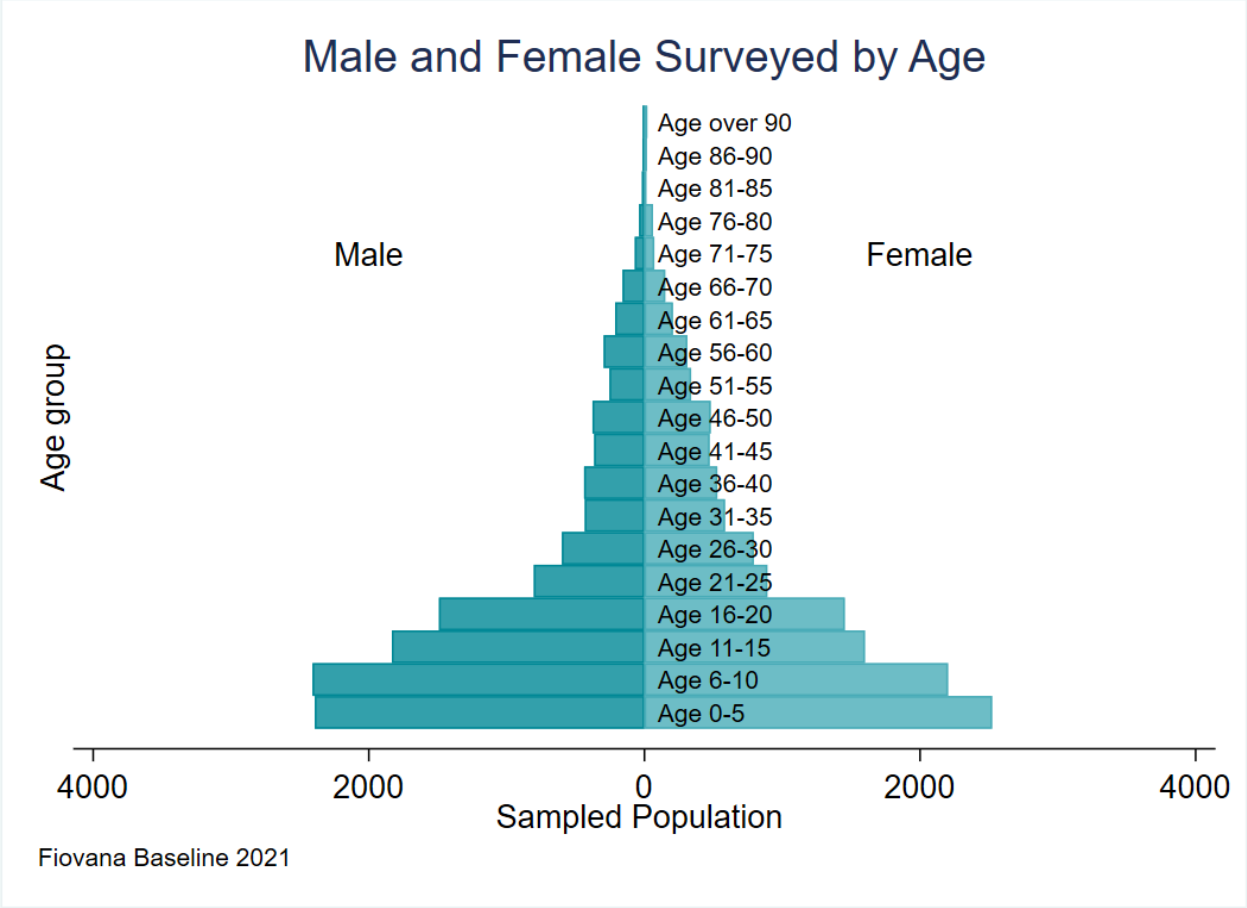


Table 6 lists the characteristics of the person self-identified as the head of household. The sample is comprised of 27% female-headed households. Roughly 32% of household heads have no formal schooling, and 35% completed primary school.

Table 6. Head of household statistics

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Age of head of households	44.65	(0.38)	2,156	45.46	(0.39)	2,141	45.06	(0.27)	4,297
Percent of female head of households	25.3%	(1.09)	2,157	27.9%	(1.15)	2,142	26.6%	(0.79)	4,299
Percent of head of households that did not attend school	33.0%	(1.18)	2,157	31.9%	(1.17)	2,142	32.4%	(0.83)	4,299
Percent of head of households with some schooling, less than primary	34.2%	(1.19)	2,157	30.2%	(1.18)	2,142	32.2%	(0.84)	4,299
Percent of heads of households that completed primary or more	32.8%	(1.17)	2,156	37.9%	(1.23)	2,141	35.4%	(0.85)	4,297

3.2 Food Security

The first indicator in this section is the prevalence of food insecurity, which is measured using the Food Insecurity Experience Scale (FIES) developed by the Food and Agriculture Organization (FAO).

The responses to these questions are analyzed by estimating a Rasch model using tools developed by the FAO in R software.[6] [7] Only households responding to all questions are included in the analysis. Furthermore, extreme responses—those responding either "yes" or "no" to all questions—are excluded from the estimation but included in the final calculation of the prevalence rates.

Table 7 summarizes the prevalence of moderate and severe food insecurity in the household based on the FIES. In the sample, approximately 18% of individuals are considered to be experiencing severe food insecurity, and over 81% are at least moderately food insecure. Severe food insecurity is higher in treatment areas (21%) compared to control (15%). The t-test comparing treatment and control based on the number of questions answered "yes" has a p-value of 0.00, confirming the higher food insecurity in treatment areas. The answers to the eight questions are disaggregated by household type in Table 8.

Table 7 shows the percent of respondents answering "yes" to each question. Overall, 16% of households responded "yes" to all eight questions for the period of the previous 30 days. Only 2.5% (107) households answered "no" to all questions. Consistent with the assumption that each question captures a progressively more severe experience, the proportion of "yes" answers generally declines with each question. The exception is between questions 4 and 5. More households (87%) reported eating less because of lack of money or other resources than reported skipping a meal (60%).

Table 7. Prevalence of moderate and severe food insecurity in the population

	Prevalence rate (not Moderate or Severe)	Prevalence rate (Moderate + Severe)	Prevalence rate (Severe)	N
All	18.7%	81.3%	17.9%	4,293
Treatment	15.7%	84.3%	20.9%	2,137
Control	21.8%	78.2%	15.2%	2,156

[6] The model produced a reliability score of 0.86, which suggests a good model fit.

[7] Cafiero et al., Methods for Estimating Comparable Prevalence Rates of Food Insecurity Experienced by Adults throughout the World, (Rome, Italy: FAO, 2016)

Table 8. Percentage of households responding "yes" to "During the past 30 days, was there a time when you or others in your household…" disaggregated by household type*

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
...were worried you would not have enough food to eat because of a lack of money or other resources	91.6%	(1.22)	2,115	92.5%	(1.17)	2,097	92.1%	(0.61)	4,212
F&M Worried	91.3%	(1.26)	1,771	92.5%	(1.21)	1,731	91.9%	(0.67)	3,502
FNM Worried	93.0%	(2.12)	319	93.4%	(1.79)	354	93.2%	(1.25)	673
MNF Worried	n/a	n/a	25	n/a	n/a	12	85.2%	(8.26)	37
...were unable to eat healthy and nutritious food because of a lack of money or other resources	92.6%	(1.29)	2,115	95.8%	(0.86)	2,097	94.2%	(0.74)	4,212
F&M Healthy	92.6%	(1.14)	1,771	95.7%	(0.85)	1,731	94.1%	(0.66)	3,502
FNM Healthy	93.2%	(2.39)	319	96.9%	(1.18)	354	95.1%	(1.36)	673
MNF Healthy	n/a	n/a	25	n/a	n/a	12	80.9%	(9.89)	37
...ate only a few kinds of foods because of a lack of money or other resources?	92.6%	(1.28)	2,115	95.9%	(0.77)	2,097	94.3%	(0.73)	4,212
F&M Few foods	92.8%	(1.16)	1,771	95.8%	(0.78)	1,731	94.3%	(0.65)	3,502
FNM Few foods	92.4%	(2.35)	319	97.0%	(1.06)	354	94.8%	(1.41)	673
MNF Few foods	n/a	n/a	25	n/a	n/a	12	n/a	n/a	37
...had to skip a meal because there was not enough money or other resources to get food?	56.7%	(2.43)	2,115	61.2%	(2.55)	2,097	58.9%	(1.59)	4,212
F&M Skipped	56.0%	(2.58)	1,771	59.7%	(2.55)	1,731	57.8%	(1.64)	3,502
FNM Skipped	60.6%	(3.68)	319	69.7%	(3.92)	354	65.3%	(2.71)	673
MNF Skipped	n/a	n/a	25	n/a	n/a	12	40.6%	(10.10)	37
...ate less than you thought you should because of a lack of money or other resources?	84.9%	(1.89)	2,115	88.8%	(1.29)	2,097	86.9%	(1.17)	4,212
F&M Ate less	83.7%	(2.01)	1,771	88.1%	(1.45)	1,731	85.9%	(1.29)	3,502
FNM Ate less	90.6%	(2.01)	319	93.4%	(1.47)	354	92.0%	(1.25)	673
MNF Ate less	n/a	n/a	25	n/a	n/a	12	80.8%	(9.05)	37
...did not have food because of a lack of money or other resources?	23.7%	(1.97)	2,115	29.8%	(2.56)	2,097	26.7%	(1.46)	4,212
F&M Runout	22.4%	(2.11)	1,771	28.3%	(2.66)	1,731	25.4%	(1.50)	3,502
FNM Runout	30.2%	(3.55)	319	37.1%	(3.72)	354	33.7%	(2.91)	673
MNF Runout	n/a	n/a	25	n/a	n/a	12	n/a	n/a	37
...were hungry but did not eat because there was not enough money or other resources?	23.8%	(2.73)	2,115	31.4%	(3.00)	2,097	27.6%	(1.73)	4,212
F&M Hungry	23.2%	(2.73)	1,771	30.2%	(3.09)	1,731	26.7%	(1.76)	3,502
FNM Hungry	27.8%	(4.05)	319	37.4%	(3.49)	354	32.7%	(2.63)	673

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
MNF Hungry	n/a	n/a	25	n/a	n/a	12	18.4%	(7.19)	37
...went without eating for a whole day because of a lack of money or other resources?	17.7%	(1.95)	2,115	23.3%	(2.84)	2,097	20.5%	(1.36)	4,212
F&M Whole Day	17.1%	(2.02)	1,771	22.4%	(2.83)	1,731	19.7%	(1.35)	3,502
FNM Whole Day	21.4%	(3.01)	319	28.1%	(3.78)	354	24.9%	(2.25)	673
MNF Whole Day	n/a	n/a	25	n/a	n/a	12	9.9%	(5.46)	37

Not applicable (n/a)

** Gendered Household Type: Female and Male Adults (F&M), Adult Female no Adult Male (FNM), Adult Male no Adult Female (MNF).*

The second indicator is the Food Consumption Score (FCS). This is a weighted sum of eight food groups consumed by the household in the previous 7 days. The weights are based on the food group's importance in the diet. For example, meat and dairy have a weight of 4, staples have a weight of 2, and sugars have a weight of 0.5. The FCS ranges from 0 to 112. Scores below 22 are considered to have a poor consumption score. Scores 22–35 are considered borderline. Acceptable scores are above 35. As shown in Table 9, the mean FCS is 33, and approximately 7% of individuals are considered to have poor FCS. Fewer than 31% of households have an acceptable FCS. The majority of households have a borderline FCS.

The FCSs disaggregated by household type are in Table 10. Households with both an adult male and female present have a higher FCS than female-only households (p-value = 0.00). There are too few male-only households to detect whether the FCSs for these households differ from those of other groups.

Table 9. Mean scores of households with poor, borderline, and acceptable Food Consumption Score

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Household FCS (0–112)	32.89	(0.50)	2115	32.3	(0.58)	2097	32.6	(0.32)	4212
F&M	33.25	(0.51)	1771	32.73	(0.57)	1731	32.99	(0.31)	3502
FNM	31.09	(0.62)	319	30.11	(0.85)	354	30.59	(0.51)	673
MNF	n/a	n/a	25	n/a	n/a	12	32.9	(2.72)	37

Not applicable (n/a)

** Gendered Household Type: Female and Male Adults (F&M), Adult Female no Adult Male (FNM), Adult Male no Adult Female (MNF)*

Table 10. Percentage of households with poor, borderline, and acceptable Food Consumption Score

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of households with poor consumption score (<22)	5.9%	(0.92)	2,115	8.0%	(1.44)	2,097	6.9%	(0.73)	4,212
F&M poor	5.3%	(0.96)	1,771	6.9%	(1.37)	1,731	6.1%	(0.69)	3,502
FNM poor	7.8%	(1.89)	319	12.8%	(2.49)	354	10.4%	(1.58)	673
MNF poor	n/a	n/a	25	n/a	n/a	12	20.3%	(9.20)	37

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of households with borderline consumption score (22–35)	62.0%	(2.13)	2,115	62.3%	(2.10)	2,097	62.1%	(1.21)	4,212
F&M border	60.8%	(2.23)	1,771	61.1%	(2.28)	1,731	61.0%	(1.32)	3,502
FNM border	68.8%	(3.48)	319	68.%2	(3.33)	354	68.5%	(2.45)	673
MNF border	n/a	n/a	25	n/a	n/a	12	55.0%	(9.13)	37
Percent of households with an acceptable consumption score (>35)	32.1%	(2.63)	2,115	29.8%	(2.89)	2,097	30.9%	(1.52)	4,212
F&M acceptable	33.9%	(2.73)	1,771	32.0%	(3.05)	1,731	32.9%	(1.57)	3,502
FNM acceptable	23.4%	(3.17)	319	19.0%	(3.46)	354	21.1%	(2.21)	673
MNF acceptable	n/a	n/a	25	n/a	n/a	12	24.7%	(8.14)	37

Not applicable (n/a)

** Gendered Household Type: Female and Male Adults (F&M), Adult Female no Adult Male (FNM), Adult Male no Adult Female (MNF)*

3.3 Child Nutrition and Health

This section presents findings on child health and nutrition. This includes quality of diet, breastfeeding practices, healthcare treatment, and incidences of diarrhea. This section also includes child anthropometric data. Due to safety concerns brought on by COVID-19, however, we were only able to capture and calculate weight at baseline.

3.3.1 Nutrition

Prevalence of children 6–23 months consuming a diet of minimum dietary diversity (MDD) and percent of children 6–23 months receiving a minimum acceptable diet (MAD) are the indicators of nutrition reported for children under 2 years old. The MDD-Children (MDD-C) uses the following eight food groups: (1) breastmilk, (2) grains, roots, and tubers, (3) legumes and nuts, (4) dairy products (milk, yogurt, and cheese), (5) flesh foods (meat, fish, poultry, and liver/organ meats), (6) eggs, (7) vitamin A-rich fruits and vegetables, and (8) other fruits and vegetables. The criteria for achieving an MDD-C is consuming at least five of the eight food groups.

Table 11 shows the percentage of children meeting these criteria. Of the children sampled, 5% met these criteria. Grains are the most consumed (80%), followed by vitamin-A-rich vegetables and fruits (61%), dairy (6%), other vegetables and fruits (5%), flesh foods (4%), and legumes (2%). Eggs were consumed the least by children (1%).

Table 11. Prevalence of children 6–23 months consuming a diet of minimum diversity

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Children (ages 6–23 months)	6.8%	(0.012)	639	3.9%	(0.011)	639	5.4%	(0.007)	1,278
Male children (ages 6–23 months)	7.4%	(0.016)	304	4.4%	(0.013)	317	5.9%	(0.008)	621

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Female children (ages 6–23 months)	6.3%	(0.017)	335	3.4%	(0.014)	322	4.9%	(0.011)	657

MAD is defined as eating a certain number of times per day (minimum meal frequency) in addition to having an MDD. The MAD uses six or seven food groups depending on whether the child is breastfed or not to define MDD.[8] Table 12 shows that only 3% of children are receiving a MAD. Roughly the same percentage of boys and girls are receiving a MAD (3%).

Minimum meal frequency (MMF) is used to calculate the MAD. The MMF must be calculated for both breastfed and non-breastfed children. The criteria to meet this if the child is breastfeeding is that they have to have three or more feedings of solid, semi-solid, or soft foods and be between the ages of 9 and 23 months. In total, 46.5% of breastfed children met these criteria, which is illustrated in Table 13. The criteria for non-breastfed children is that they have to be between the age of 6 and 23 months and have four or more feedings of solid, semi-solid, or soft foods in addition to two or more milk feedings. Breastfed children 6–8 months must receive at least two feedings. Table 13 shows that 4.4% of non-breastfed children surveyed met this standard.

Table 12. Percentage of children ages 6–23 months receiving a minimum acceptable diet

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Children (ages 6–23 months)	3.8%	(0.009)	639	2.5%	(0.007)	639	3.1%	(0.005)	1,278
Male children (ages 6–23 months)	4.0%	(0.013)	304	2.6%	(0.010)	317	3.3%	(0.008)	621
Female children (ages 6–23 months)	3.5%	(0.010)	335	2.3%	(0.011)	322	2.9%	(0.008)	657

Table 13. Minimum meal frequency, breast-fed and non-breastfed children 6–23 months

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Minimum meal frequency for breastfed children ages 6–23 months	48.7%	(0.034)	556	44.3%	(0.037)	538	46.5%	(0.019)	1,094
Minimum meal frequency for non-breastfed children ages 6–23 months	2.1%	(0.021)	83	5.9%	(0.027)	101	4.4%	(0.019)	184

Table 14 illustrates the prevalence of exclusive breastfeeding among children under 6 months. This is defined as the children under 6 months who were exclusively breastfed during the day preceding the survey, excluding any oral rehydration solution. Overall, 64% of children under the age of 6 months were exclusively breastfed.

[8] The MAD does not include breastmilk as a food group. It includes dairy products as a food group for breastfed children and excludes them for non-breastfed children

Table 14. Prevalence of exclusive breastfeeding of children under 6 months of age

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Children (under 6 months of age)	60.8%	(0.047)	176	65.6%	(0.042)	209	63.5%	(0.030)	385
Male children (under 6 months of age)	65.4%	(0.047)	88	65.9%	(0.060)	97	65.6%	(0.036)	185
Female children (under 6 months of age)	55.9%	(0.071)	88	65.4%	(0.051)	112	61.4%	(0.045)	200

The next two indicators focus on the percentage of children under 5 (0–59 months) who had diarrhea in the prior 2 weeks and the percentage of children under 5 (0–59 months) with diarrhea treated with oral rehydration therapy (ORT). A positive incidence is defined as a child experiencing an episode of diarrhea any time in the 2 weeks that preceded the survey, while ORT is defined as receiving an oral rehydration solution, recommended home fluids, or increased fluids. According to the survey results, 11% of children experienced diarrhea. Both boys and girls across the control and treatment areas had diarrhea at a similar rate. The prevalence of children who had diarrhea and were treated with ORTs is about 23% overall.

Table 15. Percentage of children under 5 (0–59 months) years old who had diarrhea in the prior 2 weeks

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Children (ages 0–59 months)	11.8%	(0.016)	2,089	10.8%	(0.011)	2,112	11.3%	(0.008)	4,201
Male children (ages 0–59 months)	11.9%	(0.017)	1,044	10.3%	(0.011)	1,016	11.1%	(0.009)	2,060
Female children (ages 0–59 months)	11.8%	(0.017)	1,045	11.2%	(0.015)	1,096	11.5%	(0.010)	2,141

Table 16. Percentage of children under 5 (0–59 months) years old with diarrhea treated with Oral Rehydration Therapy

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Children (ages 0–59 months)	17.4%	(0.034)	243	27.8%	(0.038)	234	22.5%	(0.025)	477
Male children (ages 0–59 months)	16.6%	(0.041)	122	33.1%	(0.068)	114	24.5%	(0.039)	236
Female children (ages 0–59 months)	18.2%	(0.052)	121	23.2%	(0.050)	120	20.7%	(0.037)	241

Table 17 displays a custom indicator that shows the percent of children under 5 years old who have had diarrhea or acute respiratory infection (ARI) in the past 15 days and received treatment within 24 hours from a health facility. Children received treatment for fever (64%) at a higher rate than for diarrhea (44%) and for ARI (43%). However, there were more children who had a fever and received treatment over the past 15 days than those who had diarrhea or ARI.

Table 17. Percentage of children under 5 years old who had fever, diarrhea, or acute respiratory infection in the past 15 days and received treatment within 24 hours from a health facility

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Children (0–59 months) who received treatment within 24 hours from a health facility	54.8%	(0.030)	660	59.6%	(0.029)	772	57.5%	(0.020)	1,432
Children (0–59 months) who had a fever and received treatment within 24 hours from a health facility	59.8%	(0.035)	473	67.8%	(0.034)	541	64.2%	(0.023)	1,014
Children (0–59 months) who had diarrhea and received treatment within 24 hours from a health facility	44.2%	(0.041)	171	44.6%	(0.059)	174	44.4%	(0.033)	345
Children (0–59 months) who had ARI and received treatment within 24 hours from a health facility	40.1%	(0.064)	114	45.3%	(0.048)	141	43.2%	(0.040)	255

3.3.2 Anthropometry

Anthropometric indicators traditionally include measures of prevalence rates of wasting (weight-for-height z-score (WHZ)), stunting (HAZ), and being underweight (WAZ). Given limitations to data collection related to COVID-19 safety protocols, only the weight of children under 5 years old was captured in the baseline round of surveys. Children without a known birth month and year were excluded. Children with WAZ scores of less than -2 standard deviations are considered underweight, and those with scores of less than -3 standard deviations are considered severely underweight. A little over a quarter of children were underweight, and 8% were severely underweight. Roughly 38% of children are considered to have a normal weight. Figure 3 shows the distribution of WAZ scores.[9]

[9] The figure shows WAZ scores across the full sample of children under 5 years of age.

Table 18. Prevalence of underweight children under 5 years old

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Weight-for-age z-score (WAZ)	-1.3	(0.05)	2,049	-1.3	(0.06)	2,047	-1.3	(0.04)	4,096
Percent of children under 5 years old underweight	26.3%	(1.27)	2,049	25.5%	(1.76)	2,047	25.9%	(1.09)	4,096
Percent of children under 5 years old severely underweight	9.1%	(0.94)	2,049	6.7%	(1.03)	2,047	7.9%	(0.76)	4,096
Percent of children under 5 years old with a normal weight*	39.3%	(1.82)	2,049	37.6%	(1.62)	2,047	38.4%	(1.12)	4,096

** Children with WAZ scores between -1 and 2 are considered normal weight.*

Figure 3. Distribution of weight-for-age z-score

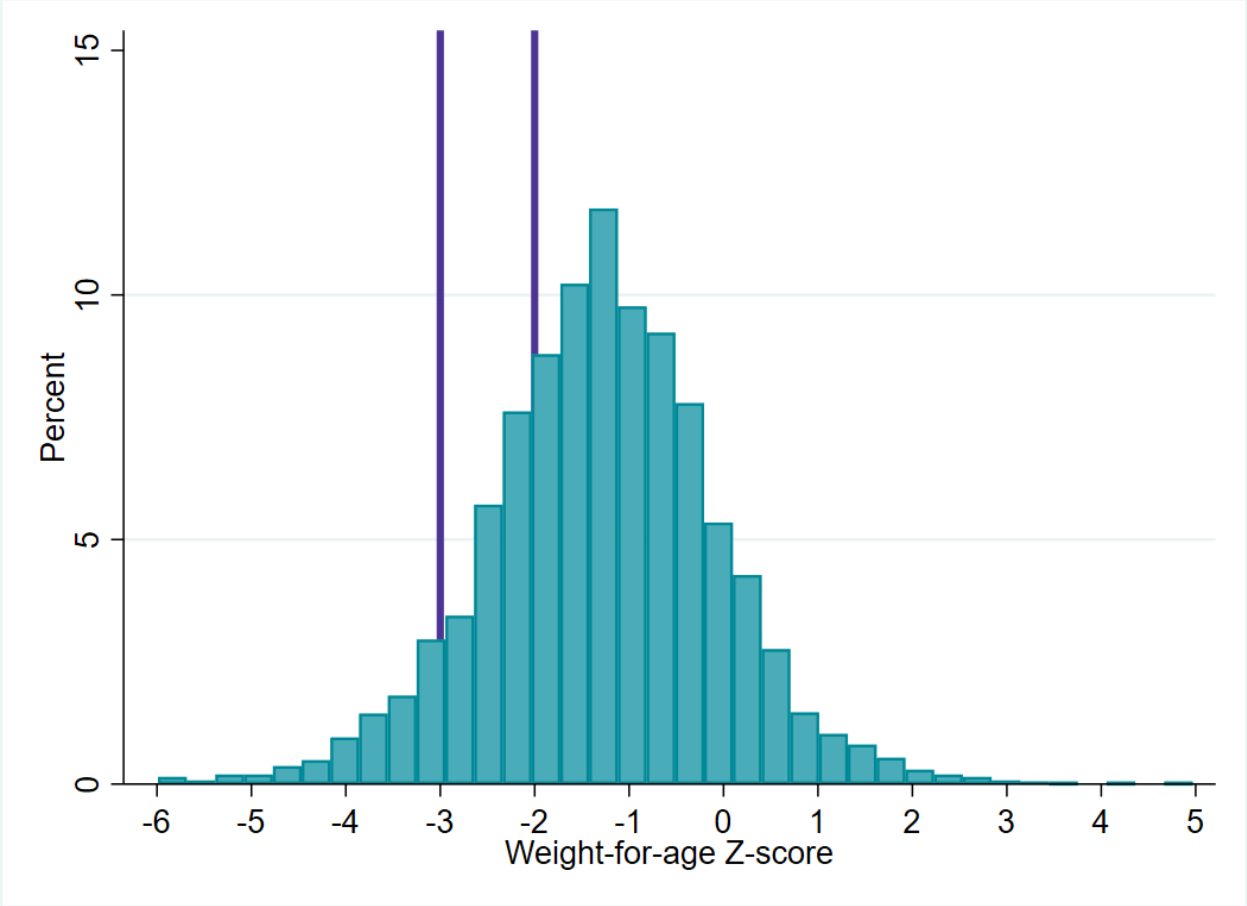


Table 19 illustrates the underweight statistics disaggregated by gender and age group. Boys have a lower WAZ on average (-1.41) than girls (-1.15) (p-value = 0.00). Older children (2–5 years old) also have a lower z-score than infants under 2 years old (p-value = 0.00). This is also reflected in both the underweight and severely underweight percentages.

Table 19. Prevalence of underweight children under 5 years old, disaggregated

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Female WAZ	-1.15	(0.07)	1,033	-1.15	(0.06)	1,072	-1.15	(0.04)	2,105
Male WAZ	-1.41	(0.06)	1,016	-1.4	(0.08)	975	-1.41	(0.05)	1,991
0–23 months WAZ	-0.94	(0.08)	796	-1.07	(0.11)	810	-1.01	(0.06)	1,606
24–59 months WAZ	-1.5	(0.05)	1,253	-1.4	(0.06)	1,237	-1.45	(0.04)	2,490
Percent of female children under 5 who are underweight	23.4%	(1.46)	1,033	22.4%	(1.95)	1,072	22.9%	(1.25)	2,105
Percent of male children under 5 who are underweight	29.3%	(1.83)	1,016	28.8%	(2.09)	975	29.0%	(1.38)	1,991
Percent of children ages 0–23 months underweight	21.9%	(1.75)	796	25.4%	(2.67)	810	23.7%	(1.67)	1,606
Percent of children ages 24–59 months underweight	29.1%	(1.52)	1,253	25.5%	(1.81)	1,237	27.3%	(1.24)	2,490
Percent of female children under 5 years that are severely underweight	7.7%	(1.30)	1,033	6.1%	(1.50)	1,072	6.9%	(0.91)	2,105
Percent of male children under 5 years that are severely underweight	10.5%	(1.13)	1,016	7.3%	(1.32)	975	8.9%	(0.90)	1,991
Percent of children 0–23 months that are severely underweight	8.2%	(1.31)	796	7.8%	(1.59)	810	8.0%	(1.08)	1,606
Percent of children 24–59 months that are severely underweight	9.7%	(1.14)	1,253	6.0%	(0.91)	1,237	7.8%	(0.81)	2,490
Female children under 5 years with a normal weight	43.4%	(1.98)	1,033	41.2%	(2.13)	1,072	42.3%	(1.32)	2,105
Male children under 5 with a normal weight	35.1%	(2.44)	1,016	33.8%	(1.98)	975	34.4%	(1.61)	1,991
Percent of children 0–23 months with a normal weight	48.6%	(2.66)	796	44.0%	(3.05)	810	46.3%	(1.93)	1,606
Percent of children 24–59 months with a normal weight	33.4%	(1.87)	1,253	33.5%	(1.97)	1,237	33.5%	(1.06)	2,490

** Children with WAZ scores between -1 and 2 are considered normal weight.*

3.4 Women's Health, Maternal Nutrition, and Reproductive Health

This section focuses on the health and reproductive decisions of women of child-bearing age. The first indicator measures the percent of women of reproductive age (WRA) consuming a diet of minimum dietary diversity (MDD-W). WRA includes all women in the household 15–49 years old. MDD is measured by counting the number of food groups a woman consumed during the previous day and night. The food groups are grains, white roots and tubers, and plantains, pulses (beans, peas, and lentils), nuts and seeds, dairy, meat, poultry and fish, eggs, dark green leafy vegetables, other vitamin A-

rich fruits and vegetables, other vegetables, and other fruits. The criteria for MDD is met when a woman eats at least five of the 10 food groups specified.

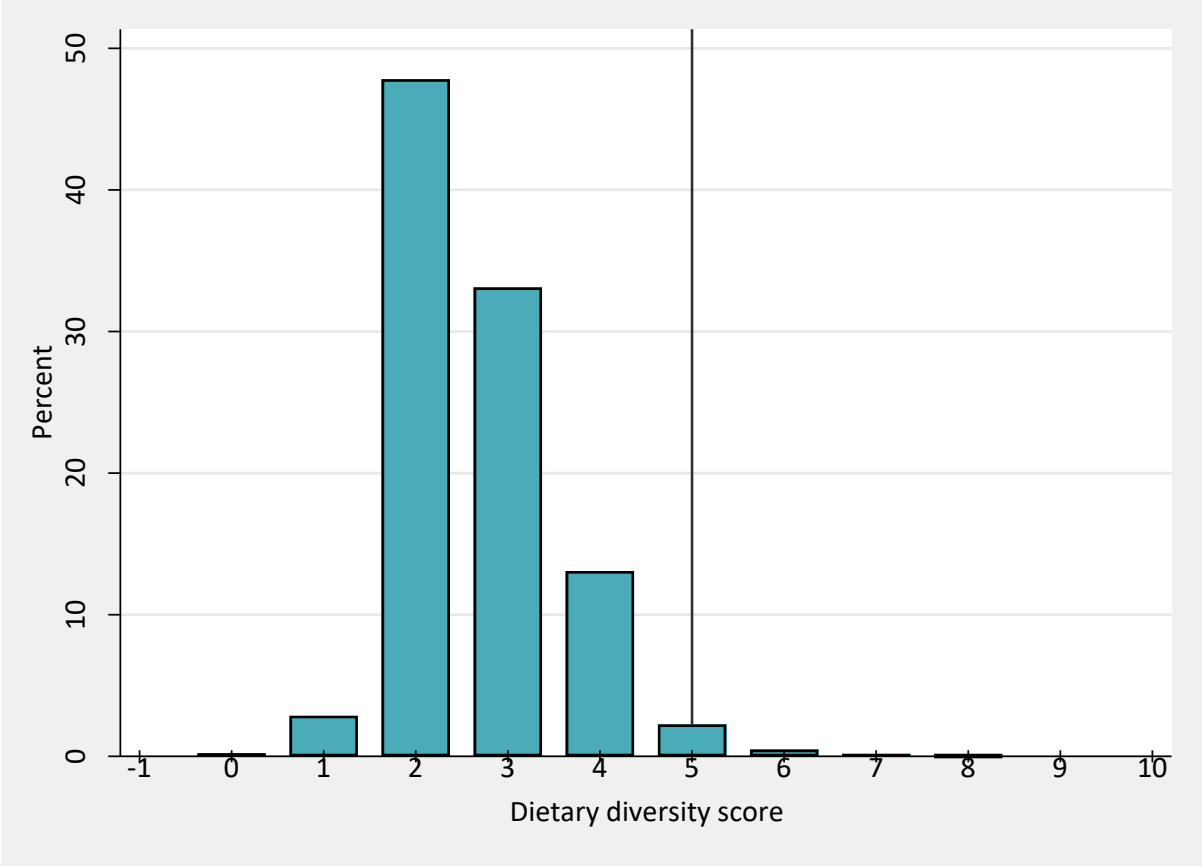
Table 20 shows that about 3% of women consumed a diet that met the MDD requirements. Figure 4 illustrates the distribution of the MDD score.[10] Almost 65% of women consumed three or fewer food groups, with almost 60% of women consuming three food groups. The most common food group consumed was grains (99%). The next most common food groups consumed are dark green leafy vegetables (88%), vitamin A-rich fruits and vegetables (27%), other fruit (21%), meat, poultry, and fish (17%), pulses (beans, peas, and lentils) (8%), eggs (1%), dairy (1%), and nuts (1%).

Table 20. Percentage of women of reproductive age consuming a diet of minimum diversity

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Women ages 15–49 years with MDD	3.2%	(0.006)	2,416	3.4%	(0.008)	2,467	3.3%	(0.005)	4,883
Women (ages 15–18)	3.8%	(0.012)	465	3.3%	(0.011)	495	3.5%	(0.008)	960
Women (age 19+)	3.1%	(0.006)	1,951	3.4%	(0.008)	1,972	3.3%	(0.005)	3923

**Minimum dietary diversity (MDD)*

Figure 4. Dietary diversity score for women of reproductive age



[10] The figure shows the distribution of the MDD score across the full sample of women of reproductive age.

Table 21 shows the percent of women of reproductive age with a live birth in the past 5 years who received at least four antenatal care (ANC) visits from skilled health personnel during their most recent pregnancies. Skilled health personnel refers to doctors, nurses, midwives, skilled birth attendants, or clinical officers. Women qualify as having received ANC if they have had at least four ANC visits. Across both control and treatment groups, about 67% of these women met these criteria during their most recent pregnancy. More than 80% of these ANC visits were with midwives.

Table 21. Percentage of births receiving at least four antenatal care visits during pregnancy

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
ANC for WRA who had a live birth during the last 5 years*	66.1%	(0.029)	1,347	68.2%	(0.024)	1,372	67.1%	(0.018)	2,719

***Women of reproductive ages 15–49*
**Antenatal care (ANC)*

The Contraceptive Prevalence Rate measures non-pregnant women of reproductive age (15–49) who are currently using or whose partners are currently using at least one contraceptive method. Table 22 displays this rate. Nearly 33% of non-pregnant women between the ages of 15–49 in a union are using birth control, with all of the women using modern birth control. Modern birth control includes female and male sterilization, injectables like Depo-Provera, intrauterine devices, contraceptive pills, implants, and female and male condoms. Traditional birth control methods include rhythm and withdrawal.

Table 22. Contraceptive prevalence rate

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Non-pregnant women 15–49 in a union using birth control	35.2%	(0.027)	1,178	29.6%	(0.025)	1,125	32.5%	(0.014)	2,303
Non-pregnant women aged 15–49 in a union using modern birth control	35.2%	(0.027)	1,178	29.6%	(0.025)	1,125	32.5%	(0.014)	2,303
Non-pregnant women aged 15–49 in a union traditional birth control	0.0%	n/a	0	0.0%	n/a	0	0.0%	n/a	0

Table 23 depicts the percent of women in a union who have knowledge of modern family planning methods that can be used to delay or avoid pregnancy. Of the women in a union between the ages of 15 and 49, 78% reported having knowledge of modern family planning methods. The rate at which women in a union reported having knowledge of modern family planning methods is similar across age groups.

Table 23. Percentage of women in a union who have knowledge of modern family planning methods that can be used to delay or avoid pregnancy

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Women in a union (ages 15–49)	78.0%	(0.031)	1,302	78.2%	(0.034)	1,263	78.1%	(0.018)	2,565
Women in a union (15–19)	74.3%	(0.048)	125	69.4%	(0.059)	119	71.8%	(0.039)	244
Women in a union (ages 20–29)	83.7%	(0.026)	457	78.3%	(0.036)	445	81.0%	(0.021)	902
Women in a union (ages 30–49)	74.9%	(0.042)	720	79.7%	(0.035)	699	77.3%	(0.020)	1,419

Table 24 presents findings on decision-making about family planning. The questions used to calculate this indicator are the following: “Did you or your partner use any of these modern contraceptive methods in the past 12 months?” and “Who usually makes the decision on whether or not you should use contraception, you, your (husband/partner), you and your (husband/partner) jointly, or someone else?” Of the women who have used modern family planning methods in the past 12 months, almost 93% report making that decision either by themselves or with their partner jointly.

Table 24. Percent of women in a union who made decisions alone or with their partner jointly about modern family planning methods

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Women in a union (ages 15–49)	92.7%	(0.021)	482	93.6%	(0.019)	429	93.1%	(0.008)	911
Women in a union (ages 15–19)	90.8%	(0.056)	34	n/a	n/a	20	92.5%	(0.038)	54
Women in a union (ages 20–29)	94.2%	(0.026)	181	96.6%	(0.016)	158	95.3%	(0.013)	339
Women in a union (ages 30–49)	91.8%	(0.024)	267	91.6%	(0.027)	251	91.7%	(0.012)	518

Table 25 is a custom indicator that shows women of reproductive age practicing at least one modern method of birth control by age regardless of whether they are in a union or not. About 24% of women are practicing a modern method of birth control, with women between the ages of 20 and 49 using modern methods more (24%) than adolescent girls (9%) (p-value = 0.00).

Table 25. Percent of non-pregnant adolescent girls and women of reproductive age practicing a modern method of birth control

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Adolescent girls and women of reproductive age (ages 15–49)	26.1%	(0.022)	2,191	21.9%	(0.016)	2,235	24.0%	(0.012)	4,426
Adolescent girls (ages 15–19)	14.7%	(0.027)	513	8.9%	(0.014)	529	11.8%	(0.016)	1,042
Women of reproductive age (ages 20–49)	29.6%	(0.022)	1,678	25.9%	(0.020)	1,706	27.7%	(0.013)	3,384

3.5 Water, Sanitation, and Hygiene Practices

The percent of households using basic drinking water services indicator is measured by three criteria: (1) having access to an improved water source, such as a public tap or protected well, (2) having that source within 30 minutes round-trip of the home, and (3) having that source available year-round. Fewer than 16% of all households meet all three of these criteria. While nearly all sources are available year-round, and 84% have water within 30 minutes, only 19% have access to an improved source.

Table 26. Percentage of households using basic drinking water services

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of households with improved water source	16.9%	(2.67)	2,159	20.7%	(3.31)	2,140	18.8%	(1.99)	4,299
F&M	15.9%	(2.39)	1,807	19.6%	(3.36)	1,769	17.7%	(1.96)	3,576
FNM	22.3%	(5.07)	325	25.5%	(4.64)	359	24.0%	(3.54)	684
MNF	n/a	n/a	27	n/a	n/a	12	22.8%	(8.35)	39
Percent of households with water source within 30 minutes	95.4%	(0.85)	2,159	96.5%	(0.58)	2,140	95.9%	(0.59)	4,299
F&M	95.7%	(0.79)	1,807	96.6%	(0.60)	1,769	96.1%	(0.55)	3,576
FNM	93.5%	(2.18)	325	95.7%	(1.24)	359	94.7%	(1.34)	684
MNF	n/a	n/a	27	n/a	n/a	12	100.0%	(.)	39
Percent of households with water available year-round	86.0%	(1.80)	2159	82.7%	(2.34)	2140	84.3%	(1.23)	4,299
F&M	85.3%	(1.97)	1807	82.4%	(2.44)	1769	83.9%	(1.32)	3,576
FNM	89.8%	(2.17)	325	83.6%	(3.58)	359	86.6%	(2.13)	684
MNF	n/a	n/a	27	n/a	n/a	12	86.9%	(8.37)	39
Percent of households with access to basic drinking water services	13.9%	(2.23)	2159	16.1%	(3.02)	2140	15.0%	(1.82)	4,299
F&M	13.1%	(1.94)	1807	15.3%	(3.04)	1769	14.2%	(1.80)	3,576
FNM	18.3%	(4.74)	325	18.9%	(3.72)	359	18.7%	(3.02)	684
MNF	n/a	n/a	27	n/a	n/a	12	22.8%	(8.35)	39

** Gendered Household Type: Female and Male Adults (F&M), Adult Female no Adult Male (FNM), Adult Male no Adult Female (MNF)*

Water use was estimated for only those treating water. This was done by asking what containers were used to collect water and how often water was collected. The volume of the containers was verified by the enumerator. On average, households report using 16 liters of water per person per day. Only 23% of households use the recommended 20 liters per day. Recalculating the BL16 indicator, the percentage of households using basic drinking water services, to include water use, recognizing the smaller sample, only 3.6% of households have access to basic drinking water services.

Table 27. Water use per capita

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Water use per capita per day(liters)	16.6	(0.69)	990	14.8	(0.64)	1,128	15.6	(0.42)	2,118
F&M	15.53	(0.69)	829	14.02	(0.71)	929	14.72	(0.45)	1,758
FNM	21.65	(1.89)	149	18.71	(1.13)	193	20.00	(1.07)	342
MNF	n/a	n/a	12	n/a	n/a	6	n/a	n/a	18
Percent of household with access to basic drinking water services including water use	3.6%	(0.93)	1002	3.5%	(0.71)	1136	3.6%	(0.62)	2,138
F&M	3.0%	(0.87)	838	3.1%	(0.69)	934	3.0%	(0.54)	1,772
FNM	5.6%	(2.22)	152	5.8%	(1.80)	196	5.7%	(1.64)	348
MNF	n/a	n/a	12	n/a	n/a	6	n/a	n/a	18

** Gendered Household Type: Female and Male Adults (F&M), Adult Female no Adult Male (FNM), Adult Male no Adult Female (MNF)*

Regarding water treatment and sanitation, only 3.8% of households were observed to have handwashing facilities available on the premises (Table 28). Half of the households (50%) report treating water, and solar disinfection and flocculation are the most common methods.

The majority of households (66%) practice open defecation, and less than 3% have household-level improved sanitation facilities. Among those not practicing open defecation, 84% use a pit latrine without a slab, which is considered unimproved, and 48% share the facility with other households. Table 28–Table 31 summarize the water and sanitation variables by household type.

Table 28. Percentage of households with soap and water at a handwashing station on the premises

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Percent of households with handwashing available	3.5%	(0.90)	1,929	4.1%	(0.90)	1,863	3.8%	(0.55)	3,792
F&M	3.3%	(0.82)	1,605	4.2%	(0.87)	1,536	3.7%	(0.53)	3,141
FNM	4.5%	(1.83)	301	3.3%	(1.22)	316	3.9%	(1.11)	617
MNF	n/a	n/a	23	n/a	n/a	11	8.3%	(6.06)	34

** Gendered Household Type: Female and Male Adults (F&M), Adult Female no Adult Male (FNM), Adult Male no Adult Female (MNF)*

Table 29. Percentage of households in target areas practicing correct use of recommended household water treatment technologies

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of households treating water	45.5%	(4.21)	2159	53.4%	(3.59)	2140	49.5%	(2.37)	4,299

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of households with treated water by adding bleach or chlorine before drinking	42.1%	(3.20)	1015	37.3%	(3.14)	1142	39.5%	(2.24)	2,157
Percent of households with treated water by filtration before drinking	10.8%	(1.96)	2,159	13.7%	(2.46)	2,140	12.2%	(1.38)	4,299
Percent of households with treated water by solar disinfection	35.2%	(3.59)	2,159	42.2%	(3.30)	2,140	38.7%	(1.92)	4,299
Percent of households with treated water by boiling before drinking	0.5%	(0.22)	2,159	0.9%	(0.27)	2,140	0.7	(0.16)	4,299

Table 30. Percentage of households in target areas practicing open defecation

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of households practicing open defecation	63.3%	(4.71)	2,159	68.0%	(3.68)	2,140	65.7%	(2.43)	4,299
F&M	62.8%	(4.64)	1,807	68.4%	(3.84)	1,769	65.6%	(2.47)	3,576
FNM	65.5%	(6.66)	325	66.5%	(5.70)	359	66.0%	(3.99)	684
MNF	n/a	n/a	27	n/a	n/a	12	64.0%	(8.64)	39

** Gendered Household Type: Female and Male Adults (F&M), Adult Female no Adult Male (FNM), Adult Male no Adult Female (MNF)*

Table 31. Percentage of households with access to basic sanitation services

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of households with access to basic sanitation facilities	2.8%	(0.85)	2,159	2.4%	(0.72)	2,140	2.6%	(0.58)	4,299
F&M	3.1%	(0.98)	1,807	2.8%	(0.82)	1,769	2.9%	(0.66)	3,576
FNM	0.9%	(0.52)	325	0.3%	(0.21)	359	0.6%	(0.28)	684
MNF	n/a	n/a	27	n/a	n/a	12	6.5%	(4.70)	39

**Gendered Household Type: Female and Male Adults (F&M), Adult Female no Adult Male (FNM), Adult Male no Adult Female (MNF)*

3.6 Agriculture

Crops

More than 94% of households farm, and 33% of household members 15 years old and over are classified as farmers. The targeted crops identified by the implementing partner were cassava, rice, and cloves. As shown in Table 32, cassava and rice are grown by 84% and 92% of farmers, respectively. Approximately one-quarter of farmers (28%) grow cash crop cloves. Other crops commonly grown in the area are coffee, citrus, sweet potatoes, and bananas.

Table 32. Crops grown

	Control			Treatment			All		
Percentage of farmers growing....	Percent	SE	N	Percent	SE	N	Percent	SE	N
Cassava	84.8%	(2.02)	2,008	83.0%	(3.09)	1,934	83.9%	(1.57)	3,942
Rice	92.6%	(1.11)	2,008	91.6%	(0.85)	1,934	92.1%	(0.67)	3,942
Cloves	25.3%	(3.47)	2,008	30.4%	(3.96)	1,934	27.8%	(2.04)	3,942
Coffee	39.1%	(3.15)	2,008	36.1%	(2.68)	1,934	37.6%	(1.84)	3,942
Citrus	28.5%	(3.71)	2,008	29.1%	(3.51)	1,934	28.8%	(2.12)	3,942
Mango	9.5%	(1.74)	2,008	9.1%	(2.13)	1,934	9.3%	(1.31)	3,942
Sweet potatoes	40.5%	(3.85)	2,008	37.0%	(3.78)	1,934	38.8%	(2.68)	3,942
Banana	38.8%	(3.12)	2,008	35.4%	(3.24)	1,934	37.1%	(1.70)	3,942
Vanilla	13.8%	(2.16)	2,008	14.3%	(2.10)	1,934	14.1%	(1.22)	3,942

The use of credit and savings is not common among farmers, and crop insurance is almost non-existent. Less than a third of farmers use at least one of the value chain participation activities. The most commonly used practices are purchase of agricultural inputs (14%), trade or sale of livestock/crops from your home/community with a buyer within your community (12%), and trade or sale of livestock/crops from primary regional markets (7%). Drying was practiced by fewer than 3% of farmers.[11] None of the other practices listed, including the use of extension, contract farming, or processing produce, were used by more than 1% of farmers.[12]

Table 33. Percentage of farmers who used financial services (savings, agricultural credit, and/or agricultural insurance) in the past 12 months & percentage of farmers who practiced the value chain interventions promoted by the activity in the past 12 months

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of farmers using agricultural credit	5.4%	(1.14)	2,103	5.1%	(0.69)	2,003	5.2%	(0.62)	4,106
Percent of farmers who saved	12.2%	(1.51)	2,105	9.8%	(0.98)	2,005	11.0%	(0.90)	4,110
Percent of farmers using insurance	0.3%	(0.15)	2,105	0.3%	(0.16)	2,005	0.3%	(0.09)	4,110
Percent of farmers reporting at least one value chain activity[13]	36.4%	(6.40)	1,645	26.0%	(4.58)	1,535	31.5%	(3.09)	3,180

The agricultural module included a list of agricultural practices of interest to the implementing partner. Table 34–Table 36 summarize the most common practices used by farmers for cassava, rice, and cloves.

[11] Drying refers to drying produce. Drying is a means of conservation, but this does not include processing the produce.

[12] The full list of value chain activities in the survey include: Purchase inputs for crops, purchase inputs for livestock, use of training and extension services, contract farming, drying produce, processing produce, trading or marketing produce through agro-dealers and/or community associations, use of formal marketing systems for livestock, use of formal marketing systems for crops, did not practice any of these activities in the past 12 months, trade or sale of livestock/crops from your home/community with a buyer from outside of your community, trade or sale of livestock/crops from your home/community with a buyer within your community, trade or sale of livestock/crops from a primary regional market.

[13] The question on participation in value chain activities had the additional inclusion criteria that the farmer sell crops or livestock for income. This excluded 930 farmers.

Only those practiced by at least 5% of farmers are shown.[14] The most commonly used improved management practices/technologies for cassava were sowing after significant rain (5%) and inter-planting (12%). For rice, the most common practices were sowing after significant rain (12%) and using organic manure (6%). For cloves, intercropping was practiced by 28% of farmers and the use of soil cover by 7% of farmers. However, 80%, 77%, and 62% of cassava, rice, and cloves farmers, respectively, used none of the listed practices.

Table 34. Improved management practices/technologies for cassava

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of farmers using at least one practice for cassava	21.5%	(2.06)	1,705	21.0%	(2.56)	1,601	21.2%	(1.45)	3,306
Percent of farmers interplanting for cassava	10.9%	(1.55)	1,708	12.1%	(1.89)	1,604	11.5%	(0.97)	3,312
Percent of farmers sowing after significant rain for cassava	5.3%	(1.37)	1,708	3.9%	(1.27)	1,604	4.6%	(0.81)	3,312
Percent of farmers that did not use modern practices one for cassava	79.7%	(2.05)	1,708	79.4%	(2.53)	1,604	79.6%	(1.37)	3,312

Table 35. Improved management practices/technologies for rice

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of farmers using at least one practice for rice	24.0%	(3.05)	1,847	22.9%	(3.51)	1,770	23.5%	(2.22)	3,617
Percent of farmers sowing after significant rain for rice	12.2%	(2.96)	1,853	10.8%	(3.35)	1,775	11.5%	(2.03)	3,628
Percent of farmers that use organic manure for rice	5.4%	(1.15)	1,853	6.8%	(1.59)	1,775	6.1%	(0.89)	3,628
Percent of farmers that did not use modern practices one for rice	76.9%	(2.96)	1,853	77.5%	(3.46)	1,775	77.2%	(2.19)	3,628

Table 36. Improved management practices/technologies for cloves

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of farmers using at least one practice for cloves	42.5%	(6.90)	528	36.0%	(5.78)	576	39.0%	(4.04)	1,104
Percent of farmers using inter-planting for cloves	31%	(6.99)	528	24.9%	(4.30)	576	27.7%	(3.83)	1,104
Percent of farmers using soil cover for cloves	5.9%	(2.14)	528	7.3%	(2.70)	576	6.7%	(1.68)	1,104
Percent of farmers that did not use modern practices one for cloves	59.3%	(7.08)	528	64.2%	(5.76)	576	61.9%	(4.09)	1,104

[14] Only those practiced by at least 5% of farmers are shown. The full list of practices included in the survey for all three crops is: Organic manure, compost, performing weeding, sowing after useful rain, crop association, crop rotation, use of improved seeds, use of climate information (rain forecast, disaster risks, etc.), windbreak, and soil cover.

The yield estimates for the three crops are presented in Table 37. Because the yield calculation is based on farmers' recall of production and farmers' estimates of the area planted, these numbers should be taken as rough estimates. The survey first asks farmers about the number of plots, the area of each plot, and how much of each plot was devoted to each of the three crops. Next, farmers are asked to recall the total production of each crop across all plots in the previous year. While most farmers measure land in Ares (1/100 of a hectare), many farmers measure production in volume, not weight, and this must be converted to kilograms.

The average yield for cassava is slightly over 5,000 kg/ha. Rice yield is approximately 3,900 kg/ha. Clove yield is estimated to be 670 kg/ha, although clove yield is often measured per bush and not per hectare, and the area covered by cloves may have been difficult to estimate. Figure 5 shows the distribution of yields. Despite trimming extreme values, some of the yield values, particularly for rice, are likely overestimated.

Figure 5. Box plot of yield estimates for target crops

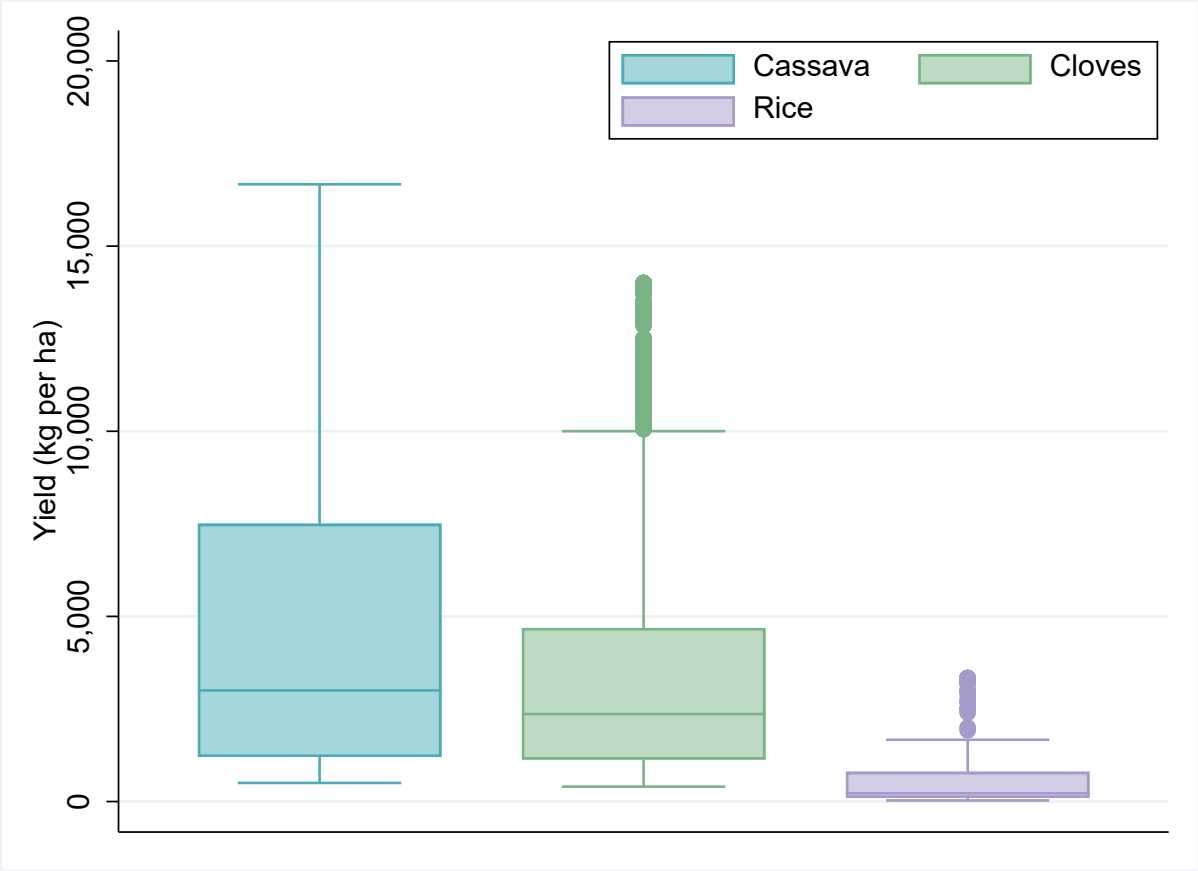


Table 37. Yield of targeted agricultural commodities within target areas

	Control				Treatment				All			
Outcome	Mean	Median	SE	N	Mean	Median	SE	N	Mean	Median	SE	N
Producers of cassava reporting yield in kg per ha*	5333.1	3000	-365.08	1389	4805.7	3000	-421.92	1315	5074.29	3000	-272.12	2704
Producers of cloves reporting yield in kg per ha	680.78	231.11	-134.96	160	665.04	220	-110.15	165	672.17	222.22	-74.69	325
Producers of rice reporting yield in kg per ha*	4315.18	2400	-358.79	1606	3459.56	2333.33	-282.73	1554	3897.38	2359.13	-247.35	3160

**Kilogram (kg)*

**Hectare (ha)*

Livestock

The targeted livestock are poultry, bees, and fish. The summary statistics for poultry farmers are presented in Table 38. In our sample, 67% of farmers raised poultry, and the average number of birds raised per farmer in the last year was 28. Only 27% of farmers reported any egg production from chickens in the previous week. Farmers tend to both sell poultry (61%) and consume it (80%). Over two-thirds of farmers (67%) reported poultry dying in the last year. Vaccinations were the only practice used by more than 3% of poultry farmers, and most farmers (94%) did not use any of the listed practices. Poultry yield, defined as the total kilograms consumed or sold divided by the number of birds kept, is estimated to be 2.4 kg/bird.

Table 38. Poultry farming

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of farmers raising poultry	67.5%	(2.69)	2,141	65.7%	(2.52)	2,046	66.6%	(1.64)	4,187
Percent of farmers using vaccinations	3.0%	(0.77)	1,433	5.1%	(1.40)	1,340	4.0%	(0.72)	2,773
Percent of farmers not using any of the poultry practices	93.9%	(1.13)	1,433	92.4%	(1.56)	1,340	93.2%	(0.73)	2,773
Percent of farmers reporting eggs in previous week	28.0%	(2.66)	1,420	25.5%	(2.08)	1,322	26.8%	(1.69)	2,742
Percent of farmers selling poultry in the last year	59.8%	(2.42)	1,427	63.2%	(2.30)	1,327	61.5%	(1.38)	2,754
Percent of farmers consuming own poultry in the last year	82.8%	(1.82)	1,426	77.9%	(2.03)	1,327	80.4%	(1.33)	2,753
Percent of farmers experiencing poultry dying in the last year	67.3%	(2.43)	1,427	66.3%	(2.51)	1,327	66.8%	(1.81)	2,754

Only 68 individuals in the survey raised bees. Half raised them for both food and the market. As found in Table 39, the average beekeeper had four hives. Only 15 farmers reported having modern hives; therefore, the yield was excluded in this report. However, traditional hives, which are more common, yielded less than 2 liters of honey.

Table 39. Beekeeping[15]

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Total number of hives owned by beekeepers	4.66	(1.35)	32	4.03	(0.42)	37	4.25	(0.54)	69
Number of modern hives owned by beekeepers	2.39	(1.55)	31	0.31	(0.22)	38	1.02	(0.73)	69
Number of traditional hives owned by beekeepers	1.93	(0.35)	31	3.68	(0.27)	38	3.08	(0.37)	69
Liters of honey produced per year--traditional hives	1.78	(0.49)	27	1.99	(0.73)	33	1.92	(0.53)	60
Percentage using beekeeping equipment (listed below)									
Percent of beekeepers using beehive	87.2%	(9.81)	32	92.8%	(4.32)	37	90.8%	(4.73)	69
Percent of beekeepers using smokers	49.0%	(13.11)	32	16.7%	(6.49)	37	28.1%	(8.41)	69
Percent of beekeepers using frames and foundations	18.4%	(9.03)	32	7.3%	(5.19)	37	11.2%	(5.22)	69
Percent of beekeepers using veil and gloves	13.6%	(5.43)	32	9.8%	(6.94)	37	11.1%	(4.85)	69
Percent of beekeepers using feeders	3.8%	(3.53)	32	0.0%	(.)	37	1.4%	(1.56)	69
Percent of beekeepers using heated knifes	29.8%	(11.54)	32	22.4%	(4.15)	37	25.0%	(4.68)	69
Percent of beekeepers using uncapping forks	6.9%	(4.40)	32	7.3%	(5.19)	37	7.1%	(3.47)	69
Percent of beekeepers using tub for wax/honey	3.8%	(3.53)	32	1.5%	(1.56)	37	2.3%	(1.95)	69
Percent of beekeepers using extractors	0.0%	(.)	32	1.5%	(1.56)	37	1.0%	(0.96)	69
Percent of beekeepers using food-grade buckets	6.2%	(4.00)	32	9.9%	(6.93)	37	8.6%	(4.38)	69
Percent of beekeepers using double sieves	9.2%	(5.13)	32	3.0%	(3.13)	37	5.2%	(3.26)	69
Percent of beekeepers using containers	3.8%	(3.53)	32	3.6%	(3.03)	37	3.7%	(2.60)	69
Percent of beekeepers using queen excluders	2.1%	(2.11)	32	3.0%	(3.13)	37	2.7%	(2.10)	69
Percent of beekeepers using queen cages	5.9%	(4.02)	32	6.9%	(4.27)	37	6.6%	(2.72)	69
Percent of beekeepers using beekeeper's suits	3.8%	(3.53)	32	3.0%	(3.13)	37	3.3%	(2.64)	69

[15] The sample size is small so these results may not be representative and should be interpreted with caution

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Percent of beekeepers using nylon brush	5.9%	(4.02)	32	1.5%	(1.56)	37	3.1%	(2.20)	69
Percent of beekeepers using attracts swarms	8.2%	(4.53)	32	5.8%	(3.88)	37	6.6%	(2.77)	69
Percent of beekeepers using filter cloths	11.3%	(5.20)	32	22.5%	(6.25)	37	18.6%	(5.53)	69
Percent of beekeepers using knives	32.7%	(13.20)	32	43.2%	(10.76)	37	39.5%	(8.87)	69
Percent of beekeepers using buckets	12.0%	(6.29)	32	24.8%	(6.04)	37	20.2%	(5.53)	69

In the sample, 287 individuals report fishing. Roughly half of fishermen fish for both home consumption and market, 46% of those fishing fish for home consumption only, and fishing for the market only is not common.

Table 40. Fishing

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of fishers fishing for food only	56.5%	(8.85)	160	33.9%	(8.27)	127	45.5%	(5.93)	287
Percent of fishers fishing for market only	1.2%	(0.72)	160	5.0%	(2.58)	127	3.03%	(1.37)	287
Percent or fishers fishing for both food and market	42.4%	(8.89)	160	61.1%	(7.78)	127	51.5%	(5.53)	287
Percent of fishers using a pirogue	29.7%	(7.36)	159	27.3%	(7.56)	127	28.6%	(5.01)	286
Percent of fishers using nets	43.3%	(7.87)	159	45.5%	(6.79)	127	44.4%	(5.17)	286
Percent of fishers using containers	33.6%	(8.12)	159	30.6%	(7.05)	127	32.1%	(4.42)	286

3.7 Poverty Measurement

This section presents three measures of poverty, all based on household expenditure. The measures are per capita daily expenditure, the percentage living on less than $1.90 per day (2011 purchasing power parity (PPP)), and the depth of poverty of the poor. The equivalent of $1.90 in current Malagasy Ariary was determined to be 2,443.[16] [17]

The poverty measures are summarized in Table 41. The mean per capita expenditure is 2,070 Ariary, or about $1.61 per day. The poverty rate is approximately 72%. The depth of poverty of the poor is 33%, which means that the average poor person is 33% below the poverty line. In monetary terms, this

[16] The 2011 PPP used was 700.228 Ariary/dollar. The Consumer Price Index used for 2011 was 72.11 and 132.5 for 2020. This gives us the poverty line = 1.9 * 700.228 * 132.5 / 72.18 = 2243

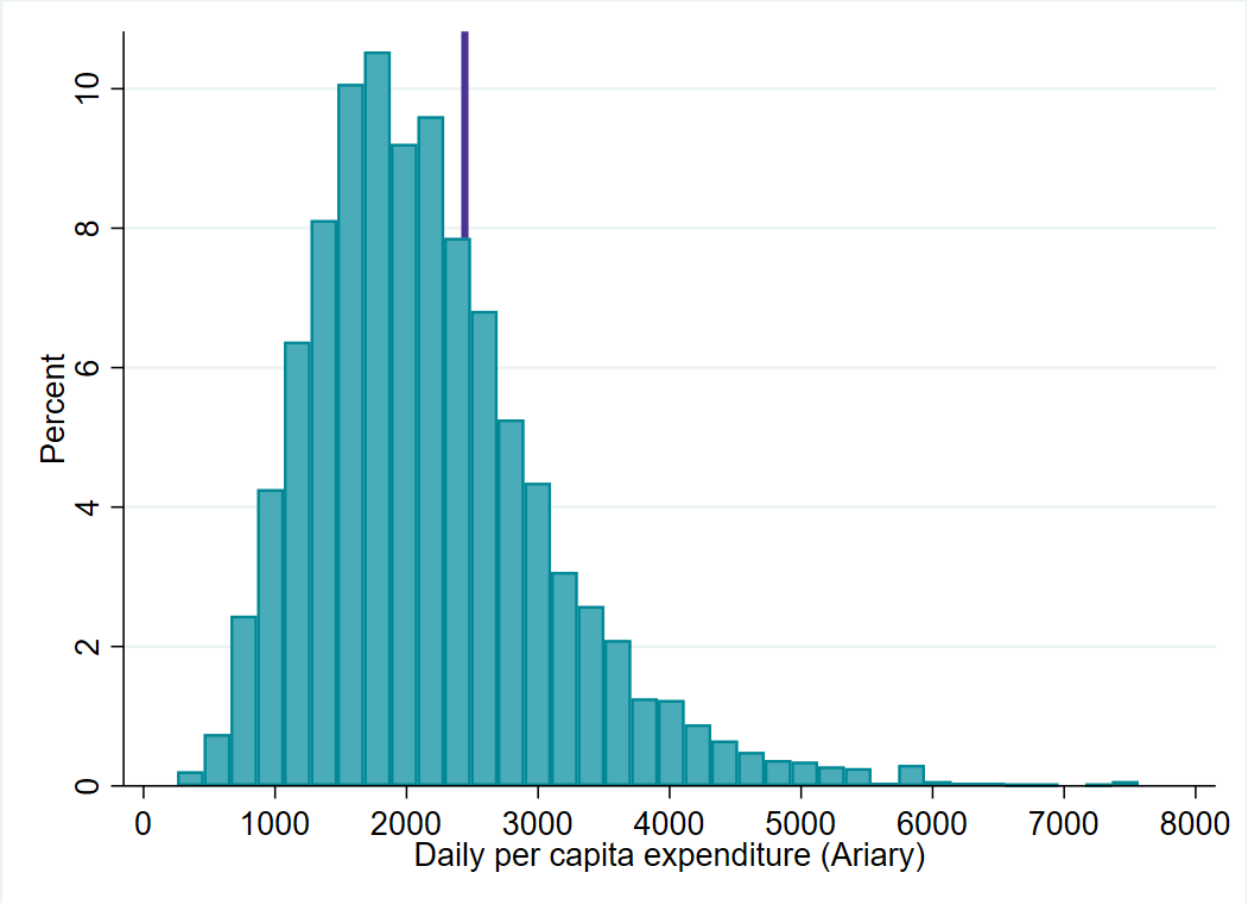
[17] The expenditure module of the survey followed standard practices for expenditure calculation. Frequent items, primarily foods, used 7-day recall. Less frequent purchases used a 30-day or 12-month recall. A rental equivalent is used to value housing and durable goods. Enumerators reported a few extreme cases of people with essentially zero expenditures who lived on what they could collect, forage, or receive from begging.

means it would require $0.63 per person per day to bring every poor person out of poverty. Figure 6 shows the distribution of expenditure values across the full sample. The poverty line is shown in dark blue.

Table 41. Poverty measures

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Prevalence of Poverty: Percentage of people living on less than $1.90/day	69.5%	(1.19)	2,160	74.3%	(1.18)	2,140	71.9%	(0.84)	4,300
Daily per capita expenditure (Ariary)	2,099.07	(23.37)	2,160	2040.82	(22.50)	2,140	2,069.51	(16.20)	4,300
Daily per capita expenditure (Dollars)	1.63	(0.02)	2,160	1.59	(0.02)	2,140	1.61	(0.01)	4,300
Depth of Poverty of the Poor: Mean percent shortfall of the poor relative to the $1.90/day 2011 PPP poverty line	32.81	(0.00)	1,404	32.41	(0.00)	1,512	32.6	(0.00)	2,916

Figure 6. Distribution of expenditure



These measures are further broken down by household type (Table 42). The types are F&M, FNM, MNF, and child no adult (CNA). In the present case, there were no CNA households. There are no large

differences between F&M and FNM households. There are very few MNF households, and therefore it is difficult to draw conclusions about this group.

Table 42. Disaggregated poverty measures by household types

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Prevalence of Poverty: Percentage of people living on less than $1.90/day	69.5%	(1.19)	2,160	74.3%	(1.18)	2,140	71.9%	(0.84)	4,300
F&M	69.7%	(1.29)	1,808	74.1%	(1.28)	1,769	71.9%	(0.91)	3,577
FNM	68.6%	(3.14)	325	75.3%	(2.77)	359	72.1%	(2.10)	684
MNF	n/a	n/a	27	n/a	n/a	12	68.3%	(8.69)	39
Daily per capita expenditure (Ariary)	2,099.07	(23.37)	2,160	2,040.82	(22.50)	2,140	2,069.51	(16.20)	4,300
F&M	2,087.56	(24.82)	1,808	2,025.98	(24.03)	1,769	2,056.39	(17.26)	3,577
FNM	2,184.62	(71.94)	325	2,151.65	(64.46)	359	2,167.27	(48.04)	684
MNF	n/a	n/a	27	n/a	n/a	12	2,387.16	(193.13)	39
Daily per capita expenditure (Dollars)	1.63	(0.02)	2,160	1.59	(0.02)	2,140	1.61	(0.01)	4,300
F&M	1.62	(0.02)	1,808	1.58	(0.02)	1,769	1.6	(0.01)	3,577
FNM	1.7	(0.06)	325	1.67	(0.05)	359	1.69	(0.04)	684
MNF	n/a	n/a	27	n/a	n/a	12	1.86	(0.15)	39

** Gendered Household Type: Female and Male Adults (F&M), Adult Female no Adult Male (FNM), Adult Male no Adult Female (MNF)*

3.8 Gender Dynamics

Gender dynamics are captured through the six indicators in this section. Because the survey targeted only men and women in a union, they are the only ones included in this section. These indicators explore male and female financial resources and access to credit.

3.8.1 Use of Financial Resources

This section presents findings on participation in cash earning activities across men and women in a union. Table 43 illustrates that, of the number of women and men in a union, 74% participated in cash earning activities in the past year. According to respondents, it was more common for men in a union to be cash earners (89%) than for women in a union (59%) (p-value = 0.00).

Table 43. Percentage of women and men in a union who earned cash in the past 12 months

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Cash earners in a union	74.5%	(0.024)	3,220	73.9%	(0.016)	3,164	74.2%	(0.011)	6,384
Cash earning women in a union	58.6%	(0.045)	1,560	58.7%	(0.034)	1,562	58.6%	(0.019)	3,122

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Women in a union (ages 15–19)	51.6%	(0.065)	120	55.9%	(0.051)	110	53.7%	(0.036)	230
Women in a union (ages 20–29)	62.2%	(0.050)	455	55.5%	(0.044)	429	59.0%	(0.027)	884
Women in a union (ages 30–49)	62.1%	(0.041)	682	62.9%	(0.034)	696	62.5%	(0.019)	1,378
Cash earning men in a union	89.6%	(0.012)	1,660	88.7%	(0.014)	1,602	89.2%	(0.008)	3,262
Men in a union (ages 15–19)	n/a	n/a	20	n/a	n/a	29	74.1%	(0.074)	49
Men in a union (ages 20–29)	84.2%	(0.022)	329	88.8%	(0.021)	270	86.3%	(0.016)	599
Men in a union (ages 30+)	91.2%	(0.013)	1,311	89.0%	(0.016)	1,303	90.1%	(0.009)	2,614

Table 44 shows the percentage of cash-earning women in a union who report participation in decisions about the use of self-earned cash. The large majority of women in a union (84%) reported that they participate in decisions about how to use their cash, whether solely or jointly, with others.

Table 44. Percentage of women in a union and earning cash who report participation in decisions about the use of self-earned cash

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Cash earning women in a union	86.6%	(0.031)	934	82.1%	(0.041)	914	84.4%	(0.016)	1,848
Women in a union (ages 15–19)	86.7%	(0.064)	67	63.1%	(0.111)	57	74.8%	(0.063)	124
Women in a union (ages 20–29)	87.1%	(0.034)	286	83.8%	(0.043)	242	85.6%	(0.024)	528
Women in a union (ages 30–49)	84.0%	(0.039)	432	82.0%	(0.044)	440	83.0%	(0.018)	872

Table 45 highlights the percentage of cash-earning men in a union who report that their spouse participates in decision-making about the use of self-earned cash. Approximately 82% of men perceive their wives to be involved in decision-making. There is little variation across age groups.[18]

Table 45. Percentage of men in union and earning cash who report spouse/partner participation in decisions about the use of self-earned cash

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Cash earning men in union	82.9%	(0.024)	1,479	80.8%	(0.025)	1,426	81.9%	(0.015)	2,905
Men in a union (ages 15–19)	n/a	n/a	15	n/a	n/a	20	82.7%	(0.078)	35

[18] The sample for baseline 34 indicator (Percentage of women in a union and earning cash who report spouse/partner participation in decisions about the use of self-earned cash) was not going to be reflective of all cash earning women in a union, so it was left out of the reporting.

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Men in a union (ages 20–29)	81.7%	(0.034)	280	81.3%	(0.036)	240	81.5%	(0.021)	520
Men in a union (ages 30+)	83.1%	(0.024)	1,184	80.8%	(0.027)	1,166	82.0%	(0.016)	2,350

3.8.2 Credit

This section presents findings on the use of credit among men and women in a union. Table 46 shows that over a third of men and women in a union (36%) borrowed in the previous 12 months. Women and men in a union report borrowing at similar rates (36% and 35%).

Table 46. Percentage of women/men in a union with access to credit

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Men and women in a union	35.6%	(0.030)	3,220	35.9%	(0.029)	3,164	35.8%	(0.017)	6,384
Men in a union	36.0%	(0.030)	1,660	36.5%	(0.027)	1,602	36.2%	(0.016)	3,262
Men in a union (ages 15–19)	n/a	n/a	20	n/a	n/a	29	24.1%	(0.075)	49
Men in a union (ages 20–29)	39.1%	(0.041)	329	39.8%	(0.043)	270	39.4%	(0.026)	599
Men in a union (ages 30+)	35.4%	(0.030)	1,311	36.0%	(0.027)	1,303	35.7%	(0.017)	2,614
Women in a union	35.2%	(0.030)	1,560	35.4%	(0.032)	1,562	35.3%	(0.018)	3,122
Women in a union (ages 15–19)	26.2%	(0.062)	120	33.1%	(0.065)	110	29.5%	(0.045)	230
Women in a union (ages 20–29)	41.4%	(0.043)	455	36.7%	(0.039)	429	39.1%	(0.025)	884
Women in a union (ages 30–49)	34.0%	(0.031)	682	37.3%	(0.036)	696	35.7%	(0.022)	1,378

Of men and women in a union who report borrowing, a majority of them (69%) participate in decisions about credit. These are decisions made by the respondents alone and with a spouse/partner or another individual. As illustrated in Table 47, men in a union participate in decisions about credit at a much higher rate than women in a union (p-value = 0.00), with 87% of men in a union reportedly making credit decisions.

Table 47. Percentage of women/men in a union who make decisions alone or jointly about credit

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Men and women in a union	69.9%	(0.024)	1,165	67.3%	(0.020)	1,115	68.6%	(0.014)	2,280
Men in a union	88.9%	(0.021)	615	86.7%	(0.029)	585	87.8%	(0.016)	1,200
Men in a union (ages 15–19)	n/a	n/a	5	n/a	n/a	8	n/a	n/a	13
Men in a union (ages 20–29)	89.8%	(0.029)	138	91.3%	(0.032)	109	90.5%	(0.024)	247

	Control			Treatment			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Men in a union (ages 30+)	88.7%	(0.022)	472	85.6%	(0.037)	468	87.1%	(0.019)	940
Women in a union	49.4%	(0.046)	550	46.7%	(0.065)	530	48.0%	(0.035)	1,080
Women in a union (ages 15–19)	40.0%	(0.106)	36	38.4%	(0.116)	32	39.1%	(0.082)	68
Women in a union (ages 20–29)	47.4%	(0.051)	189	34.6%	(0.057)	162	41.6%	(0.037)	351
Women in a union (ages 30–49)	53.5%	(0.058)	239	52.8%	(0.062)	243	53.1%	(0.037)	482

3.9 Resilience

3.9.1 Ability to Recover from Shocks and Stresses Index

The ability to recover from shocks and stresses index reflects the ability to recover from negative events that have impacted the household. On average, households score 2.6 on this index. This index is composed of indices that reflect how households perceived their recovery as well as the total number and severity of shocks the household experienced over the past year. Table 48 below illustrates that there was little to no observable difference across treatment and control household responses (see Annex A for tests of significance). There is also little variation in the perceived ability to recover across the different household types (p-value = 0.30).

Table 48. Ability to recover from shocks and stresses index

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Household ability to recover from shocks & stresses index	2.586	(0.062)	1,849	2.606	(0.045)	1,862	2.596	(0.033)	3,711
F&M	2.6	(0.062)	1,553	2.604	(0.047)	1,542	2.602	(0.035)	3,095
FNM	2.52	(0.099)	273	2.615	(0.068)	310	2.571	(0.050)	583
MNF	n/a	n/a	23	n/a	n/a	10	2.441	(0.103)	33
Household ability to recover index (2–6)	2.594	(0.065)	1,884	2.612	(0.052)	1,881	2.603	(0.039)	3,765
F&M	2.598	(0.068)	1,576	2.601	(0.056)	1,560	2.599	(0.042)	3,136
FNM	2.586	(0.092)	283	2.671	(0.066)	311	2.63	(0.051)	594
MNF	n/a	n/a	25	n/a	n/a	10	2.395	(0.111)	35

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Household total shocks experiences (0-22)	2.292	(0.085)	2,160	2.283	(0.091)	2,140	2.287	(0.053)	4,300
F&M	2.357	(0.087)	1,808	2.355	(0.098)	1,769	2.356	(0.057)	3,577
FNM	1.959	(0.111)	325	1.937	(0.080)	359	1.948	(0.065)	684
MNF	n/a	n/a	27	n/a	n/a	12	2.074	(0.385)	39
Household shock exposure index (0-176)	13.664	(0.586)	2,074	13.217	(0.571)	2,077	13.439	(0.364)	4,151
F&M	14.041	(0.584)	1,745	13.616	(0.597)	1,717	13.828	(0.377)	3,462
FNM	11.442	(0.821)	305	11.191	(0.631)	350	11.311	(0.479)	655
MNF	n/a	n/a	24	n/a	n/a	10	16.829	(2.620)	34

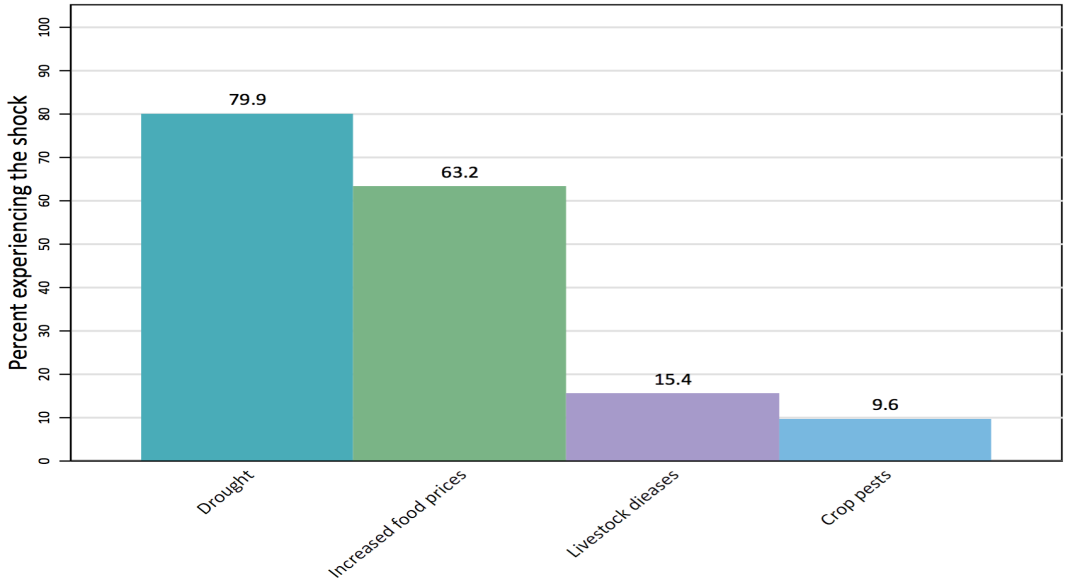
** Gendered Household Type: Female and Male Adults (F&M), Adult Female no Adult Male (FNM), Adult Male no Adult Female (MNF)*

The perceived ability to recover index reflects a household's perspective on their ability to meet food needs now, relative to the previous year, as well as their ability to meet their future food needs. Households score an average of 2.6 (range of 2–6). In other words, households perceive their ability to meet their current needs as worse than the previous year and suspect that their ability to meet these needs will deteriorate in the future. There is variation in how different household types perceive their ability to recover (p-value = 0.00), with households with no female adult present reporting a lower ability to recover and households with no male adult present reporting a higher ability.

Households experienced an average of 2.3 out of 22 possible shocks in the previous year. The most commonly reported shocks are illustrated below in Figure 7, which shows the shocks experienced by at least 10% of households. A large majority of households (80%) listed the drought as one of these shocks. Other common shocks listed included rising food prices, livestock diseases, and crop pests.

In terms of the number and intensity of shocks experienced, households scored an average of 13.4 out of 176, which accounts for 22 shocks and four different levels of severity (regarding both the impact on the household economic situation and impact on household consumption). This suggests that out of the average of 2.3 shocks experienced, households perceived those shocks to be severe. The shock exposure index varies across household types (p-value = 0.00), with households with no female adult present reporting a greater number and intensity of shocks and households with no male adult present reporting the lowest.

Figure 7. Most common shocks reported by households



3.9.2 Social Capital Indices

These indices convey the ability of households to draw on social networks to get support to reduce the impact of shocks and stresses on their households.[19] They measure both the degree of bonding—social capital among households within their own communities—and the degree of bridging—social capital between households in the area and households outside their own community. Findings suggest that households are able to draw on other households within their community slightly more (average score of 54.4) than they are able to draw on other households outside of their community (average score of 48.2). There is variation across household types in both the bonding subindex (p-value = 0.00) and the bridging subindex (p-value = 0.05). In both cases, households with both male and female adults present are more able to draw on community members for support than households with one or the other adult not present.

Table 49. Social capital indices

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Household bonding subindex (0–100)	52.773	(1.892)	2,160	56.001	(2.187)	2,140	54.391	(1.093)	4,300
F&M	53.442	(2.028)	1,808	56.605	(2.166)	1,769	55.023	(1.095)	3,577
FNM	49.724	(2.451)	325	53.627	(2.810)	359	51.732	(1.805)	684

[19] Two questions that are included in the social capital index were accidentally deleted from the FIOVANA survey. Specifically, these questions were "who could households turn to inside (and outside) of the village if they needed help urgently." Due to this, we do not create the full social capital index but only report two of the subindices that form the full index. Here the bonding index focuses only on whom households would give help to within their communities, and the bridging index focuses only on whom households would give help to outside of their communities.

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
MNF	n/a	n/a	27	n/a	n/a	12	43.644	(7.412)	39
Household bridging subindex (0–100)	46.348	(2.113)	2,160	49.975	(2.371)	2,140	48.165	(1.271)	4,300
F&M	46.682	(2.270)	1,808	50.392	(2.348)	1,769	48.537	(1.334)	3,577
FNM	45.488	(2.554)	325	47.952	(3.319)	359	46.756	(1.887)	684
MNF	n/a	n/a	27	n/a	n/a	12	38.943	(7.014)	39

** Gendered Household Type: Female and Male Adults (F&M), Adult Female no Adult Male (FNM), Adult Male no Adult Female (MNF)*

3.9.3 Absorptive Capacity Index

The absorptive capacity index reflects the ability of households to prepare for, deal with, and mitigate the impact of shocks and stressors on well-being outcomes through preventive measures and positive coping strategies. Overall, households score 30.3 out of 100 on this index, reflecting a low ability to absorb shocks.[20] As discussed below, there are few resources that households have access to that would enable them to better mitigate shocks.

A key aspect of the absorptive capacity index captures financial resources that households have access to in order to absorb shocks. Overall, very few households have access to financial resources for absorbing shocks, lowering their ability to mitigate the impact of shock on well-being outcomes. Specifically, only 12% of households have cash savings, 1% have reported receiving remittances, and less than 1% have access to insurance. Households on average own 6.4 different types of household and productive assets (out of 43), although this does not necessarily mean that households have a large asset stock.

Table 50. Absorptive capacity index

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Household absorptive capacity index (0–100)	27.103	(1.456)	1,904	33.376	(1.834)	1,952	30.264	(1.108)	3,856
Household access to cash savings index (0–1)	0.118	(0.017)	2,159	0.115	(0.015)	2,140	0.117	(0.009)	4,299
Household asset ownership index - total type (0–31)	6.416	(0.187)	2,102	6.398	(0.147)	2,089	6.407	(0.109)	4,191
Household remittances index (0–1)	0.01	(0.003)	2,160	0.012	(0.003)	2,140	0.011	(0.002)	4,300
Household access to insurance index (0–1)	0.003	(0.002)	1,990	0.003	(0.002)	1,966	0.003	(0.001)	3,956
Household bonding social capital index (0–6)	1.112	(0.044)	2,160	1.199	(0.055)	2,140	1.156	(0.026)	4,300

[20] The three resilience indices were calculated by taking the first principal component of all of the sub-indices included in those tables. We then predicted the score for each household based on the weighted combination of the first component and the subindices. This score was rescaled to be between 0 and 100.

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Household access to informal safety nets index (0–6)	2.396	(0.169)	2,080	2.779	(0.136)	2,140	2.59	(0.100)	4,220
Household shock preparedness & responsiveness index (0–3)	0.922	(0.055)	2,160	1.098	(0.071)	2,140	1.01	(0.044)	4,300
Household access to humanitarian assistance index (0–1)	0.089	(0.026)	2,160	0.277	(0.037)	2,140	0.183	(0.025)	4,300

The absorptive capacity index also captures the level of social capital that households have access to in order to help them absorb shocks. Overall, findings suggest that most households have low social capital. The bonding social capital index reflects the number of types of individuals that households could draw on inside of their communities (out of three groups). On average, households feel able to draw on 1.2 of these types of individuals. Moreover, households reported that they have moderate access to and have been active in community organizations that typically serve as informal safety nets. On average, households have access to 2.5 of six types of safety nets.

Another element of absorptive capacity is how well a household is prepared to mitigate shocks[21] through the availability of disaster preparedness groups in the community, as well as other household shock mitigation strategies. On average, households score a 1.01 out of 3 on this index, suggesting a lower ability to mitigate shocks.

The last dimension of absorptive capacity is the availability of humanitarian assistance in the community. Less than one-fifth of households (18%) reported that they had received emergency food or cash assistance from the government or from a non-governmental organization (NGO).[22]

3.9.4 Adaptive Capacity Index

The adaptive capacity index measures the ability of households to manage resources and make proactive and informed choices to better prepare for and adapt to future shocks. The index is composed of several components that reflect different resources or adaptive abilities. On average, households score 31.8 out of 100 on this index,[23] which suggests that households have a limited ability to manage resources and adapt to future shocks. Households across the treatment and control groups perform similarly on this score.

[21] This index does not include whether the household reports participating in any of the following activities: soil conservation activities, flood diversion structures (i.e., protection of land/infrastructure from flooding), planting trees on communal land, or improving access to health services given available data.

[22] Note that this index does not capture whether non-governmental organization/government assistance is available in their community, but they have not received it.

[23] We followed precedent with TANGO and did not exclude factors that loaded negatively on the first component in the construction of this index. This is because we want the indices to be comparable across baseline and endline (where at endline, the factors that load negatively may be different). However, the two scores are comparable on average.

Table 51. Adaptive capacity index

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Household adaptive capacity index (0–100)	29.73	(1.218)	1,886	33.966	(1.072)	1,863	31.846	(0.691)	3,749
Household bridging social capital index (0–6)	0.978	(0.049)	2,160	1.063	(0.060)	2,140	1.02	(0.030)	4,300
Household linking social capital (0–4)	0.041	(0.010)	2,160	0.029	(0.005)	2,140	0.035	(0.006)	4,300
Household social network index (0–6)	1.462	(0.094)	2,150	1.959	(0.092)	2,140	1.711	(0.061)	4,290
Household education/training index (0–8)	1.112	(0.053)	2,159	1.245	(0.056)	2,135	1.179	(0.038)	4,294
Household asset ownership index - total type (0–31)	6.416	(0.187)	2,102	6.398	(0.147)	2,089	6.407	(0.109)	4,191
Household access to financial resources (0–2)	0.403	(0.114)	2,160	0.787	(0.063)	2,140	0.595	(0.062)	4,300
Household livelihood diversification index (0–20)	2.716	(0.099)	2,160	2.799	(0.105)	2,140	2.757	(0.059)	4,300
Household adoption of improved practices index (0–1)	0.07	(0.013)	1,990	0.059	(0.011)	1,966	0.064	(0.008)	3,956
Household exposure to information index (0–19)	4.215	(0.343)	2,160	4.248	(0.291)	2,140	4.232	(0.176)	4,300
Household aspirations/confidence to adapt index (0–16)	9.205	(0.100)	2,056	9.198	(0.122)	2,039	9.202	(0.059)	4,095

One aspect of the adaptive capacity index captures households' social capital and networks, given that households that are able to leverage these networks more effectively may better prepare for and adapt to future shocks. Across these indicators, households score poorly, suggesting that households are not able to effectively leverage social capital and networks to adapt to shocks. In particular, the bridging social capital index reflects the number of types of individuals that households could draw on outside of their communities (out of three groups). On average, households feel able to draw on 1.0 of these types of individuals. The linking social capital index reflects how well-connected households are to government or NGO leaders and whether they can draw on them for help. Households score very low (0.04 out of 4) on this, suggesting that the majority of households neither know leaders nor are they able to ask leaders for help. Finally, the social network index captures household access to and participation in various support groups. Households score a 1.7 out of 6, suggesting that only a minority of households have access to and/or participate in these groups.

Another aspect of the adaptive capacity index captures the human resources, assets, and financial resources available to households to mitigate shocks. Overall, households have low levels of human capital and asset resources, suggesting constraints on the overall resource pool they are able to draw on in the face of shocks. The education/training index reflects the level of human capital in the household,

specifically adult literacy, whether any adult has surpassed primary school, and the number of trainings in which household adults have participated. Households score low (1.8 out of 8) on this indicator, reflecting that overall household human capital is low. The asset ownership index illustrates the number of different types of assets a household owns (out of 43 types). On average, a household owns 6.4 different types of assets. This could mean that overall household asset stock is low, although this does not reflect the value of each asset. Finally, the access to financial resources index reflects the financial resources available in the village through credit and savings institutions. Households have, on average, 0.6 out of 2 of these institutions available to them.

A third aspect of the adaptive capacity index reflects how diversified and improved household livelihood activities are. In summary, household activities are not well-diversified, and few households have adopted improved practices. The livelihood diversification index reflects the number of different livelihood activities that households were engaged in over the past year. Overall, households were engaged in an average of 2.6 out of 20 activities, indicating that activities are not well-diversified. The adoption of improved practices index[24] reflects whether households adopted improved crop or livestock practices, natural resource management practices, or improved storage practices. Overall, households score 0.06 out of 1, indicating that only a minority of households have adopted improved practices. The exposure to information index captures the number of topics that households have received information on in the past year, which relates directly to a household's ability to make informed choices in order to better prepare for shocks. On average, households have received information on 4.2 out of 19 available topics, highlighting that households have had limited exposure to information to help inform shock mitigation strategies.

Finally, the aspirations/confidence to adapt index reflects a household adult's aspirations, confidence to adapt, and a sense of control over one's life. On average, adults score 9.2 out of 16 on this index, reflecting a moderate sense of confidence to adapt.

3.9.5 Transformative Capacity Index

The transformative capacity index[25] captures system-level resources, governance, and institutions that make up the enabling environment that promotes or limits a household's capacity to respond to shocks and stressors. On average, households score 35.7 out of 100 on this index,[26] indicating that there are not very strong institutions available to enhance household capacity to respond to shocks. Households across the treatment and control groups perform similarly on this score.

[24] This index does not include a measure of quality for each of the service types. Instead, it only captures whether or not the service exists. Health services reflect whether NGOs are currently conducting health activities and not whether local health institutions are available.

[25] Note that this index does not include the following sub-indices given data availability: access to livestock services and collective action.

[26] We followed precedent with TANGO and did not exclude factors that loaded negatively on the first component in the construction of this index. This is because we want the indices to be comparable across baseline and endline (where at endline the factors that load negatively may be different). For the case of the transformative index, the index that adjusts for negative factors is 35.11 on average across the sample. The main driver between these scores is that the infrastructure factor gets more weight in the score we show here.

Table 52. Transformative capacity index

	Control			Treatment			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Household transformative capacity index (0–100)	35.305	(2.474)	1,333	36.007	(2.655)	1,782	35.734	(1.747)	3,115
Household access to infrastructure index (0–4)	1.004	(0.104)	2,160	0.949	(0.107)	2,140	0.976	(0.068)	4,300
Household basic services index (0–4)	1.375	(0.082)	2,160	1.92	(0.074)	2,140	1.648	(0.061)	4,300
Household access to markets index (0–1)	1	(.)	2,160	1	(.)	2,140	1	(.)	4,300
Household access to communal natural resources index (0–4)	0.237	(0.070)	2,160	0.156	(0.065)	2,140	0.197	(0.036)	4,300
Household access to agricultural services index (0–1)	0.044	(0.032)	2,160	0.146	(0.065)	2,140	0.095	(0.038)	4,300
Household bridging social capital index (0–6)	0.978	(0.049)	2,160	1.063	(0.060)	2,140	1.02	(0.030)	4,300
Household linking social capital index (0-4)	0.041	(0.010)	2,160	0.029	(0.005)	2,140	0.035	(0.006)	4,300
Household social cohesion index (0–3)	0.169	(0.059)	2,160	0.16	(0.066)	2,140	0.165	(0.033)	4,300
Household local decision-making index (0–1)	0.34	(0.027)	2,148	0.359	(0.025)	2,122	0.349	(0.015)	4,270
Household gender index (0–3)	2.368	(0.080)	2,160	2.118	(0.047)	2,140	2.243	(0.053)	4,300
Household gender equitable decision-making index (0–2)	0.704	(0.036)	2,160	0.665	(0.048)	2,140	0.684	(0.018)	4,300
Household access to formal safety nets index (0–13)	1.787	(0.165)	1,339	1.562	(0.136)	1,800	1.649	(0.097)	3,139
Household local government responsiveness index (0–2)	0.871	(0.050)	2,160	0.951	(0.042)	2,140	0.911	(0.025)	4,300

One dimension of the transformative capacity index is the accessibility of infrastructure and services in the community. Communities have access to some basic services but even fewer key infrastructure types. The basic services index[27] illustrates the number of services (police force, primary schools, health, and financial services) that are available in the community. Households have access to 1.6 out of four of these services on average. The access to infrastructure index reflects how many types of key infrastructure (electricity grid, piped water, mobile phone service, and roads) are available in the community. On average, households have access to 0.98 out of four of these types of key infrastructure.

The next dimension of the transformative capacity index is the availability of economic institutions to support livelihoods. Access to these economic institutions is varied. All households report having access

[27] This index does not include a measure of quality for each of the service types. Instead, it only captures whether or not the service exists. Health services reflect whether NGOs are currently conducting health activities and not whether local health institutions are available.

to markets.[28] Only 10%, however, report having access to agricultural extension services.[29] Few households have access to natural communal resources: on average, households have access to only 0.20 out of four natural communal resources (communal grazing land, water source, firewood, and irrigation source). Specifically, 15% of communities have communal grazing land, 3% of communities have an irrigation source, less than 1% of communities have a communal water source, and no communities report a communal firewood source.

Another aspect of the transformative capacity index reflects the strength of households to support themselves through their networks. Overall, the ability of households to draw on their networks is low. In particular, the bridging social capital index reflects the number of types of individuals that households could draw on outside of their communities (out of three groups). On average, households feel able to draw on 1.0 of these types of individuals. The linking social capital index reflects how well-connected households are to government or NGO leaders and whether they can draw on them for help. Households score very low (0.04 out of 4) on this, suggesting that the majority of households either do not know leaders or they are not able to ask leaders for help. The social cohesion index[30] illustrates how active households have been in various support groups in the community. On average, households report engaging in 0.17 out of three support groups, reflecting that participation in support groups is not common. Finally, the local decision-making index reflects how actively households participate in groups in their communities. About one-third of households (35%) report active participation.

Another dimension captured by the transformative capacity index is the extent to which there are gender-related barriers in the community. Overall, there seem to be a moderate number of gender-related barriers in the community. The gender index reflects constraints to gender-neutral behavior at the community level. On average, communities report 2.2 out of three gender-neutral behaviors are norms. The gender equitable decision-making index[31] reflects how equitable decision-making is across male and female adults within the same household. On average, households score 0.68 out of 2 on this index, reflecting that out of two key household decisions, on average, 0.68 involve both male and female household members.

A final dimension of the transformative capacity index measures how available and reliable external sources of support are. Overall, households have access to a low number of these external resources. The formal safety nets index reflects the number of external safety nets (e.g., emergency food or cash assistance, agricultural inputs) available in the community. Overall, households have access to 1.6 out of 13 formal safety nets. The government responsiveness index reflects whether households have access to a reliable police force and a peace committee.[32] On average, households have access to 0.91 of two of these resources.

[28] We assumed that any community in which a household reported selling crops to a local market had access to a market.

[29] This index was calculated based on the percentage using agricultural extension services versus those with access, given available data.

[30] This index ranges from 0–3 instead of 0–4 as we do not have data on whether community members came together for social events.

[31] This index does not include measures of equitable decision-making around nutrition and child health as well as around savings. Thus, the index ranges from 0–2 instead of 0–4.

[32] This indicator also corresponds to the baseline 24% of households that believe local government will respond effectively to future shocks and stresses.

4. COMPARISON OF TREATMENT AND CONTROL GROUPS

Based on the data collected in the baseline, the research can evaluate the overall comparability of the treatment and control groups. This is done by comparing the mean values of a range of demographic and household-level characteristics and identifying any trends of statistically significant differences between the two groups. The table below illustrates the results of the exercise and confirms that the treatment and control group are, overall, balanced. There are no statistically significant differences in means between the two household groups at baseline. A joint test of orthogonality demonstrates that the balance characteristics are balanced (p-value = 0.976). Additional balance tables between treatment and control groups are in Annex A of this report.

Table 53. Household roster balance table

	Control		Treatment			
Outcome	Mean	N	Mean	N	Difference	P-value
Average age of people in the household roster	20.795	12,535	20.904	12,555	0.109	0.823
Percent of females in the household roster	51.047%	12,535	51.358%	12,557	0.311	0.641
Percent of farmers in the household roster	34.626%	6,324	31.508%	6,415	-3.118	0.078
Percent of people with at least some schooling in the household roster	65.895%	10,409	68.879%	10,409	2.983	0.31
Percent of people who worked for cash in the roster	52.306%	7,689	51.369%	7,746	-0.936	0.728
Percent of households with adult male and female present in the roster	83.058%	2,160	82.701%	2,140	-0.357	0.852
Percent of households with adult female only present in the roster	15.825%	2,160	16.709%	2,140	0.883	0.637
Percent of households with adult male only present in the roster	1.116%	2,160	0.59%	2,140	-0.527	0.075
Household Head						
Average age of heads of households in the roster	44.651	2,156	45.462	2,141	0.811	0.39
Percent of female head of households in the roster	25.317	2,157	27.897	2,142	2.58	0.26
Percent that did not attend school in the roster	32.966	2,157	31.898	2,142	-1.068	0.719
Percent of people in the roster with some schooling, less than primary	34.228	2,157	30.171	2,142	-4.057	0.14
Percent of people in the roster that completed Primary or more	32.788	2,156	37.924	2,141	5.136	0.053

Denotes significance at 10 pct., ** at 5 pct., and * at 1 pct. The p-value for a joint test of orthogonality is 0.976*

5. CONCLUSION

The FIOVANA baseline survey was conducted in southeastern Madagascar in the districts of Farafangana, Manakara Atsimo, Mananjary, Vangaindrano, Vohipeno, and Vondrozo. This area is normally characterized by abundant rainfall and favorable growing conditions for a variety of crops, but this region is also remote with rugged terrain and poor road access. The baseline survey of 4,300 households reflects an area dominated by agriculture. Over 94% of households farm and 92% of farmers grow rice. While farmers do grow cash crops, including cloves, coffee, and bananas, agriculture is limited by the lack of access to input and output markets, contract farming, credit, and extension.

Poverty rates in the region are high. The percentage living on less than $1.90 per day (2011 PPP) is 72%. Furthermore, 18% of individuals are considered to be facing severe food insecurity, and over 81% are at least moderately food insecure. Only 31% of households have an adequate Food Consumption Score. Very few children are consuming a diet of minimum diversity (5%) and minimum acceptability (3%). A quarter of children under 5 years old are underweight in the region. While women have a higher minimum dietary diversity than children, the percentage (9%) is still low, with most women consuming only three diverse food groups.

Households have access to few resources that would enable them to better mitigate shocks and perceive that they have a low ability to recover from future shocks. Moreover, institutions available to enable households' capacity to respond to shocks seem to be weak. These findings underscore the importance of the resilience-focused activities that FIOVANA aims to deliver.

The baseline data shows a good balance between treatment and control communes. Looking ahead to the endline survey in 2025, there are several potential challenges. First, the length of time between baseline and endline implies that attrition may be an issue. Second, there are many organizations working in this region, some of which will likely have health, nutrition, or agriculture interventions in control as well as treatment communes. This may make it more difficult to identify the effects of the FIOVANA activity. To address this, the baseline survey collected information on current activities operating in each commune, and the same will be done at endline. Furthermore, the outcome monitoring study planned for 2023 will provide an opportunity to assess changes in the practices and activities of households linked to FIOVANA activities.

ANNEX A: BALANCE TABLES

Table 54. Food security

Outcome	Control		Treatment			
	Mean	N	Mean	N	Difference	P-value
Household FCS (0–112)	32.891	2,115	32.302	2,097	-0.589	0.507
Percent of households with poor consumption score (<22)	5.88	2,115	7.967	2,097	2.087	0.294
Percent of households with borderline consumption score (22–35)	62.01	2,115	62.269	2,097	0.258	0.941
Percent of households with acceptable consumption score (>35)	32.109	2,115	29.764	2,097	-2.345	0.615
Percent of households worried about not having enough food to eat because of a lack of money or other resources	91.566	2,115	92.54	2,097	0.974	0.639
Percent of households unable to eat healthy and nutritious food because of a lack of money or other resources	92.566	2,115	95.798	2,097	3.231	0.058
Percent of households that ate only a few kinds of foods because of a lack of money or other resources	92.589	2,115	95.914	2,097	3.325	0.045
Percent of households that skipped a meal because there was not enough money or other resources	56.686	2,115	61.165	2,097	4.479	0.254
Percent of households that ate less than you thought you should because of a lack of money or other resource	84.907	2,115	88.783	2,097	3.876	0.104
Percent of households that did not have food because of a lack of money or other resources	23.676	2,115	29.752	2,097	6.076	0.1
Percent of households that are hungry but did not eat because there was not enough money or other resource	23.786	2,115	31.39	2,097	7.604	0.115
Percent of households that went without eating for a whole day because of a lack of money or other resource	17.74	2,115	23.329	2,097	5.59	0.18

Denotes significance at 10 pct., ** at 5 pct., and * at 1 pct. The p-value for a joint test of orthogonality is 0.000*

Table 55. Child nutrition and health

Outcome	Control		Treatment			
	Percent	N	Percent	N	Difference	P-value
MDD children ages 6–23 months	0.068	639	0.039	639	-0.029	0.127
MAD children ages 6–23 months	0.038	639	0.025	639	-0.013	0.309
Exclusively breastfed children under 6 months of age	0.608	176	0.656	209	0.048	0.469
Children under 5 who had diarrhea	0.118	2,089	0.108	2,112	-0.011	0.601

Outcome	Control		Treatment			
	Percent	N	Percent	N	Difference	P-value
Children under age 5 who had fever, diarrhea, or acute raspatory infection (ARI) in the past 15 days and received treatment within 2 hours from a health facility or health service	0.548	660	0.596	772	0.048	0.299
Children who had diarrhea and were given ORT	0.174	243	0.278	234	0.104*	0.07

**The results in this table are expressed as percentages*

Table 56. Anthropometry

Outcome	Control		Treatment			
	Mean	N	Mean	N	Difference	P-value
Weight-for-age Z-score (WAZ) children 0–59 months	-1.28	2,049	-1.271	2,047	0.01	0.918
Female children 0–59 months WAZ	-1.153	1,033	-1.15	1,072	0.003	0.976
Male children 0–59 months WAZ	-1.411	1,016	-1.401	975	0.01	0.924
Children 0–23 months WAZ	-0.944	796	-1.071	810	-0.127	0.407
Children 24–59 months WAZ						0.238
Percent of children 0–59 months underweight	26.301	2,049	25.462	2,047	-0.84	0.702
Percent of female children 0–59 months that are underweight	23.402	1,033	22.385	1,072	-1.017	0.673
Percent of male children 0–59 months that are underweight	29.264	1,016	28.774	975	-0.49	0.862
Percent of children 0–23 months that are underweight	21.927	796	25.407	810	3.48	0.271
Percent of children 24–59 months that are underweight	29.094	1,253	25.496	1,237	-3.598	0.123
Percent of children 0–59 months that are severely underweight	9.106	2,049	6.679	2,047	-2.427	0.07
Percent of female children 0–59 months that are severely underweight	7.733	1,033	6.131	1,072	-1.602	0.46
Percent of male children 0–59 months that are severely underweight	10.509	1,016	7.27	975	-3.239	0.077
Percent of children 0–23 months that are severely underweight	8.194	796	7.781	810	-0.414	0.834
Percent of children 24–59 months that are severely underweight	9.688	1,253	5.98	1,237	-3.708	0.012
Percent of female children 0–59 months with a normal weight	43.444	1,033	41.147	1,072	-2.298	0.477
Percent of male children 0–59 months with a normal weight	35.101	1,016	33.771	975	-1.33	0.663
Percent of children 0–23 months with a normal weight	48.622	796	44.005	810	-4.616	0.29
Percent of children 24–59 months with normal weight	33.376	1,253	33.526	1,237	0.15	0.963

Table 57. Women's health, maternal nutrition, and reproductive health

Outcome	Control		Treatment			
	Percent	N	Percent	N	Difference	P-value
Women of reproductive age (15–49) with MDD	0.032	2416	0.034	2467	0.002	0.867
Women in a union using birth control	0.352	1176	0.297	1121	-0.055	0.233
Women of reproductive age who had a live birth during the last 5 years that received ANC during last pregnancy	0.661	1347	0.682	1372	0.021	0.61
Women of reproductive age in a union who have knowledge of modern family planning methods	0.78	1302	0.782	1263	0.002	0.964
Women of reproductive age in a union who use a modern family planning method in the last 12 months who made decisions about modern family planning methods in the past 12 months	0.927	482	0.936	429	0.009	0.801
Women of reproductive age who take at least one method of birth control	0.032	2416	0.034	2467	0.002	0.867

Denotes significance at 10 pct., ** at 5 pct., and * at 1 pct. The p-value for a joint test of orthogonality is 0.681*
**The results in this table are expressed as percentages*

Table 58. Water, sanitation, and hygiene

Outcome	Control		Treatment			
	Mean	N	Mean	N	Difference	P-value
Percent of households with improved water source	16.859	2,159	20.701	2,140	3.842	0.404
Water source within 30 minutes per household	95.364	2,159	96.453	2,140	1.089	0.237
Water available year-round per household	87.594	2,159	85.044	2,140	-2.55	0.394
Households with access to basic drinking water services	14.188	2,159	16.72	2,140	2.531	0.536
Handwashing available per household	3.503	1,929	4.097	1,863	0.593	0.681
Households that treat their water	46.528	2,159	54.22	2,140	7.692	0.256
Households that treat water by adding bleach or chlorine before drinking	2.118	2,159	2.224	2,140	0.106	0.936
Households that treat water by flocculation before drinking	19.884	2,159	20.295	2,140	0.41	0.903
Households that treat water by filtration before drinking	10.765	2,159	13.656	2,140	2.891	0.415
Households that treat water by solar disinfection	35.22	2,159	42.193	2,140	6.974	0.238
Households that treat water by boiling before drinking	0.521	2,159	0.898	2,140	0.377	0.306
Households practicing open defecation	63.33	2,159	67.99	2,140	4.66	0.505
Households using improved sanitation facilities	2.764	2,159	2.407	2,140	-0.357	0.738
Household water use per capita (liters)	16.58	990	14.839	1,128	-1.741	0.108

Table 59. Agriculture–cassava, rice, and cloves

Outcome	Control		Treatment			
	Mean	N	Mean	N	Difference	P-value
Cassava						
Percent of farmers using at least one practice for cassava	21.453	1,705	20.998	1,601	-0.455	0.901
Percent of farmers using interplanting for cassava	10.915	1,708	12.093	1,604	1.179	0.681
Percent of farmers sowing after significant rain for cassava	5.281	1,708	3.92	1,604	-1.361	0.524
Percent of farmers that did not use any of the practices for cassava	79.684	1,708	79.44	1,604	-0.243	0.947
Rice						
Percent of farmers using at least one practice for rice	24.036	1,847	22.917	1,770	-1.119	0.818
Percent of farmers using organic manure for rice	5.348	1,853	6.868	1,775	1.52	0.476
Percent of farmers sowing after significant rain for rice	12.238	1,853	10.746	1,775	-1.492	0.759
Percent of farmers that did not use any of the practices for rice	76.891	1,853	77.519	1,775	0.629	0.894
Cloves						
Percent of farmers using at least one practice for cloves	42.449	528	35.975	576	-6.474	0.513
Percent of farmers interplanting for cloves	30.982	528	24.869	576	-6.113	0.486
Percent of farmers using soil cover for cloves	5.929	528	7.303	576	1.374	0.71
Percent of farmers that did not use any of the practices for cloves	59.322	528	64.207	576	4.885	0.626
Other Practices						
Percent of farmers using agricultural credit	5.411	2,103	5.061	2,003	-0.35	0.808
Percent of farmers who saved	12.167	2,105	9.773	2,005	-2.394	0.215
Percent of farmers using insurance	0.312	2,105	0.251	2,005	-0.062	0.808
Percent of farmers reporting at least one value chain activity	36.423	1,645	26.035	1,535	-10.388	0.283

Table 60. Agriculture–yield

Outcome	Control		Treatment			
	Mean	N	Mean	N	Difference	P-value
Farmers reporting cassava yield in kg per ha	5,340.62	1,387	4,805.695	1,315	-534.924	0.352
Farmers reporting cloves yield in kg per ha	680.779	160	665.038	165	-15.74	0.935
Farmers reporting rice yield in kg per ha	4,317.811	1,605	3,459.563	1,554	-858.247	0.068
Farmers reporting zero rice production	1.318	1,852	1.333	1,780	0.015	0.977

Table 61. Poverty measurements

Outcome	Control		Treatment			
	Mean	N	Mean	N	Difference	P-value
Percent poor per household	69.495	2,160	74.284	2,140	4.789	0.095
Daily per capita expenditure (Ariary)	2,099.067	2,160	2,040.822	2,140	-58.245	0.435
Daily per capita expenditure (Dollars)	1.633	2,160	1.588	2,140	-0.045	0.435

Denotes significance at 10 pct., ** at 5 pct., and * at 1 pct. The p-value for a joint test of orthogonality is 0.028*

Table 62. Use of financial resources

Outcome	Control		Treatment			
	Percent	N	Percent	N	Difference	P-value
Women and men in a union who earned cash in the past 12 months	0.745	3,220	0.739	3,164	-0.006	0.858
Men in a union and earning cash who report spouse/partner participation in decisions about the use of self-earned cash	0.829	1,479	0.808	1,426	-0.021	0.604
Women in a union and earning cash who report participation in decisions about the use of self-earned cash	0.866	934	0.821	914	-0.045	0.494

Denotes significance at 10 pct., ** at 5 pct., and * at 1 pct. The p-value for a joint test of orthogonality is 0.4865*

**The results in this table are expressed as percentages*

Table 63. Credit

Outcome	Control		Treatment			
	Percent	N	Percent	N	Difference	P-value
People in a union who have access to credit	0.356	3,220	0.359	3,164	0.003	0.945
Men and women in a union who report making the borrowing decision	0.699	1,165	0.673	1,115	-0.026	0.456

** denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. The p-value for a joint test of orthogonality is 0.458*

**The results in this table are expressed as percentages*

Table 64. Resilience

Outcome	Control		Treatment			
	Mean	N	Mean	N	Difference	P-value
Household adaptive capacity index (0–100)	29.73	1,886	33.966	1,863	4.236	0.034
Household bridging Social Capital index (0–6)	0.978	2,160	1.063	2,140	0.085	0.363
Household linking social capital (0–4)	0.041	2,160	0.029	2,140	-0.012	0.312
Household social network index (0–6)	1.462	2,150	1.959	2,140	0.497	0.003
Household education/training index (0–7)	1.112	2,159	1.245	2,135	0.133	0.11
Household asset ownership index—total type (0–31)	6.416	2,102	6.398	2,089	-0.018	0.944
Household access to financial resources (0–2)	0.403	2,160	0.787	2,140	0.384	0.011

Outcome	Control		Treatment			
	Mean	N	Mean	N	Difference	P-value
Household livelihood diversification index (0–20)	2.716	2,160	2.799	2,140	0.084	0.619
Household adoption of improved practices index (0–1)	0.07	1,990	0.059	1,966	-0.011	0.559
Household exposure to information index (0–19)	4.215	2,160	4.248	2,140	0.033	0.95
Household aspirations/confidence to adapt index (0–16)	9.205	2,056	9.198	2,039	-0.007	0.97
Household absorptive capacity index (0–100)	27.103	1,904	33.376	1,952	6.273	0.02
Household access to cash savings index (0–1)	0.118	2,159	0.115	2,140	-0.003	0.925
Household asset ownership index—total type (0–31)	6.416	2,102	6.398	2,089	-0.018	0.944
Household remittances index (0–1)	0.01	2,160	0.012	2,140	0.002	0.641
Household access to insurance index (0–1)	0.003	1,990	0.003	1,966	-0.001	0.769
Household bonding Social Capital index (0–6)	1.112	2,160	1.199	2,140	0.086	0.319
Household access to informal safety nets index (0–6)	2.396	2,080	2.779	2,140	0.383	0.111
Household shock preparedness & responsiveness index (0–3)	0.922	2,160	1.098	2,140	0.175	0.071
Household access to humanitarian assistance index (0–1)	0.089	2,160	0.277	2,140	0.188	0
Household transformative capacity index (0–100)	35.296	1,333	36.04	1,782	0.744	0.851
Household access to formal safety nets index (0–13)	1.787	1,339	1.562	1,800	-0.225	0.335
Household access to markets index (0–1)	1	2,160	1	2,140	0.000	
Household access to communal natural resources index (0–4)	0.237	2,160	0.156	2,140	-0.081	0.481
Household basic services index (0–4)	1.375	2,160	1.92	2,140	0.545	0
Household access to infrastructure index (0–3)	1.004	2,160	0.949	2,140	-0.056	0.731
Household access to agricultural services index (0–1)	0.044	2,160	0.146	2,140	0.102	0.154

Outcome	Control		Treatment			
	Mean	N	Mean	N	Difference	P-value
Household bridging Social Capital index (0–6)	0.978	2,160	1.063	2140	0.085	0.363
Household linking social capital (0–4)	0.041	2,160	0.029	2140	-0.012	0.312
Household social cohesion index (0–3)	0.169	2,160	0.16	2140	-0.009	0.934
Household gender equitable decision-making index (0–2)	0.704	2,160	0.664	2140	-0.039	0.617
Household local decision-making index (0–1)	0.34	2,148	0.359	2122	0.019	0.654
Household local government responsiveness index (0–2)	0.871	2,160	0.951	2140	0.080	0.312
Household gender index (0–3)	2.368	2,160	2.118	2140	-0.250	0.01
Household ability to recover from shocks & stresses index	2.586	1,849	2.606	1862	0.020	0.813
Household index of social capital at household level (0-100)	49.56	2,160	52.988	2140	3.428	0.339

ANNEX B: ADDITIONAL TABLES

Table 65. Crops grown, gender

	Male			Female			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent farmers growing cassava	89.3%	(1.32)	3,028	66.4%	(3.14)	914	83.9%	(1.57)	3,942
Percent farmers growing rice	94.6%	(0.63)	3,028	84.3%	(2.32)	914	92.1%	(0.67)	3,942
Percent farmers growing cloves	32.7%	(2.38)	3,028	12.3%	(1.52)	914	27.8%	(2.04)	3,942
Percent farmers growing coffee	43.4%	(2.08)	3,028	19.0%	(1.79)	914	37.6%	(1.84)	3,942
Percent farmers growing citrus	31.8%	(2.43)	3,028	19.2%	(2.05)	914	28.8%	(2.12)	3,942
Percent farmers growing mango	10.9%	(1.63)	3,028	4.2%	(0.62)	914	9.3%	(1.31)	3,942
Percent farmers growing cassava	89.3%	(1.32)	3,028	66.4%	(3.14)	914	83.9%	(1.57)	3,942
Percent farmers growing sw_pot	40.8%	(2.79)	3,028	32.6%	(3.28)	914	38.8%	(2.68)	3,942
Percent farmers growing cloves	32.7%	(2.38)	3,028	12.3%	(1.52)	914	27.8%	(2.04)	3,942
Percent farmers growing banana	42.0%	(2.12)	3,028	21.5%	(1.46)	914	37.1%	(1.70)	3,942
Percent farmers growing vanilla	17.0%	(1.52)	3,028	4.6%	(0.73)	914	14.1%	(1.22)	3,942

Table 66. Agriculture value chain practices, gender

	Male			Female			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent using agricultural credit	5.4%	(0.65)	3,049	4.9%	(0.81)	1,057	5.2%	(0.62)	4,106
Percent of farmers who saved	11.6%	(1.00)	3,051	9.2%	(1.26)	1,059	11.0%	(0.90)	4,110
Percent of farmers using insurance	0.3%	(0.15)	3,051	0.1%	(0.13)	1,059	0.3%	(0.09)	4,110
Percent of farmers reporting at least one value chain activity	30.5%	(2.72)	2,405	34.5%	(4.67)	775	31.5%	(3.09)	3,180

Table 67. Modern practices for cassava, gender

	Male			Female			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent using at least one practice for cassava	21.5%	(1.52)	2,705	20.1%	(2.53)	601	21.2%	(1.45)	3,306
Organic manure for cassava	1.2%	(0.20)	2,709	1.7%	(0.65)	603	1.3%	(0.24)	3,312
Compost for cassava	3.0%	(0.59)	2,709	1.7%	(0.73)	603	2.8%	(0.51)	3,312
Performing weedings for cassava	0.03%	(0.03)	2,709	0.3%	(0.27)	603	0.1%	(0.05)	3,312
Sowing after significant rain for cassava	4.9%	(0.86)	2,709	3.6%	(1.05)	603	4.6%	(0.81)	3,312
Interplanting for cassava	11.5%	(0.94)	2,709	11.4%	(2.12)	603	11.5%	(0.97)	3,312
Crop rotation for cassava	2.4%	(0.54)	2,709	2.1%	(0.59)	603	2.3%	(0.49)	3,312
Use of improved seeds for cassava	0.2%	(0.12)	2,709	0.3%	(0.21)	603	0.2%	(0.10)	3,312
Use of climate information for cassava	0.2%	(0.15)	2,709	0.0%	(.)	603	0.2%	(0.12)	3,312
Wind break for cassava	0.0%	(.)	2,709	0.0%	(.)	603	0.0%	(.)	3,312
Soil cover for cassava	0.3%	(0.09)	2,709	0.0%	(.)	603	0.2%	(0.07)	3,312
Micro doses of fertilizer for cassava	0.0%	(.)	2,709	0.7%	(0.50)	603	0.1%	(0.10)	3,312
Crop rotation for cassava	0.4%	(0.15)	2,709	0.3%	(0.30)	603	0.4%	(0.13)	3,312
Intercropping and Agroforestry for cassava	0.4%	(0.17)	2,709	0.3%	(0.18)	603	0.4%	(0.15)	3,312
land leveling for cassava	0.1%	(0.07)	2,709	0.0%	(.)	603	0.1%	(0.05)	3,312
Did not use any of the practices for cassava	79.2%	(1.42)	2,709	81.0%	(2.38)	603	79.6%	(1.37)	3,312

Table 68. Modern practices for rice, gender

	Male			Female			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent using at least one practice for rice	23.8%	(2.33)	2,853	22.4%	(2.69)	764	23.5%	(2.22)	3,617
Use of improved seeds for rice	0.1%	(0.06)	2,860	0.4%	(0.31)	768	0.2%	(0.08)	3,628
Use of climate information for rice	0.2%	(0.08)	,2860	0.0%	(.)	768	0.2%	(0.06)	3,628
Wind break for rice	0.0%	(0.03)	2,860	0.0%	(.)	768	0.0%	(0.02)	3,628
Soil cover for rice	0.1%	(0.06)	2,860	0.2%	(0.20)	768	0.1%	(0.06)	3,628
Micro doses of fertilizer for rice	1.3%	(0.27)	2,860	0.8%	(0.24)	768	1.2%	(0.22)	3,628
Crop rotation for rice	0.2%	(0.07)	2,860	0.2%	(0.17)	768	0.2%	(0.06)	3,628
Intercropping and Agroforestry for rice	0.0%	(0.04)	2,860	0.1%	(0.14)	768	0.1%	(0.04)	3,628
land leveling for rice	0.0%	(.)	2,860	0.1%	(0.14)	768	0.0%	(0.03)	3,628
Did not use any of the practices for rice	76.9%	(2.30)	2,860	78.4%	(2.66)	768	77.2%	(2.19)	3,628

Table 69. Modern practices for cloves, gender

	Male			Female			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent using at least one practice for cloves	39.7%	(4.02)	994	32.8%	(6.03)	110	39.0%	(4.04)	1,104
Compost for cloves	3.4%	(0.94)	994	3.3%	(2.03)	110	3.4%	(0.88)	1,104
Performing weedings for cloves	0.0%	(.)	994	0.0%	(.)	110	0.0%	(.)	1,104
Sowing after significant rain for cloves	0.5%	(0.16)	994	0.5%	(0.52)	110	0.5%	(0.19)	1,104
Interplanting for cloves	28.2%	(3.73)	994	23.7%	(5.87)	110	27.7%	(3.83)	1,104
Crop rotation for cloves	0.7%	(0.35)	994	0.0%	(.)	110	0.7%	(0.31)	1,104
Use of improved seeds for cloves	0.6%	(0.34)	994	0.5%	(0.52)	110	0.6%	(0.32)	1,104
Use of climate information for cloves	0.5%	(0.34)	994	0.0%	(.)	110	0.4%	(0.30)	1,104
Wind break for cloves	0.1%	(0.08)	994	0.0%	(.)	110	0.1%	(0.07)	1,104
Soil cover for cloves	6.7%	(1.70)	994	6.5%	(2.70)	110	6.7%	(1.68)	1,104
Intercropping and Agroforestry for cloves	4.2%	(1.43)	994	0.9%	(0.76)	110	3.8%	(1.22)	1,104
land leveling for cloves	0.1%	(0.13)	994	0.0%	(.)	110	0.1%	(0.12)	1,104
Use of improved seeds for cloves	0.6%	(0.34)	994	0.5%	(0.52)	110	0.6%	(0.32)	1,104

	Male			Female			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Did not use any of the practices for cloves	61.3%	(4.07)	994	67.2%	(6.03)	110	61.9%	(4.09)	1,104

Table 70. Agricultural yield, gender

	Male			Female			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Cassava yield in kg per ha	4,912.53	(262.89)	2,214	5,768.37	(403.90)	490	5,074.29	(272.12)	2,704
Cloves yield in kg per ha	616.48	(65.97)	276	919.8	(158.23)	49	672.17	(74.69)	325
Rice yield in kg per ha	3,858.06	(238.32)	2,503	4,046.44	(326.14)	657	3,897.38	(247.35)	3,160

Table 71. Poultry farming, gender

	Male			Female			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent of farmers raising poultry	69.4%	(1.66)	3,100	58.8%	(2.30)	1,087	66.6%	(1.64)	4,187
Use of improved poultry variety/breed	0.6%	(0.18)	2,142	0.6%	(0.41)	631	0.6%	(0.17)	2,773
Use of improved feed	0.0%	(0.01)	2,142	0.0%	(.)	631	0.0%	(0.01)	2,773
Use of improved shelters	0.4%	(0.16)	2,142	0.0%	(.)	631	0.3%	(0.12)	2,773
Use of improved fodder production	0.1%	(0.05)	2,142	0.0%	(.)	631	0.1%	(0.04)	2,773
Vaccinations	3.7%	(0.74)	2,142	5.1%	(1.31)	631	4.0%	(0.72)	2,773
Use of para-veterinary services for poultry	0.2%	(0.13)	2,124	0.1%	(0.06)	624	0.2%	(0.10)	2,748
Food preservation	0.1%	(0.06)	2,124	0.2%	(0.15)	624	0.1%	(0.06)	2,748
Selective breeding	0.2%	(0.11)	2,124	0.0%	(.)	624	0.1%	(0.08)	2,748
Habitat	3.2%	(0.56)	2,124	1.5%	(0.48)	624	2.8%	(0.39)	2,748
Percent of farmers reporting eggs in previous week	27.6%	(1.90)	2,124	23.4%	(2.11)	630	26.6%	(1.72)	2,754
Poultry yield in kg per bird	2.4%	(0.02)	2,139	2.4%	(0.03)	630	2.4%	(0.02)	2,769
Percent selling poultry in the last year	61.6%	(1.59)	2,124	60.9%	(2.95)	630	61.5%	(1.38)	2,754
Percent consuming own poultry in the last year	82.4%	(1.42)	2,123	74.0%	(2.75)	630	80.4%	(1.33)	2,753
Percent of farmers experiencing poultry dying in the last year	64.9%	(2.07)	2,124	73.2%	(2.93)	630	66.8%	(1.81)	2,754

	Male			Female			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Did not use any of these practices in the past 12 months	93.8%	(0.76)	2,142	94.2%	(1.24)	631	93.9%	(0.67)	2,773

Table 72. Beekeeping, gender

	Male			Female			All		
Outcome	Mean	SE	N	Mean	SE	N	Mean	SE	N
Total number of hives	4.15	(0.41)	65	5.92	(3.40)	4	4.25	(0.54)	69
Number of modern hives	n/a	n/a	13	n/a	n/a	2	n/a	n/a	15
Liters of honey per modern hive	n/a	n/a	13	n/a	n/a	2	n/a	n/a	15
Number of traditional hives	3.51	(0.39)	58	n/a	n/a	2	3.44	(0.38)	60
Liters of honey per traditional hive	1.91	(0.55)	58	n/a	n/a	2	1.92	(0.53)	60
Percentage using beekeeping equipment (listed below)									
Beehive	90.2%	(4.93)	65	n/a	n/a	4	90.8%	(4.73)	69
Smoker	29.8%	(8.72)	65	n/a	n/a	4	28.1%	(8.41)	69
Frames and Foundation	11.9%	(5.58)	65	n/a	n/a	4	11.2%	(5.22)	69
Veil and Gloves	11.8%	(5.09)	65	n/a	n/a	4	11.1%	(4.85)	69
Feeder	1.4%	(1.69)	65	n/a	n/a	4	1.4%	(1.56)	69
Heated Knife	25.7%	(4.90)	65	n/a	n/a	4	25.0%	(4.68)	69
Uncapping Fork	7.6%	(3.67)	65	n/a	n/a	4	7.1%	(3.47)	69
Tub For Wax/Honey	2.5%	(2.10)	65	n/a	n/a	4	2.3%	(1.95)	69
Extractor	1.0%	(1.02)	65	n/a	n/a	4	1.0%	(0.96)	69
Food-Grade Bucket	8.2%	(4.46)	65	n/a	n/a	4	8.6%	(4.38)	69
Double Sieve	5.5%	(3.51)	65	n/a	n/a	4	5.2%	(3.26)	69
Containers	3.9%	(2.80)	65	n/a	n/a	4	3.7%	(2.60)	69
Queen excluder	2.8%	(2.22)	65	n/a	n/a	4	2.7%	(2.10)	69
Queen cage	7.0%	(2.88)	65	n/a	n/a	4	6.6%	(2.72)	69
Beekeeper's suit	3.5%	(2.84)	65	n/a	n/a	4	3.3%	(2.64)	69
Nylon brush	3.2%	(2.38)	65	n/a	n/a	4	3.1%	(2.20)	69
Attracts swarm	7.0%	(2.92)	65	n/a	n/a	4	6.6%	(2.77)	69
Filter cloth	19.7%	(6.09)	65	n/a	n/a	4	18.6%	(5.53)	69
Knife	38.7%	(8.86)	65	n/a	n/a	4	39.5%	(8.87)	69
Bucket	20.6%	(6.14)	65	n/a	n/a	4	20.2%	(5.53)	69

Table 73. Fishing, gender

	Male			Female			All		
Outcome	Percent	SE	N	Percent	SE	N	Percent	SE	N
Percent fishing for food only	46.5%	(6.40)	204	43.3%	(10.73)	83	45.5%	(5.93)	287
Percent fishing for market only	1.7%	(0.86)	204	6.0%	(3.64)	83	3.0%	(1.37)	287
Percent fishing for both food and market	51.8%	(6.24)	204	50.7%	(9.27)	83	51.5%	(5.53)	287
Percent of fishers using a pirogue	37.7%	(6.14)	204	8.1%	(5.94)	82	28.6%	(5.01)	286
Percent of fishers using nets	55.6%	(6.40)	204	19.2%	(6.07)	82	44.4%	(5.17)	286
Percent of fishers using containers	27.2%	(4.88)	204	43.3%	(7.20)	82	32.1%	(4.42)	286

Table 74. Non-governmental organizations in the control areas

Organization/leader of the project	Frequency	Percent	Cum.
ADRA	3	2.3%	2.26
AFAFI SUD	3	2.3%	4.51
DEFIS	23	17.3%	21.8
FAO	1	0.8%	22.56
FID	8	6.0%	28.57
PAM	6	4.5%	33.08
ONN	1	0.8%	33.83
USAID ACCESS	20	15.0%	48.87
WHH (WELT HUNGER LIFE)	2	1.5%	50.38
Church	7	5.3%	55.64
Malagasy Government	3	2.3%	57.89
Individual	1	0.8%	58.65
International NGO	27	20.3%	78.95
Malagasy NGO	12	9.0%	87.97
Other bilateral organization	8	6.0%	93.98
Other international organization	8	6.0%	100
Total	133	100	

Table 75. Non-governmental organizations in the treatment areas

Organization/leader of the project	Freq.	Percent	Cum.
ADRA	48	26.1%	26.09
AFAFI SUD	4	2.2%	28.26
CARE	1	0.5%	28.8
CRS	4	2.2%	30.98
DEFIS	25	13.6%	44.57
FID	7	3.8%	48.37
PAM	1	0.5%	48.91
ONN	2	1.1%	50
USAID ACCESS	20	10.9%	60.87
WHH (WELT HUNGER LIFE)	5	2.7%	63.59
Church	6	3.3%	66.85
Malagasy Government	4	2.2%	69.02
International NGO	28	15.2%	84.24
Malagasy NGO	12	6.5%	90.76
Other bilateral organization	5	2.7%	93.48
Other international organization	12	6.5%	100
Total	184	100	

Table 76. Non-governmental organization activity

	Control		Treatment		All	
Outcome	Percent reporting the activity	N	Percent reporting the activity	N	Percent reporting the activity	N
Administrative support (conseil, finance, personnel)	0.0%	133	0.0%	184	0.0%	317
Construction, public buildings	0.0%	133	0.0%	184	0.0%	317
Construction, roads	2.3%	133	1.6%	184	1.9%	317
Construction, other (including water and irrigation services)	18.8%	133	10.3%	184	13.9%	317
Health	30.8%	133	41.9%	184	37.2%	317
Education	6.8%	133	3.8%	184	5.1%	317
Professional training	1.5%	133	1.1%	184	1.3%	317
Agriculture	43.6%	133	51.1%	184	48.0%	317
Livestock	13.5%	133	21.7%	184	18.3%	317
Fishing/fish farming	3.0%	133	7.6%	184	5.7%	317
Reforestation/environment	6.0%	133	10.9%	184	8.8%	317
Industry/crafts	0.0%	133	0.0%	184	0.0%	317
Commerce/transport	0.8%	133	1.1%	184	1.0%	317
Savings and credit	0.0%	133	1.6%	184	1.0%	317
Conservation (fauna and flora)	2.3%	133	0.0%	184	1.0%	317
Cultural	0.0%	133	0.5%	184	0.3%	317
Food aid	6.0%	133	16.9%	184	12.3%	317
Women and child services	2.3%	133	1.6%	184	1.9%	317
Disability services	0.0%	133	0.0%	184	0.0%	317
IEC support	1.5%	133	1.6%	184	1.6%	317
Support of farmers groups	15.0%	133	16.9%	184	16.1%	317
Good governance	0.0%	133	1.6%	184	1.0%	317
Market access	0.0%	133	0.5%	184	0.3%	317

**N is an organization, not commune*