# Quantitative Evaluation of the Social Fund for Development Rainfed Agriculture and Livestock Program (RALP)

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# Executive Summary

The Rainfed Agriculture and Livestock Project (RALP) is a five-year program designed to improve agricultural productivity by fostering the formation and training of small producer groups in rural Yemen. The program started in September 2008 and will continue with a one-year extension until September 2014. This report is an intermediate quantitative evaluation of the program impacts based on a baseline survey conducted in 2009 and a follow-up survey in 2011. The evaluation is based on two levels of data: a short questionnaire ("mini-census") administered to all members of the sampled villages, and a detailed household survey administered to selected participants in treatment villages and to randomly drawn households in control villages. Approximately 28% of households chose to participate in a RALP group. The RALP intervention is based on the formation of cooperative production groups. Interested participants in treated communities organize themselves into groups of 5 to 8 members and are given training in organization and agricultural best practices (mostly for goat and sheep raising or for beekeeping), as well as subsidies for the purchase of livestock and other inputs.

The first chapter of this report describes the program intervention and the evaluation design. In the second chapter, we use the mini-census data to estimate average community-wide impacts of the RALP intervention. This includes both direct impacts on participating households, as well as the possibility of spillovers to non-participating households. In the third and fourth chapters, we describe and apply the methodology of propensity score matching with inverse probability weighting to correct for self-selection in the household survey data. Using this procedure, we estimate the impact of the RALP treatment on participating households for a larger set of outcome variables.

Our analysis of community wide impacts shows that the program increased ownership of goats and sheep and of beehives, showing that the transfers promoted types of agricultural investments that would not otherwise have been made. The program increased the probability that a household would benefit from any goats or sheep by about 10 percentage points from 68% at baseline. The estimated impact on the average number of animals owned was an increase of about 1.5 goats or sheep per household from an average of 4.5 at baseline. The share of households that own beehives is much smaller, and we estimate positive but not statistically significant increases in beehive ownership. We also find evidence that the RALP program increased perceptions of community willingness to cooperate. We find an increase of about 6 percentage points from 10% at baseline in the share of households that responded that other community members would help in the event of a family crisis, and 17 percentage points from a baseline of 65% in the share of households that responded that other community members would help in the event of a communal problem such as a flooded road or a closed school. In our analysis of impacts on participating households, we examined livestock ownership, knowledge and practices related to livestock raising or beekeeping (depending on the type of group that the household participated in), consumption, community solidarity, and female empowerment.

The household survey distinguished between goats and sheep in individual ownership, and goats and sheep in shared ownership. We find a substantial increase of about 34 or 46 percentage points (depending on the weighting scheme used) on the probability of a household benefiting from at least one sheep or goat, relative to a baseline rate of only about 10%. Even among goat and sheep groups, however, not all participants ended up with shared ownership of at least one

goat or sheep. This could mean that animals bought through the program had already been sold at the time of the follow-up survey, or in a few cases that the project had not yet been funded (15% of households). It is also noticeable that there is a statistically significant increase of 12 or 10 percentage points in the probability of individually owning goats or sheep associated with program treatment. Program administrators noted that they had seen that participants in RALP groups took advantage of the training provided and economies of scale in livestock production by purchasing their own animals in addition to those provided by the program and owned collectively. For total number of goats and sheep, we estimate a program impact of approximately 2 animals per household for participants. Compared to the community survey estimate of 1.5 animals per households on average in the community, and given a participation rate of only about 25%, this suggests that there were also substantial positive spillovers to non-participants.

Regarding knowledge and practices, we find that the RALP intervention - which also included increases in the supply of veterinary health services - was effective in increasing access to veterinary services. The rate of vaccinating animals and the rate of taking sick animals to a veterinarian both increased by around 25 percentage points from a baseline level of 50%. (The magnitude of the effect on taking animals to the vet is sensitive to the weighting scheme used) The share of animals lost due to sickness, however, remained relatively constant at 15%. RALP participation also caused a doubling in the rate of participation in animal fattening.

For beehive groups, the sample size is much smaller, and we present some suggestive evidence of increases in knowledge about honey extraction and use of protective equipment and summarize data on changes in ownership, but are not able to find statistically significant impacts.

Because it was still early in the program when the follow-up survey was conducted, we are not surprised to find few positive impacts on consumption or food security. The one positive finding is a much higher frequency of milk consumption among treated households. We find a strong impact of the RALP intervention on measures of perceived community solidarity as expressed by responses to hypothetical questions about who is willing to help in a time of crisis. The follow-up survey was conducted during the 2011 economic and political crisis, and we see that in both treatment and control households there was an increase in the number of respondents who said that friends or relatives would help. In treatment households, however, there was also an increase in the number of respondents who thought community members in general would help each other. We also find positive impacts on some measures of women's empowerment.

The RALP groups offered an opportunity for women to meet regularly outside the home and participate in a shared economic project. According to the qualitative survey, women appreciated the group structure of the project more than men. In the Yemeni context where women's lives are culturally limited to the home, we expect that these characteristics will be associated with greater decision-making power for women generally. We find that the share of women who reported being involved in decision making about large purchases increased by 10 or 14 percentage points compared to a baseline of about 30%, and the share of women that reported they could access money independently increased by 12 or 13 percentage points from a baseline value of 45%. The one sense in which women became "worse off" was a decrease in the share of women reporting ability to sell assets without permission, which we speculate is related to the increased share of household assets controlled by women as a result of the program.

Assessing the full impact of the RALP program will need a second follow-up survey implemented after the program terminates in September 2014.

# Chapter 1

# Introduction

## 1.1 RALP Program Design

The Rainfed Agriculture and Livestock Project (RALP) is a program designed to improve the agricultural productivity of communities that lack irrigation. The program started in September, 2008 and was scheduled to last for five years, although it has been extended until September 2014 due to the economic crisis of 2011. The program is active in five governorates: Hajjah, Al-Hodeidah, Lahj, Maweet, and Sana'a. Communities were selected for intervention using criteria from the 2001 agricultural census, including that agriculture be at least 70% rainfed. The targeting goal was not necessarily to reach the poorest of the poor, but to reach communities and households that could best benefit from the program. The targeted communities were selected based on the following criteria:

1. Agriculture and animal husbandry are the predominant economic activities
2. Communities are socially homogenous and women are actively involved in community life
3. Rainfall accounts for at least 70% of water used for agriculture and animal husbandry
4. Community is between 200-600 households
5. 35% of the population lives below the poverty line
6. Small ownership of farmland prevails (2 hectares and less)

The RALP program consists of a variety of interventions aimed at fostering cooperative producer groups. Most groups are engaged in either goat and sheep raising and fattening, or beekeeping.

Members of treated communities, with some eligibility restrictions, were informed about the program and encouraged to self-select into groups of 5-8 members. The groups were given training in preparing a project proposal and cooperative group functioning. The groups then independently prepared their proposal and agreed on a set of rules for allocating responsibilities among group members and distributing project income. A selected treasurer in each group received additional training in book-keeping, and a lock box for project funds.

The RALP producer groups are eligible for SFD grants for purchases of livestock and inputs on a cost-sharing basis. For goat and sheep projects in the first round, RALP groups received an average of 10-15 animals from SFD, and were required to purchase an additional 5 animals from their own contributions.[1] The program also provided free training in agricultural best practices related to goat and sheep raising and beekeeping. The program also increased the supply of veterinary health services by providing short-term training and equipment for locals designated as health workers.

[1] In the second round of the program the average number of animals per group was increased to 20-25.

Income from animals owned by RALP groups is distributed among members, with a portion of the income saved for group expenses. After a minimum of two years, RALP groups will be allowed to distribute jointly owned animals or beehives among their members.

There are currently 1700 active RALP project groups, of which the majority participate in livestock raising or fattening, followed by beekeeping. In the program as a whole, 73% of originally formed groups are currently active and functioning.[2]

## 1.2 Group Characteristics

In our sample, the average group size was 5.45. Groups were generally either all male or all female: 83% of respondents indicated that group members were all of the same gender. By contrast, group membership varied by educational level and economic status. Only 11% of respondents indicated that all group members had the same education level and only 58% of respondents indicated that all group members had the same economic level, which may be an important factor in the RALP program's ability to increase community solidarity.

The majority of groups in our sample were goat and sheep groups, followed by beekeeping groups. Table 1.1 shows the distribution of households in our sample by type of group. There was a lot of variation in the group contribution reported in our sample. The average contribution was 6,974 riyal or about $32, with a standard deviation of 6,325. 15% of respondents reported that their project had not yet been funded at the time of the follow-up survey.

## 1.3 Targeting

RALP participation was theoretically limited by several criteria to target the program to poorer members of the community. However, project administrators are not confident that these criteria were consistently applied, and in our sample, we do not find evidence of targeting by these criteria. According to the original plan, potential group members were required to satisfy at least four of the following three conditions:

- Own less than 0.5 hectares of land
- Not own cattle
- Own less than 4 goats or sheep
- Receive benefits from the Social Welfare Fund

While we do not have information on the last point in the household survey, we do know whether they met the first three criteria. About 54% of surveyed households in treatment groups in our sample met less than two of the three criteria on which we have data.[3] Also better-off families participated at almost the same rate as poorer members of the community. (See chapter 3)

## 1.4 Research Questions

The purpose of this evaluation is both to summarize what is known about the functioning of the RALP program, and to measure changes in knowledge, attitudes, and asset ownership that can be attributed to RALP. We evaluate the effectiveness of the Rainfed and Agricultural Livestock Program in:

- Improving the economic well-being of individuals: outcome variables food security and animal ownership

[2] Reported by RALP program officer

[3] Out of 750 households in the household survey, we have land ownership information for 728, with missing values caused by unknown local units for measuring land.

- Improving the capacity of individuals: outcome variables in agricultural knowledge, and female empowerment
- Improving the capacity of communities: outcome variables in reported community solidarity

## 1.5 Evaluation Design

The evaluation was designed to measure the impact of RALP in communities scheduled for treatment by the program. Treatment (N=95) sites were defined as villages and communities with a minimum of 11 program participants. An equal number of control sites were identified from among districts where the RALP program was not active by using matching on population and agricultural census data (agricultural production characteristics, structure of land ownership, literacy rates, electricity rates) from among villages between 2km and 15 km from each treatment site to find the closest match.

In each of the treatment and control communities, a list of all households was established, and 12 households were randomly selected to participate in the evaluation. A baseline survey, including both community and household surveys was conducted in June 2009, and a follow-up survey was conducted in June 2011. This gives the basis for a double difference estimation strategy for intermediate program impacts. A third round of surveys to estimate final program impacts is under discussion.

### 1.5.1 Impact Evaluation Strategy

The primary challenge in impact evaluation is to identify changes which are attributable to the program intervention (the causal effect of the program) rather than to other factors. The matching procedure for the choice of control villages was designed to reduce as much as possible the difference in characteristics of treatment and control villages in the sample. We also use the differences in differences strategy, which provides a second level of control for cases in which other factors may not be perfectly balanced between the treatment and control villages.

For community level analysis, the unit of analysis is the community, and the estimating equations are of the form: $y_{tc} = \nu_c + Expost_t + \beta * RALP_{ct} + \epsilon_{ct}$ where $y_{tc}$ is the average outcome for community c at time t, $\nu$ is a community level fixed effect, $Expost$ is a dummy variable indicating the time trend, and $RALP$ is the variable of interest which is equal to one for treated communities in the follow-up survey.

For household level analysis, we are able to match households between baseline and expost and use fixed effects at the household level to control for time invariant characteristics. The estimating equations are of the form: $y_{th} = \mu_h + Expost_t + \beta * RALP_{ht} + \epsilon_{th}$, where $\mu_h$ is a household level fixed effect. Inverse propensity score weighting is also used to correct for differences between treatment and control households due to self-selection at the household level. The calculation of these weights is discussed in detail below.

## 1.6 Community Level Balance

In spite of the attempt to balance communities by using propensity score matching, treatment communities had higher ownership rates for goats and sheep and beehives, but lower per capita numbers of animals owned. Both these characteristics indicate a greater potential for benefits from RALP in the treatment villages than in the control villages. The double difference methodology is necessary to control differences in baseline characteristics, and requires the assumption that in spite of the different initial conditions, the two sets of communities would have had similar trends. We find this assumption reasonable, as the differences, while statistically significant, are small in relative magnitude. The difference in ownership rate is 6 percentage points relative to the approximately 60% ownership rate in control villages, and the difference in the number of animals of 0.12 is relative to average ownership of slightly less than 5 animals. See table 1.3 and tables 2.1

and 2.1 in chapter 2. The magnitudes of the differences between treatment and control villages are also small relative to the time trends and program impacts that are estimated below.

The treatment and control communities also differed in terms of expressed attitudes about cooperation, however, these attitudes were concentrated among program participants. Consequently, it is probable that the expectation of greater cooperation in treatment villages was either a result of the initial group formation stages of the project, or perceived as the more desirable answer to give enumerators. See table 1.4

There was no significant difference between treatment and control in the three measures of agricultural practices- moving animals, giving sugar to bees, and veterinary access. See table 1.5.

## 1.7 Sample Size and Attrition

At baseline a listing of households in the community was prepared and all households were given a poverty ranking by community members using a participatory wealth ranking methodology. All households in the listing were interviewed using a short questionnaire referred to as the "'mini-census"' and indicated whether or not they were potential participants in the RALP program. From among potential participants, six poor, three very poor, and three average households were randomly selected to complete the full survey. In case a sufficient number of participants of the correct category could not be found, a participant from the next highest group was substituted. In control communities, the same economic stratification was used, but sampling was random among the entire community. As a result, respondents in the treatment communities are slightly better off on average than respondents in control communities. We discuss the potential bias caused by this stratification scheme in our matching methodology described below.

For the follow-up survey, a 60 household subsample of the original listing (selected as being the households geographically nearest to the 12 randomly selected survey households) was resurveyed using the mini-census questionnaire. For the household survey, the original 12 randomly selected households were resurveyed, but if a potential participating household ended up not participating in RALP (or could not be relocated), it was dropped and replaced with a participating household.

The data available consist of two parts: the community mini-census including poverty assessment, household animal assets, and measures of within village cooperation; and the household survey with detailed information on RALP group participation, consumption, assets, and knowledge of best practices in animal raising and beekeeping.

### 1.7.1 Community Minicensus

In the subset for which we have both baseline and follow-up date in the community survey, we have a total of 4,721 observations, or 60 households per community. This subsample was randomized in control villages, but not in treatment villages, introducing a potential source of bias to our community level analysis, as households in the subsample were more likely than average to participate in RALP. A comparison of the wealth distribution in the full community census with the sub-sample is shown in table 1.6.

### 1.7.2 Household Survey

The projected sample size for the household survey was 95 communities with 12 households each, for a total of 1140 treatment and 1140 control households. In the actual baseline survey, since only potential RALP participants were included, several treatment villages had less than 12 participants. The sample size at baseline was 1095 treatment and 1140 control.

Between baseline and follow-up there was attrition at both the community level and the household level. Six treatment communities were dropped from the program and follow-up survey due to funding constraints, while one community could not be resurveyed due to the conflict situation. In addition, approximately 23% of households that were surveyed at baseline were dropped from

the sample because they ended up not participating in the RALP program. This is another source of potential bias that we will mention in our discussion of the matching methodology.

The follow-up household survey included 979 treatment households and 1,130 control households. Excluding replacement households, the total size of the panel is 750 treatment and 1,068 control households. The sample size actually used for analysis is reduced further as observations with missing data in the characteristics used for calculating propensity scores are excluded. We also drop 57 households included in the treatment sample who were interviewed in spite of eventually not participating in the program, as we believe that their inclusion in the sample was an error made by the local enumerators and have no information about why they were included. The final sample used for analysis consists of 625 treatment households and 987 control households. Table 1.7 summarizes the original and final sample sizes for the household survey.

| | Full sample | Sample used in analysis |
|---|---|---|
| Goat and sheep | 685 | 426 |
| Beehives | 265 | 173 |
| Veterinary training | 9 | 4 |
| Other | 26 | 12 |

Table 1.1: Distribution of group type at follow-up

| Criteria met | Frequency | Percentage |
|---|---|---|
| 0 | 31 | 4% |
| 1 | 374 | 50% |
| 2 | 166 | 26% |
| 3 | 63 | 19% |
| Total | 728 | |

Table 1.2: Number of eligibility criteria met by participants in household survey

| | |
|---|---|
| Percent own goats or sheep | 0.06** |
| Percent own cattle | -0.07*** |
| Percent own beehives | 0.03*** |
| Avg. number goats and sheep per hh | -0.12*** |
| Avg. number cattle per hh | -0.11 |
| Avg. number beehives per hh | 0.01 |
| Percent of animal owners with vet access | -0.01 |
| Percent of beehive owners that give sugar | -3.38 |
| Percent of animal owners that move animals for grazing | -0.06 |
| Observations | 182 |

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

Table 1.3: Animal ownership at baseline (t-test for difference of means)

| | Expect Cooperation of Community in Case of: | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | Family Problem | Communal Problem | Personal Problem | Terrace Problem |
| Control Baseline | 0.129 | 0.573 | 0.404 | 0.0243 |
| Control Expost | 0.0970 | 0.556 | 0.496 | 0.0603 |
| Treatment Baseline | 0.0982 | 0.646 | 0.509 | 0.0276 |
| Treatment Expost | 0.162 | 0.729 | 0.534 | 0.0543 |
| Observations | 348 | 348 | 348 | 348 |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1.4: Measures of existing cooperation in the community (t-test for difference of means)

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| | |
|---|---|
| Percent of animal owners with vet access | -0.01 |
| Percent of beehive owners that give sugar | -3.38 |
| Percent of animal owners that move animals for grazing | -0.06 |
| Observations | 182 |

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

Table 1.5: Agricultural practices (t-test for difference of means)

| | (1) | (2) | (3) |
|---|---|---|---|
| | Potential Participation | Potential Participation (subset) | Actual Participation (subset) |
| better off | 725 | 359 | 359 |
| wealth==average | 2285 | 1209 | 1209 |
| wealth==poor | 3425 | 1945 | 1945 |
| very poor | 2244 | 1208 | 1208 |
| Total | 8679 | 4721 | 4721 |
| Observations | 8679 | 4721 | 4721 |

count coefficients; $t$ statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1.6: Distribution by wealth ranking

| | All households | Panel households | Used in Analysis |
|---|---|---|---|
| Treatment Baseline | 1084 | 750 | 625 |
| Treatment Expost | 990 | 750 | 625 |
| Control Baseline | 1129 | 1068 | 987 |
| Control Expost | 1135 | 1068 | 987 |

Table 1.7: Sample Size

# Chapter 2

# Community Level Analysis: Average Effect

We estimate the average community level effect of the program based on the data collected in the minicensus, limited to the subsample that was resurveyed. Within this subsample, the rate of participation in a RALP group was 28%. We find strong evidence that the program increased ownership of goats and sheep and beehives, showing that the transfers promoted types of agricultural investment that would not otherwise have been made. The size of the effects also suggests positive spillovers on animal ownership beyond the initial grant. Further, we find evidence that the RALP program increased perceptions of community willingness to cooperate.[1]

The major observable impact of the RALP program was to increase ownership of goats and sheep. The program presence increased the probability that a household would own any goats or sheep by about 10 percentage points, from a baseline of 68% of households at baseline. There was also a relatively small but significant negative effect on the rate of cattle ownership, which suggests that part of the increase in goat and sheep ownership may have been substituting for cattle ownership. We also estimate a significant positive impact of 4 percentage points on the rate of ownership beehives, compared to baseline of 8.7% and a 1 percentage point decrease in beehive ownership in control areas. See tables 2.1 and 2.2.

The estimated impact on the average number of animals owned was an increase of about 1.5 goats or sheep per household, which is an increase of about 33% relative to baseline ownership. Given a participation rate of 28%and average grant of 3 animals per group members, this suggests that there was some positive spillover on animal ownership beyond the animals provided directly by SFD. The estimated coefficient for the program impact on number of beehives is positive (0.07), but not significant, probably due to the very small share of the sample than owned any beehives. See tables 2.3 and 2.4.

Regarding measures of economic cooperation, the survey asked respondents if they themselves participated in a non-RALP cooperative or any other type of joint economic activity with others. In both treatment and control villages, there was in increase in self-reported economic cooperation, but no significant program impact. See the first two columns in tables 2.5 and 2.6.

The minicensus also asked how many other households in the village the respondent knows that participated in selling or marketing with others. As a summary statistic, we took the ratio of the total number of households reported to the number of households in the village. There is no adjustment for the possibility of double reporting, so the ratio here cannot be compared with the self-reported rate of economic co-operation. The summary statistics show that in control villages, the relative number of reported households increased between baseline and follow-up, while in

[1]Since the subsample was not strictly randomized in treatment communities (it was selected to geographically include treated households), it is not fully representative of the entire treated community. We expect this caused a positive bias in the estimation results if households near eventual participants were likely to have a greater increase in outcome variables during this time period than more remote households.

treatment, the relative number also increased but to a lesser extent. However, the differences are not statistically significant. See tables 2.5 and 2.6.

Finally, the minicensus included a series of questions about perceptions of community solidarity. First, the survey asked, if there was a tribal or family dispute in the area, who would help? Second, if there was a communal problem such as a road closed by heavy rain or the school was closed, who would help? Third, if a member of the village suffered a crisis such as a serious illness, who would help? Fourth, if a terrace that you farm collapsed who would help? For each question, the possible answers were: the whole community, some members of the community, local leaders, or no one. The first and second answers were coded as expected community solidarity, and we find a significant increase of about 6 percentage points (compared to a base of about 10%) in the probability of expected community solidarity for family problems and 17 percentage points for community problems (compared to a base of about 65%) as a result of the RALP intervention. See tables 2.7 and 2.8.

| | Goats or Sheep | Cattle | Beehives |
|---|---|---|---|
| Control Baseline | 0.610 | 0.376 | 0.0530 |
| Control Expost | 0.663 | 0.385 | 0.0521 |
| Treatment Baseline | 0.680 | 0.311 | 0.0877 |
| Treatment Expost | 0.755 | 0.323 | 0.0937 |
| Observations | 348 | 348 | 348 |

Table 2.1: Rate of animal ownership (subsample only)

| | Goats or Sheep | Cattle | Beehives |
|---|---|---|---|
| RALP Program | 0.0926*** | -0.0616*** | 0.0416*** |
| | (4.27) | (-2.98) | (4.44) |
| Expost | 0.0173 | 0.0414** | -0.0183** |
| | (0.92) | (2.31) | (-2.25) |

$t$ statistics in parentheses

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

Table 2.2: Average program impact on rate of animal ownership (subsample only)

| | Goats or Sheep | Cattle | Beehives |
|---|---|---|---|
| Control Baseline | 4.996 | 0.586 | 0.434 |
| Control Expost | 5.360 | 0.615 | 0.528 |
| Treatment Baseline | 4.827 | 0.469 | 0.463 |
| Treatment Expost | 6.902 | 0.520 | 0.605 |
| Observations | 348 | 348 | 348 |

Table 2.3: Animal ownership- number of animals (subsample only)

| | Goats or Sheep | Cattle | Beehives |
|---|---|---|---|
| RALP Program | 1.542*** | -0.0945*** | 0.0772 |
| | (2.92) | (-2.61) | (0.69) |
| Expost | 0.448 | 0.0877*** | 0.0794 |
| | (0.98) | (2.80) | (0.82) |

$t$ statistics in parentheses

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

Table 2.4: Average program impact on number of animals (subsample only)

| | Self-Reported: | | Reported of Others | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | Participate in Coop | Other Economic Cooperation | Sell with Others | Market with Other |
| Control Baseline | 0.0520 | 0.0556 | 0.218 | 0.0542 |
| Control Expost | 0.0683 | 0.0919 | 0.667 | 0.225 |
| Treatment Baseline | 0.0327 | 0.0712 | 0.404 | 0.233 |
| Treatment Expost | 0.0927 | 0.103 | 0.592 | 0.293 |
| Observations | 348 | 348 | 348 | 348 |

Table 2.5: Measures of economic cooperation in the community (1) share of respondents that participated in a cooperative (2) share of respondents that took part in economic activity with others (3) average number of other households known by respondent to engage in cooperative selling (4) average number of other households in community known by respondent to engage in cooperative marketing

| | Self-Reported: | | Reported of Others | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | Participate in Coop | Other Economic Cooperation | Sell with Others | Market with Others |
| RALP Program | 0.0244 | 0.0116 | -0.0747 | 0.0678 |
| | (1.49) | (0.85) | (-0.96) | (1.53) |
| Expost | 0.0259* | 0.0285** | 0.356*** | 0.0817** |
| | (1.84) | (2.41) | (5.27) | (2.13) |

$t$ statistics in parentheses

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

Table 2.6: Average program impact on measures of economic cooperation in the community. (1) share of respondents that participated in a cooperative (2) share of respondents that took part in economic activity with others (3) average number of other households known by respondent to engage in cooperative selling (4) average number of other households in community known by respondent to engage in cooperative marketing

| | Expect Cooperation of Community in Case of: | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | Family Problem | Communal Problem | Personal Problem | Terrace Problem |
| Control Baseline | 0.129 | 0.573 | 0.404 | 0.0243 |
| Control Expost | 0.0970 | 0.556 | 0.496 | 0.0603 |
| Treatment Baseline | 0.0982 | 0.646 | 0.509 | 0.0276 |
| Treatment Expost | 0.162 | 0.729 | 0.534 | 0.0543 |
| Observations | 348 | 348 | 348 | 348 |

$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Table 2.7: Measures of expected solidarity in the community: share of respondents that expect community to help in the case of (1) a family problem (2) a community problem (3) a personal problem (4) a problems with terraces

| | Expect Cooperation of Community in Case of: | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | Family Problem | Communal Problem | Personal Problem | Terrace Problem |
| RALP Program | 0.0651*** | 0.173*** | 0.0380 | -0.00595 |
| | (3.09) | (4.91) | (0.96) | (-0.57) |
| Expost | -0.0167 | -0.0529* | 0.0396 | 0.0343*** |
| | (-0.91) | (-1.73) | (1.16) | (3.81) |

$t$ statistics in parentheses

$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

Table 2.8: Average program impact on measures of expected solidarity in the community: share of respondents that expect community to help in the case of (1) a family problem (2) a community problem (3) a personal problem (4) a problems with terraces

# Chapter 3

# Household Level Self-Selection into RALP and Calculation of Propensity Scores

## 3.1 Self-selection into RALP groups

In the June 2009 baseline community minicensus, 26% (2,309 out of 8,954 surveyed) of households in treatment communities indicated that they had signed up for membership in a RALP group. Only households that signed up at the beginning of the program had an opportunity to receive program treatment. Because there was high attrition from the total number signed up to the actual number who participated in the program, we refer to the status of these households at baseline as "potential membership." These are households that were both eligible for participation and actively interested in participating. As discussed below, eligibility restrictions were not consistently enforced, so the primary difference between potential participants and non-participants is interest and confidence in the program.[1]

Potential membership was highest in the wealth group "poor", but rates of potential membership were between 20 and 30 percent for all wealth groups. This is expected from the program's targeting as better off households were more likely to be excluded by the above criteria to the extent that they were applied, and the very poor were less likely to be able to benefit from the program due to lack of resources to contribute.

In the RALP program as a whole, 1400 potential groups were formed based on expressed interest in joining the program. Of these potential groups, 680 remained together and took part in the program. While no new groups could be formed at later stages of the program, households could join existing active groups, so on the household level, the decline in the participation rate from the initial stage of group formation to the active stage of the program was less than implied by the decline in the number of groups. However, this clarifies that the 23% attrition rate from the program as seen in our sample is not unusual.

Of the households that were resurveyed in the follow-up household minicensus (a non-random subset selected geographically to include known participants in the household survey), the percentage of households reporting potential RALP participation was 32%. This seems to imply that the subset included in the follow-up mini-census is not perfectly representative of the community, probably due to excluding more remote households.

In the follow-up minicensus, 27% of this subset (1,353 out of 5,051) actually reported participation in RALP. The decrease from potential to actual membership (15% decrease) is lower than the attrition rate in the household survey (23%) due to the non-random nature of sampling.

[1] As noted in the qualitative evaluation, a common reason for not signing up for the program was lack of trust in the program.

Interestingly, the attrition rate also varies by wealth category.

Table 3.1 shows the share of surveyed households by wealth category that were potential or actual participants according to the available data. Column 1 shows the share of households that were potential participants at baseline according to the entire community mini-census. Column 2 shows the share of households that were part of the follow-up-post mini-census that were potential group members at baseline. As the follow-up mini-census was non-random, the rates of potential participation are higher in this subset. Column 3 shows the share of households that were part of the subset that actually participated in RALP. Because only a subset of households were surveyed, the actual participation rates in column 3 cannot be compared directly to the potential rates in column 1. The difference between the first two columns gives an indication of the extent to which the non-random sampling may bias estimates of actual participation in the entire community.

In looking at the rates of participation, we also notice poor and very poor households were most likely to be interested in participating in RALP, but also had relatively sharp drop from potential to actual participation. This is is logical since the RALP program required cost-sharing contributions from participants that poor and very poor households may have been unable to meet, and underscores that the design of the RALP program was not necessarily meant for targeting the poorest community members. Also, more than 1 in 5 households identified as better-off in the PRA participated in RALP.

## 3.2 Propensity Score Matching

Because the household survey included a random selection of households from control communities, but only self-selected participating households in treatment communities, we cannot directly compare outcomes in the two groups. We use inverse-weighting by propensity scores to balance the treatment and control samples. This method corrects for bias introduced by self-selection that is explained by observable factors. We acknowledge that participation could also be driven by unobservable factors. The double-difference methods controls for some of these unobservable factors that are constant over time.

Two different methods are applied for the estimation of propensity scores. Also, for each method, we calculate a propensity scores for three different treatments: the overall treatment of participating in the RALP training program, and then separately for the treatment of belonging to a goat and sheep group or belonging to a beekeeping group. This will allow us to look at the effect of treatment in the relevant group for outcome variables that are specific to that type of project.

First, we use the traditional method of running a logit regression on a set of baseline characteristics of the two groups represented in the household survey- self-selected treated households vs. randomly selected households in control communities. This is referred to as the single step propensity scores. Weights used in the regression analysis are calculated by combining propensity scores with sampling weights.

Propensity scores ($p$) are derived from the logit regression of presence in the sample ($S$) of actual program participants ($R$) on baseline characteristics ($X$) and minicensus baseline characteristics ($M$).

Assuming that $prob(i \in R) \perp prob(i \in S)$:

$$prob(i \in R | i \in S, X_i, M_i) = prob(i \in R | X_i, M_i)$$

$$p_{i,\text{singlestep}} = prob(i \in R | i \in S, X_i, M_i) = f(\beta_X X_i + \beta_M M_i) + e_i$$

However, because in this evaluation, sampling was not random among all actual participants, this assumption of independence is incorrect.[2] An alternative to making the assumption of independence is to directly estimate the unconditional probability of actual membership in a RALP

[2]Sampling was influenced by the stratification and sampling rules described above. For example, although better off households were less likely than average or poor households to participate in the program, these households are over-represented in the sample of treated households due to the sampling methodology of choosing from a higher

group. We can express the probability of actual membership (R) as conditional on potential membership (T) and location in a village where the RALP program was offered.

$$\begin{aligned} & prob(i \in R | X_i, M_i) \\ &= prob(i \in R | i \in T, X_i, M_i) prob(i \in T | X_i, M_i) \\ &= prob(i \in R | i \in T, X_i, M_i) prob(i \in T | v \in T, M_i, X_i) prob(v \in T | M_v, X_v) \end{aligned}$$

We implement this by running separate logit regressions to estimate intermediate propensity scores using data from the mini-census to estimate the probability of treatment at the village level and potential membership in a RALP group at the individual level, and using both minicensus and household survey data to estimate the probability of actually participating in a RALP group, given potential interest.

$$p0_{iv} = prob(v \in T) = f(M_v \gamma) + \epsilon_{0iv}$$

$$p1_{iv} = prob(i \in T | v \in T) = f(M_i \zeta) + \epsilon_{1iv}$$

$$p2_{iv} = prob(i \in R | i \in T) = f([M_i X_i] \eta) + \epsilon_{2iv}$$

Because these intermediate propensity scores are based on minicensus data only, we are missing some information that was given in the single-step estimation. We found that the predictive power of this approach was maximized by adding the intermediate propensity scores as explanatory variables in the same logit regression as used in the single-step approach.

$$p_{iv,\text{multi-step}} = f(\theta_X X_i + \theta_M M_i + \beta_0 \widehat{p0_{iv}} + \beta_1 \widehat{p1_{iv}} + \beta_2 \widehat{p2_{iv}})$$

Finally, because sampling was stratified by wealth category at baseline, we estimate the probability of sampling based on the number of potential participants of each wealth category in the minicensus. Sampling weights are the probability of selection of household $i$, given wealth ranking $j$, where $S_{jv}$ is the number of households of wealth ranking $j$ selected from the village and $N_{jv}$ is the total number of households in the mini-census with wealth ranking $j$, and $g_j$ is the set of households with wealth ranking $j$.

$$s_{ijv} = \frac{1}{prob(i \in S_v | i \in g_j)} = \frac{S_{jv}}{N_{jv}} \frac{N_v}{S_v}$$

Final weights used for analysis are the product of inverse propensity scores and inverse sampling probabilities:

$$w_{ijv} = \begin{cases} \frac{s_{jv}}{1 - \text{prob}(i \in R)} & \text{if} \quad i \in R \\ \frac{s_{jv}}{\text{prob}(i \in R)} & \text{if} \quad i \in C \end{cases}$$

Table 3.3 shows three separate logit regressions. First, for distinguishing between RALP treatment and non-RALP treatment, and then regressions where treatment is specific to the type of group that the household participated in. The set of independent variables was chosen from among a much larger set of potential explanatory variables in the baseline household survey after trying multiple specifications to maximize the explanatory power and keeping variables that were significant predictors of treatment status.[3] The same set of independent variables is used for all

wealth level if there was an insufficient number of participating households in the given wealth level. Unfortunately, there is no perfect way to address this through re-weighting, because we do not know the actual number of participants at each wealth level since the follow-up minicensus was (as noted above) a non-representative sub-sample of the population.

[3]We exclude from consideration as explanatory variables expectations about community cooperativeness from the minicensus in comparisons between treatment and control in spite of this attitude being a strong predictor of RALP participation, because rates of expressed cooperativeness are much higher overall in treatment villages and we suspect these opinions changed in consequence of declared interest in participating in the RALP program.

regressions, so that the difference between the two approaches is clear. After enforcing overlap and calculating inverse weights, we test the balance of covariates between treatment and control for each of the three types of treatment in table 3.4 which show the p-scores from a test of the difference in means between treatment and follow-up. As can be seen, the inverse probability weighting eliminates the statistically significant differences between the baseline characteristics of treatment and control households.

Figures 3.2, 3.4, and 3.6 show the distributions of propensity scores for each of the three treatment types. Below each figure is the corresponding pair distributions using the second method.

The second method takes advantage of the additional information provided by the baseline minicensus and attempts to fully model the process of selection. First, a logit regression is to determine the characteristics that differed between the two sets of communities to control for imperfect matching during the choice of villages for the survey. Second, a logit regression is used within treatment villages to determine the characteristics that differed between non-participants and potential participants. Third, within treatment villages, we run a logit regression to determine characteristics that predicted that potential participants would actually participate in the program. Out of sample prediction is used to predict the probability of potential participation and actual participation in control villages. Finally, actual RALP participants are compared to non-treated households controlling for the propensity scores calculated in the previous steps. Propensity scores calculated using this method will be referred to as multistep propensity scores.

The process of calculating the multistep propensity scores is illuminating for what it shows about the determinants of self-selection into the program. Table 3.5 shows estimation of the multistep propensity scores for participation in any group type. The first column shows that villages in the RALP treatment group, as noted above, had more households owning animals and beehives. The second column shows that within treatment villages, potential participants were more likely to be poor or very poor, to own animals or bees, and not to have access to a vet. The third column shows households that were more involved in agricultural production at baseline (income from agriculture, involved in animal fattening, and listing self-employment in agriculture as a primary occupation) were more likely to remain in the program than average households, and that land ownership was a strong predictor of whether the household would stay in the program.

Because the determinants of sampling probability by wealth level are already partially modeled in the multi-step method, it is not clear whether re-weighting based on estimated probability of sampling will increase the accuracy of the method. All regressions are in the report below are shown using three types of propensity scores: single step propensity scores with wealth strata re-weighting, multi-step propensity scores without wealth strata reweighting, and multistep propensity scores with wealth strata reweighting.

The same method is repeated in tables 3.6 and 3.7 for goat and sheep groups and beekeeping groups, respectively. Table 3.8 shows the p-values for balancing tests.

Figures 3.2, 3.4, and 3.6 show the distribution of propensity scores using the single step method; while figures 3.3, 3.5, and 3.7 show the distribution of propensity scores using the multi-step methods. The three pairs of figures represent the propensity scores for participation in any RALP group, a goat and sheep RALP group, or a beekeeping RALP group respectively.The same bandwidth is used for smoothing the kernel densities, so the pairs of figures are comparable.

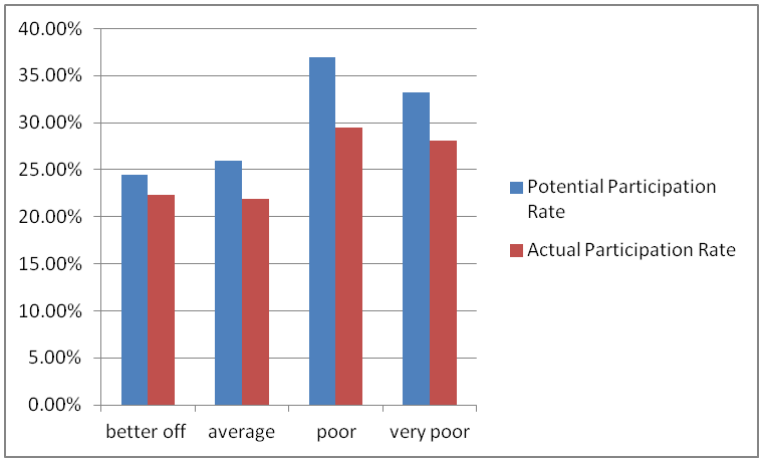



Figure 3.1: Potential and Eventual Participation by Wealth Category. See summary statistics in table 3.1

| | (1) Potential Participation | (2) Potential Participation (subset) | (3) Actual Participation (subset) |
|---|---|---|---|
| wealth==better off | 0.217 | 0.245 | 0.223 |
| wealth==average | 0.221 | 0.260 | 0.219 |
| wealth==poor | 0.281 | 0.369 | 0.295 |
| very poor | 0.254 | 0.332 | 0.281 |
| Total | 0.252 | 0.322 | 0.266 |
| Observations | 8679 | 4721 | 4721 |

mean coefficients; $t$ statistics in parentheses

$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Table 3.1: Potential and Eventual Participation by Wealth Category. Column 1 shows the share of households that were potential participants at baseline according to the entire community mini-census. Column 2 shows the share of households that were part of the follow-up-post mini-census and were potential group members at baseline. Column 3 shows the share of households that were part of the subset that actually participated in RALP.

| | Goat and Sheep Groups | Beekeeping Groups | Other Groups |
|---|---|---|---|
| wealth==better off | 0.157 | 0.0700 | 0.0245 |
| wealth==average | 0.143 | 0.0835 | 0.0218 |
| wealth==poor | 0.218 | 0.0878 | 0.0419 |
| very poor | 0.216 | 0.0765 | 0.0301 |
| Total | 0.194 | 0.0824 | 0.0321 |
| Observations | 4295 | 3774 | 3578 |

Table 3.2: Probability of actual participation by type of group among subset

| | Any group | Goats and Sheep | Beekeeping |
|---|---|---|---|
| wealth==better off | 1.304*** | 1.628*** | 0.702 |
| | 0.01 | 0.00 | 0.12 |
| wealth==poor | 0.423*** | 0.546*** | 0.350 |
| | 0.01 | 0.00 | 0.17 |
| wealth==very poor | 0.568*** | 0.661*** | 0.389 |
| | 0.00 | 0.00 | 0.27 |
| land owned (m2) | -0.002*** | -0.001*** | -0.002*** |
| | 0.00 | 0.00 | 0.00 |
| sqrt land owned | 0.091*** | 0.072*** | 0.115*** |
| | 0.00 | 0.00 | 0.00 |
| income from agriculture | 0.093* | 0.091 | 0.184** |
| | 0.09 | 0.14 | 0.04 |
| owns animals | 0.544* | 0.923*** | 0.012 |
| | 0.05 | 0.01 | 0.97 |
| owns bees | 1.809*** | 0.656** | 2.866*** |
| | 0.00 | 0.04 | 0.00 |
| fatten animals | 0.978*** | 1.086*** | 0.716** |
| | 0.00 | 0.00 | 0.02 |
| does not feed bees | -2.664** | -2.068* | -2.466* |
| | 0.01 | 0.06 | 0.08 |
| bought or sold in market last month | 0.350*** | 0.230 | 0.552** |
| | 0.01 | 0.13 | 0.02 |
| no literate members of hh | -0.316** | -0.274* | -0.319 |
| | 0.02 | 0.07 | 0.16 |
| number of women in hh | -0.172*** | -0.184** | -0.145 |
| | 0.01 | 0.01 | 0.19 |
| member of non-SFD association | -0.634* | -0.664** | -1.954** |
| | 0.05 | 0.05 | 0.02 |
| sell with group | 0.796*** | 0.864*** | 0.228 |
| | 0.01 | 0.01 | 0.69 |
| any cattle | -0.235 | -0.464*** | 0.177 |
| | 0.16 | 0.01 | 0.53 |
| number goats and sheep own | -0.130*** | -0.164*** | -0.052 |
| | 0.00 | 0.00 | 0.22 |
| number goats and sheep share | -0.059 | -0.077 | -0.028 |
| | 0.22 | 0.15 | 0.59 |
| sqrt goats and sheep owned | 0.663*** | 0.784*** | 0.286 |
| | 0.00 | 0.00 | 0.14 |
| sqrt goats and sheep shared | 0.230 | 0.181 | 0.268 |
| | 0.26 | 0.44 | 0.30 |
| r2_p | 0.150 | 0.147 | 0.212 |
| N | 1634 | 1441 | 1187 |

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

Table 3.3: Logit Regressions for the Single Step Method of PSM weight calculations. The dependent variables are (1) Any Group- inclusion in the treatment group (2) Goats and Sheep- inclusion in the treatment group as a member of a livestock group (3) Beekeeping- inclusion in the the treatment group as a member of a beekeeping group.

| | Any Group | | Goats and Sheep | | Beekeeping | |
|---|---|---|---|---|---|---|
| | original | weighted | original | weighted | original | weighted |
| | p | p | p | p | p | p |
| wealth==better off | 0.088* | 0.775 | 0.115 | 0.901 | 0.184 | 0.243 |
| wealth==poor | 0.674 | 0.576 | 0.696 | 0.323 | 0.606 | 0.680 |
| wealth==very poor | 0.409 | 0.637 | 0.173 | 0.298 | 0.772 | 0.355 |
| land owned (m2) | 0.371 | 0.942 | 0.286 | 0.988 | 0.945 | 0.800 |
| sqrt land owned | 0.571 | 0.935 | 0.418 | 0.986 | 0.746 | 0.914 |
| income from agriculture | 0.078* | 0.864 | 0.370 | 0.654 | 0.017** | 0.961 |
| owns animals | 0.000*** | 0.919 | 0.000*** | 0.767 | 0.019** | 0.436 |
| owns bees | 0.000*** | 0.891 | 0.217 | 0.836 | 0.000*** | 0.599 |
| numbers of goats and sheep | 0.574 | 0.995 | 0.934 | 0.820 | 0.187 | 0.854 |
| number of cows | 0.383 | 0.186 | 0.018** | 0.171 | 0.058* | 0.944 |
| number of beehives | 0.001*** | 0.683 | 0.820 | 0.782 | 0.000*** | 0.820 |
| fatten animals | 0.000*** | 1.000 | 0.000*** | 0.897 | 0.038** | 0.409 |
| no vet access | 0.197 | 0.574 | 0.128 | 0.294 | 0.967 | 0.397 |
| share of animals lost to sickness | 0.033** | 0.942 | 0.029** | 0.598 | 0.326 | 0.400 |
| does not feed bees | 0.809 | 0.674 | 0.622 | 0.522 | 0.769 | 0.618 |
| moves animals in dry season | 0.198 | 0.613 | 0.140 | 0.983 | 0.550 | 0.522 |
| bought or sold in market last month | 0.007*** | 0.888 | 0.039** | 0.946 | 0.007*** | 0.135 |
| no literate members of hh | 0.047** | 0.719 | 0.058* | 0.872 | 0.332 | 0.495 |
| number of women in hh | 0.779 | 0.852 | 0.457 | 0.567 | 0.672 | 0.408 |
| number of adults in hh | 0.883 | 0.635 | 0.664 | 0.464 | 0.350 | 0.205 |
| female head of hh | 0.268 | 0.975 | 0.192 | 0.320 | 0.616 | 0.105 |
| member of non-SFD association | 0.172 | 0.844 | 0.177 | 0.508 | | |
| sell with group | 0.019** | 0.877 | 0.037** | 0.804 | 0.257 | 0.783 |
| buy with group | 0.642 | 0.414 | 0.755 | 0.099* | 0.657 | 0.579 |
| woman saves own income | 0.370 | 0.866 | 0.797 | 0.886 | 0.239 | 0.814 |

Table 3.4: P-values for Balancing Tests on Baseline Characteristics- Unweighted and Weighted using the Single Step Method. The first pair of columns compares all treatment to all control households, the second pair of columns compares treatment households in livestock groups to all control households, and the third pair of column compares treatment households in beekeeping groups to all control households. Dependent variables are listed on the left.

| | treatment | | potential RALP | | resurveyed | | actual RALP | |
|---|---|---|---|---|---|---|---|---|
| number of goats and sheep | -0.075 | 0.15 | -0.033*** | 0.00 | | | | |
| number of cows | -1.905*** | 0.00 | -0.164* | 0.06 | | | | |
| number of beehives | 0.259 | 0.32 | | | | | | |
| owns animals | 3.631*** | 0.01 | 0.696*** | 0.00 | 0.490* | 0.08 | | |
| wealth== betteroff | | | -0.121 | 0.25 | | | | |
| wealth==poor | | | 0.388*** | 0.00 | | | | |
| wealth==very poor | | | 0.372*** | 0.00 | | | | |
| owns bees | | | 0.686*** | 0.00 | 0.334 | 0.28 | | |
| sqrt number of goats and sheep | | | 0.178*** | 0.00 | | | | |
| sqrt number of cows | | | 0.305** | 0.02 | | | | |
| no access to vet | | | -0.199*** | 0.00 | | | | |
| expect cooperation in infrastructure problem | | | 0.150*** | 0.00 | | | | |
| expect cooperation in terrace problem | | | 0.505*** | 0.00 | | | | |
| number hhs that cooperate in buying/selling | | | -0.140*** | 0.00 | 0.196* | 0.08 | | |
| land owned (m2) | | | | | -0.001* | 0.06 | -0.002*** | 0.00 |
| sqrt land owned (m2) | | | | | 0.048* | 0.10 | 0.118*** | 0.00 |
| income from agriculture | | | | | 0.185** | 0.02 | 0.191** | 0.03 |
| fatten animals | | | | | 0.540* | 0.08 | 1.074*** | 0.00 |
| bought or sold in market last month | | | | | | | 0.364** | 0.03 |
| number of women in hh | | | | | | | -0.173** | 0.02 |
| belong to any non-SFD association | | | | | | | -0.923*** | 0.01 |
| Pr(treatment) | | | | | | | 5.489*** | 0.00 |
| Pr(potentialRALP) | | | | | | | 6.147*** | 0.00 |
| Pr(resurveyed) | | | | | | | -0.213 | 0.94 |
| r2_p | 0.060 | | 0.040 | | 0.037 | | 0.289 | |
| N | 191 | | 8908 | | 875 | | 1491 | |

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

Table 3.5: Logit Regressions for the Multi-step Method of PSM weight calculations for Inclusion in Any Type of Treatment Group. The first three dependent variables (columns) refer to intermediate propensity scores $p0 = Pr(treatment) = prob(v \in T)$, $p1 = Pr(potentialRALP) = prob(i \in T | v \in T)$, and $p2 = Pr(resurveyed) = prob(i \in R | i \in T)$. For p0, the dependent variable is being a treatment village and the sample size reflects the total number of communities. For p1, the dependent variable is potential RALP membership and the sample size reflects the total number of households surveyed in treatment villages. For p2, the dependent variable is being resurveyed in the expost household survey (due to the sampling methodology, this is equivalent to actually participating in RALP after having signed up as a potential participant). The sample size reflects the number of households included in the baseline household survey in treatment villages. For the final regression, (last columns) the dependent variable is inclusion in the treatment sample of household surveys. The sample size reflects the number of resurveyed household surveys. The estimated propensity scores from the intermediate regressions are included as explanatory variables in the final regression.

| | treatment | | potential RALP | | resurveyed | | actual RALP | |
|---|---|---|---|---|---|---|---|---|
| number of goats and sheep | -0.061 | 0.26 | -0.065*** | 0.00 | -0.033** | 0.02 | | |
| number of cows | -2.441*** | 0.00 | | | | | | |
| number of beehives | 0.286 | 0.28 | 0.063** | 0.03 | | | | |
| owns animals | 4.044*** | 0.00 | 0.774*** | 0.00 | 1.101*** | 0.00 | | |
| wealth== betteroff | | | -0.127 | 0.35 | | | | |
| wealth==poor | | | 0.478*** | 0.00 | | | | |
| wealth==very poor | | | 0.523*** | 0.00 | | | | |
| owns bees | | | 0.851** | 0.01 | | | | |
| sqrt number of goats and sheep | | | 0.417*** | 0.00 | | | | |
| sqrt number of beehives | | | -0.598** | 0.01 | | | | |
| no access to vet | | | -0.355*** | 0.00 | | | | |
| moves animals in dry season | | | 0.131* | 0.09 | | | | |
| expect cooperation in family problem | | | 0.084 | 0.20 | | | | |
| expect cooperation in infrastructure problem | | | 0.113* | 0.08 | | | | |
| expect cooperation in terrace problem | | | 0.301* | 0.09 | | | | |
| number hhs that cooperate in buying/selling | | | -0.215*** | 0.00 | 0.300** | 0.02 | | |
| income from agriculture | | | | | 0.309*** | 0.00 | 0.144 | 0.12 |
| fatten animals | | | | | 0.918*** | 0.01 | 1.069*** | 0.00 |
| no literate member of hh | | | | | -0.717*** | 0.00 | | |
| number of women in hh | | | | | -0.216* | 0.06 | -0.168* | 0.07 |
| land owned (m2) | | | | | | | -0.002*** | 0.00 |
| sqrt land owned (m2) | | | | | | | 0.105*** | 0.00 |
| belong to any non-SFD association | | | | | | | -0.884* | 0.05 |
| Pr(treatment) | | | | | | | 5.732*** | 0.00 |
| Pr(potentialRALPgs) | | | | | | | 7.601*** | 0.00 |
| Pr(resurveyed) | | | | | | | 1.606 | 0.22 |
| r2_p | 0.081 | | 0.055 | | 0.085 | | 0.280 | |
| N | 181 | | 8022 | | 610 | | 1295 | |

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

Table 3.6: Logit Regressions for the Multi-step Method of PSM weight calculations for Inclusion in Goats and Sheep Treatment Group. See full description in caption of preceding table 3.5

| | treatment | | potential RALP | | resurveyed | | actual RALP | |
|---|---|---|---|---|---|---|---|---|
| number of goats and sheep | -0.261*** | 0.01 | | | | | | |
| number of cows | -1.171 | 0.12 | -0.458*** | 0.00 | | | | |
| number of beehives | -0.967** | 0.04 | -0.191** | 0.03 | 0.106 | 0.15 | | |
| owns animals | 1.961 | 0.20 | | | | | | |
| owns bees | 21.658*** | 0.00 | 1.337*** | 0.01 | | | 2.044*** | 0.00 |
| wealth== betteroff | | | -0.439** | 0.04 | | | | |
| wealth==poor | | | 0.491*** | 0.00 | | | | |
| wealth==very poor | | | 0.397*** | 0.01 | | | | |
| sqrt number of cows | | | 1.251*** | 0.00 | | | | |
| sqrt number of beehives | | | 0.781* | 0.07 | | | | |
| expect cooperation in infrastructure problem | | | 0.259** | 0.01 | | | | |
| expect cooperation in terrace problem | | | 0.476* | 0.06 | | | | |
| number hhs that cooperate in buying/selling | | | | | 0.448* | 0.06 | | |
| number hhs that cooperate in marketing | | | | | -0.617* | 0.09 | | |
| no access to vet | | | | | -0.588 | 0.16 | | |
| land owned (m2) | | | | | | | -0.002*** | 0.00 |
| sqrt land owned (m2) | | | | | | | 0.109*** | 0.00 |
| income from agriculture | | | | | | | 0.216*** | 0.00 |
| fatten animals | | | | | | | 0.880*** | 0.00 |
| bought or sold in market last month | | | | | | | 0.532** | 0.02 |
| no literate member of hh | | | | | | | -0.097 | 0.68 |
| Pr(treatment) | | | | | | | 5.179*** | 0.00 |
| Pr(potentialRALPb) | | | | | | | -0.940 | 0.68 |
| Pr(resurveyed) | | | | | | | 3.689** | 0.04 |
| r2_p | 0.158 | | 0.112 | | 0.044 | | 0.299 | |
| N | 157 | | 7165 | | 228 | | 1208 | |

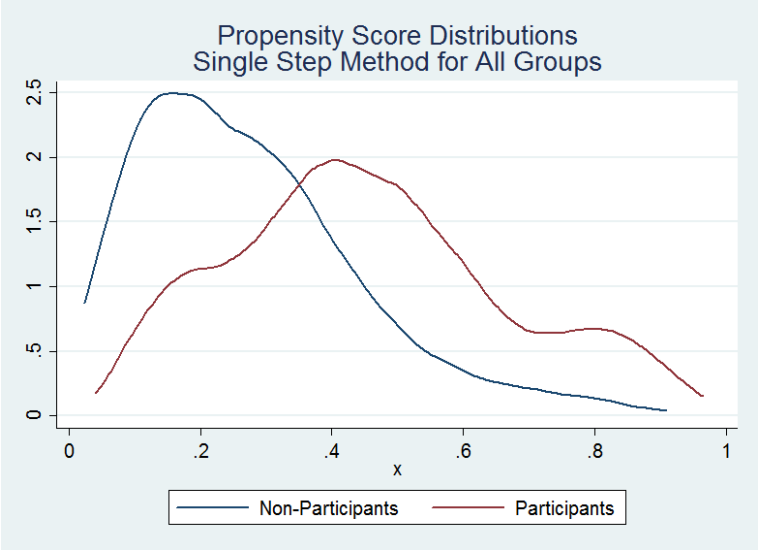
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.7: Logit Regressions for the Multi-step Method of PSM weight calculations for Inclusion in Beekeeping Treatment Group. See full description in caption of preceding table 3.5

| | Any Group | | Goats and Sheep | | Beekeeping | |
|---|---|---|---|---|---|---|
| | original | weighted | original | weighted | original | weighted |
| | p | p | p | p | p | p |
| wealth==better off | 0.088* | 0.779 | 0.115 | 0.491 | 0.184 | 0.481 |
| wealth==poor | 0.674 | 0.539 | 0.696 | 0.247 | 0.606 | 0.654 |
| wealth==very poor | 0.409 | 0.892 | 0.173 | 0.361 | 0.772 | 0.456 |
| land owned (m2) | 0.371 | 0.527 | 0.286 | 0.884 | 0.945 | 0.198 |
| sqrt land owned | 0.571 | 0.519 | 0.418 | 0.924 | 0.746 | 0.166 |
| income from agriculture | 0.078* | 0.791 | 0.370 | 0.843 | 0.017** | 0.874 |
| owns animals | 0.000*** | 0.733 | 0.000*** | 0.768 | 0.019** | 0.645 |
| owns bees | 0.000*** | 0.106 | 0.217 | 0.424 | 0.000*** | 0.297 |
| numbers of goats and sheep | 0.574 | 0.410 | 0.934 | 0.666 | 0.187 | 0.330 |
| number of cows | 0.383 | 0.495 | 0.018** | 0.786 | 0.058* | 0.970 |
| number of beehives | 0.001*** | 0.198 | 0.820 | 0.313 | 0.000*** | 0.629 |
| fatten animals | 0.000*** | 0.986 | 0.000*** | 0.660 | 0.038** | 0.538 |
| no vet access | 0.197 | 0.594 | 0.128 | 0.887 | 0.967 | 0.422 |
| share of animals lost to sickness | 0.033** | 0.316 | 0.029** | 0.835 | 0.326 | 0.561 |
| does not feed bees | 0.809 | 0.181 | 0.622 | 0.224 | 0.769 | 0.143 |
| moves animals in dry season | 0.198 | 0.900 | 0.140 | 0.879 | 0.550 | 0.330 |
| bought or sold in market last month | 0.007*** | 0.231 | 0.039** | 0.067* | 0.007*** | 0.658 |
| no literate members of hh | 0.047** | 0.237 | 0.058* | 0.870 | 0.332 | 0.040** |
| number of women in hh | 0.779 | 0.958 | 0.457 | 0.750 | 0.672 | 0.071* |
| number of adults in hh | 0.883 | 0.985 | 0.664 | 0.992 | 0.350 | 0.495 |
| female head of hh | 0.268 | 0.632 | 0.192 | 0.746 | 0.616 | 0.749 |
| member of non-SFD association | 0.172 | 0.883 | 0.177 | 0.999 | | |
| sell with group | 0.019** | 0.294 | 0.037** | 0.225 | 0.257 | 0.759 |
| buy with group | 0.642 | 0.722 | 0.755 | 0.988 | 0.657 | 0.332 |
| woman saves own income | 0.370 | 0.805 | 0.797 | 0.812 | 0.239 | 0.751 |

Table 3.8: P-values for Balancing Tests on Baseline Characteristics- Comparison Between Unweighted and Weighted using the Multi-Step Method. The first pair of columns compares all treatment to all control households, the second pair of columns compares treatment households in livestock groups to all control households, and the third pair of column compares treatment households in beekeeping groups to all control households. Dependent variables are listed on the left.

Figure 3.2: Distribution of propensity scores (single step method)



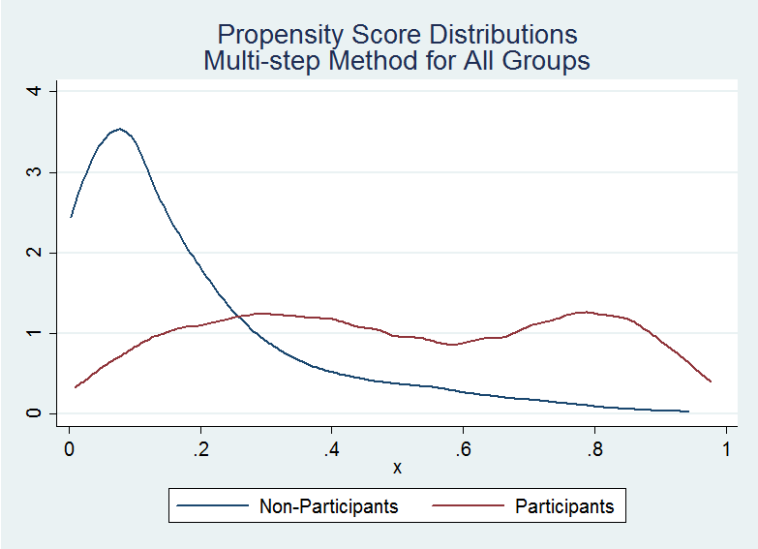




Figure 3.3: Distribution of propensity scores (multi-step method)

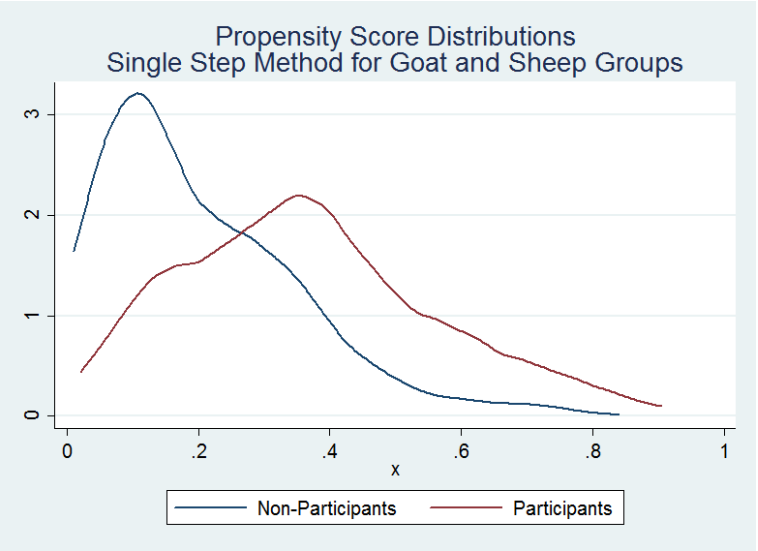



Figure 3.4

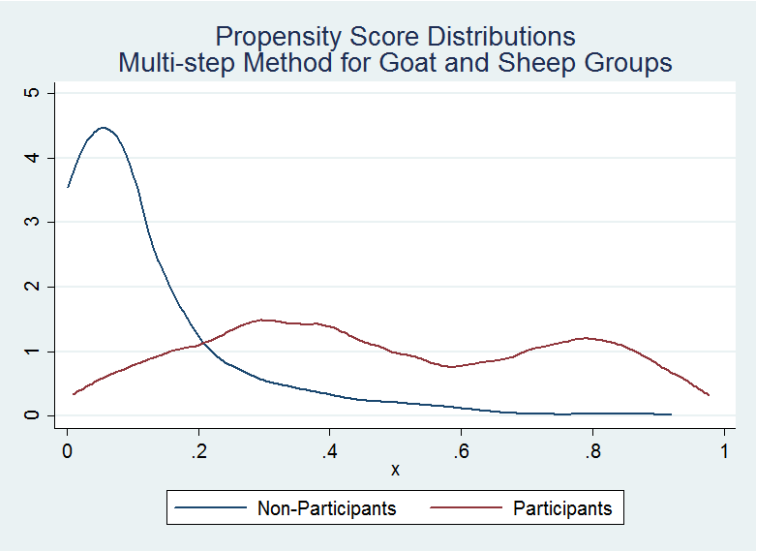



Figure 3.5

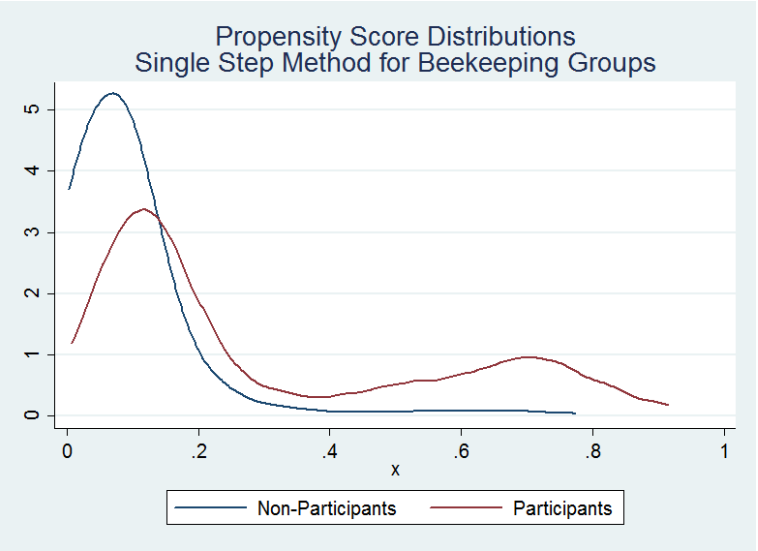



Figure 3.6

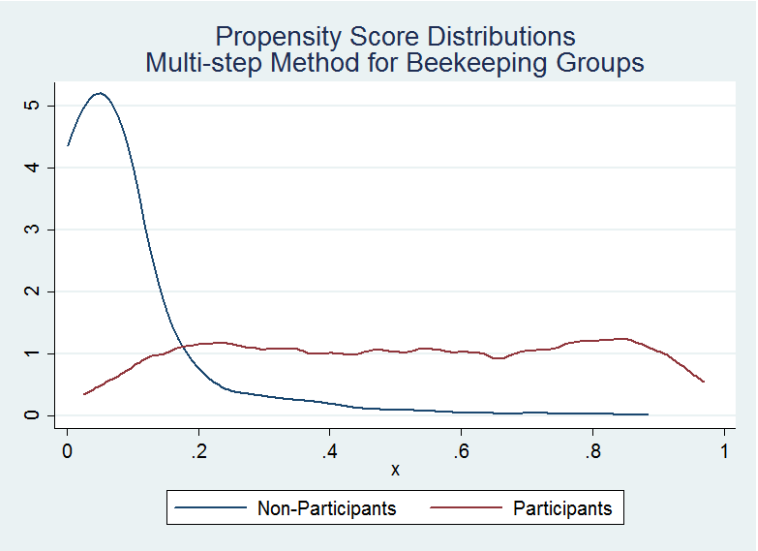



Figure 3.7

# Chapter 4

# Household Level Analysis: Effect of Treatment on the Treated

At the household level, a detailed survey was collected both ex-ante (2009) and at the mid-point of the intervention (2011) with modules on animal and beehives ownership, knowledge, and practices. As described in the previous chapter, only participating households were surveyed in treatment villages/ Due to concerns about self-selection and non-random sampling, we weighted the household level observations using two alternative methods of calculating the propensity score weights. We use the household survey data with inverse probability weighting to estimate the effect of the program on participating households. After eliminating observations where the overlap assumption is not met, the sample size consists of 625 treatment households and 1003 control households for the single-step weighting or 442 treatment households and 975 control households for the multi-step weighting.

In the first two sections of this chapter, we consider the two types of group as separate treatments. In the first section, we estimate the impact of participation in a goat and sheep group on ownership of goats and sheep and knowledge and practices related to livestock raising. In the second section, we analyze changes in ownership of beehives and knowledge and practices related to beekeeping for participants in beekeeping groups. In the final three sections, we estimate the program impact on participating households in any type of group on food security, perceptions of community solidarity, and female empowerment. For each type of weighting, we show both summary statistics and regression results.

## 4.1 Goats and Sheep

### 4.1.1 Livestock Assets

For the outcome variable of goat and sheep ownership, we consider the relevant treatment to be participation in a goat and sheep group. We look at both average number of animals per household and the probability that a household has any animals. The survey categorized animals as either owned individually by the household or shared, and we look at both goats and sheep as separate categories then combined into a single total.

Regarding the probability of owning any animals, there is variation in the point estimates by weighting type, but we find an increase of between 34 or 46 percentage points on the probability of a household benefiting from at least one sheep or goat in shared ownership. This is relative to baseline rates of only about 10%, so it is a substantial increase. What is surprising is that even among goat and sheep groups, not all participants ended up with shared ownership of at least one animal. If we look at the 429 households participating in RALP goat and sheep groups, 170 reported zero goats or sheep in shared ownership. This could mean that animals bought through the program had already been sold at the time of the follow-up survey, or in a few cases that the

project had not yet been funded. Summary statistics are shown in tables 4.1 and 4.2. Regression results are presented in tables 4.3 and 4.4.

It is also noticeable that there is a small, but statistically significant increase in the probability of individually owning goats or sheep of 10 or 12 percentage points associated with program treatment. Since all program animals were shared, this is again evidence of positive spillovers from the program training.

We see positive impacts on animal ownership in the category of shared animals, which corresponds with the goals of the RALP intervention. The regression results presented in tables 4.7 and 4.8 show a positive program impact of 0.6 or 0.5 shared goats per household. Corresponding summary statistics are presented in tables 4.5 and 4.6.

We also see large positive and significant coefficients on individual ownership of goats and sheep, both in terms of probability of owning (increase of 6 percentage points) and number of animals owned (increase of 1.1 to 1.4 animals depending on the weighting scheme). Since animals purchased as part of a group project would be jointly owned, the positive effect on individual sheep ownership may suggest a spillover effect of the inputs provided by the program within the set of treatment households, or that animals in groups were considered as individually owned. Program administrators noted that qualitatively they had seen that participants in RALP groups took advantage of the training provided and economies of scale in livestock production by purchasing their own animals in addition to those provided by the program and owned collectively. When combining between goats and sheep in individual and shared ownership, we find a significant program impact of of 1.8 or 2.0 animals per household.

### 4.1.2 Knowledge and Practices

The household survey included a detailed module on knowledge and practices related to livestock, and we find that the RALP interventions- which combined both training and increases in the supply of veterinary health services- were effective in increasing knowledge and use of veterinary services, and in increasing the probability that households sold animals and participated in animal fattening.

We find no significant program impact on the share of animals lost to disease or other causes in the past year. The average share of animals lost decreased slightly in both treatment and control households but the difference was not statistically significant. See summary statistics in tables 4.9 and 4.10 and regression results in tables 4.11 and 4.12.

We find a strong positive program impact on the probability of selling animals, and a large though not statistically significant increase in the probability of buying animals. This finding provides suggestive support to the hypothesis that the lack of animals in shared ownership is a result of program animals already having been sold. Indeed, the follow-up survey took place at the beginning of the economic crisis in Yemen, so it is likely that there was more interest at the time in the sale of assets than in long-term investment. A program officer also noted that many participants were skeptical during the period of the crisis about whether they would receive any further training and support, which may have increased their willingness to sell assets. In both treatment and control households, there was approximately a 5 percentage point increase in the probability of having sold animals in the past 12 months, and we estimate a program impact of 9 or 6 percentage points increase. Summary statistics on buying and selling are presented in tables 4.13 and 4.13 and regression results in tables 4.15 and 4.16.

Regarding knowledge and practices, we find positive impacts on grazing and knowledge of feeds. The survey included an open question asking what other types of food and supplements could be given to animals, and we take the total number mentioned as an indicator of knowledge about animal nutrition. We estimate that RALP program training and group structure increased the share of households that take their animals to graze from by 7 or 12 percentage points, increasing the rate of grazing to about 94% compared to 82% in control communities. The number of feeds mentioned in the open question also increased significantly by about 0.3 or 0.5 compared to a baseline average of between 2.5 and 3 on average. See summary statistics in tables 4.17 and 4.18 and regression results in 4.19 and 4.20.

The practice of fattening animals is distinguished from raising animals, as the animals are sold after approximately 6 months of feeding. The RALP program encouraged this form of production, and significantly increased the probability of being involved in animal fattening. We estimate the increase in probability as 28 or 23 percentage points depending on the weighting scheme used, in either case representing more than a doubling of the baseline rate. Correspondingly the average number of animals fattened increased significantly by .9 or .7 animals per household. Summary statistics for probability of being involved in fattening animals and number of animals fattened are given in tables 4.21 and 4.22 and regression results are given in tables 4.23 and 4.24.

Finally, we look at indicators related to animal health. We find a large program impact of 28 or 20 percentage points, representing a 50% increase compared to baseline in the probability of vaccinating animals, and a similar magnitude increase in the probability that, in case of disease, the animal will be treated by a veterinarian. Correspondingly, there is a decrease in the probability that the respondent says no one will be able to treat a sick animal. Summary statistics on health practices are presented in tables 4.25 and 4.26 and regression results in tables 4.27 and 4.28.

It is important to note that the above indicators in which we find program impact are a subset of the total number of indicators measured by the household survey. Variables in which we found no significant program impact included: maintaining pastures, growing fodder, and having a shelter for animals. There was also no significant impact on the probability of providing drinking water to animals for the reason that this practice was already universal before the intervention.

## 4.2 Beekeeping

### 4.2.1 Beehive Ownership

For the outcome of beehive ownership, the relevant treatment condition is membership in a beekeeping group. As with goats and sheep, we look both at the number of beehives owned, and at the probability of a household owning or benefiting from shared ownership of at least one beehive. Summary statistics and regression results are presented for each weighting scheme.

We find positive but not significant impact of about 0.8 shared beehives per participating households using single step weights and 0.5 beehives per participating household using multi-step weights. Using single step weights, we also estimate a statistically significant increase of about 1.5 beehives per household in total due to an increase of another 0.8 beehives per household in the individually owned category. The single step weighting also suggests a positive though not statistically significant impact on the share of households owning or benefiting from beehives. Summary statistics for the two weighting schemes are presented in tables 4.30 and 4.31 and regression results in tables 4.33 and 4.34.

We also show summary statistics for the unweighted sample in table 4.32, which shows clearly how different the baseline ownership levels are between treatment and control. The unweighted summary statistics also show that the increase in the number of households with shared beehives was not reflected in an equally large increase in the average number of beehives, and so was probably accompanied by the same types of losses for large beehive owners as seen in control communities. Finally, it is surprising that even among participants in beekeeping groups, the rate of access to beehives whether owned or shared remained very low at the time of follow-up (35% and 14% respectively) in spite of the program being designed to facilitate shared ownership of beehives. The qualitative study suggests that a one cause of failure to increase beehive ownership was diseases and poor matching between bee varieties and the local environment.

### 4.2.2 Beekeeping Knowledge and Practices

As noted above, the number of beekeepers in our sample is relatively small due to loss of beehives between baseline and follow-up and relatively small increases associated with the program. Since the knowledge questions were only asked for beehive owners in control (though for all beekeeping group participants in treatment), and practice questions were only asked for beehive owner in

both treatment and control, we clearly have an insufficient sample size for formal analysis. Table 4.35 describes the total sample size of beekeepers. We only have 41 control households that own beehives at expost 54 treatment households, and an even smaller subset that sell honey and responded to questions about their sales.

The summary statistics presented below are unweighted- a simple comparison of beekeepers in control villages to beekeepers in the RALP program with no attempt to correct for self-selection into the program. Bias could actually run both ways- RALP participants may be more motivated than average beekeepers in treatment villages, but respondents in control villages who own beehives without program support may also be more knowledgeable or better-off than average villagers.

With the caveats of a small sample size, and possible bias due to non-random selection, we do see suggestive evidence that the program training improved beekeeping practices in several dimensions.

One of the training goals was to encourage beekeepers to use more modern types of beehive that permit easier cleaning. Table 4.35 shows that the number of these types of beehive increased in treatment villages, while the number of improved beehives increased in both treatment and control villages. Table 4.36 shows that average honey production almost doubled in treatment villages, although this increase was not accompanied by an increase in sales. Regarding maintaining the health of bees, the probability that something had caused a decrease in the number of beehives was lower in treatment than in control households at follow-up. Both in treatment and control households, there was an increase in awareness and ability to treat infestations and recognition of common infestations. See tables 4.37 and 4.38. Use of protective equipment when harvesting honey, particularly masks and gloves, increased dramatically in treatment communities. See table 4.39. Part of the RALP beekeeping training focused on marketing honey and labeling to establish a good reputation for quality. The practice of labeling honey and price per kilo does not show an increase associated strongly with the RALP intervention (see table 4.40), however as noted above the sample of households that sell honey is very small. Practices related to maintaining a good environment for the bees such as planting special plants and preserving natural areas showed increases both in treatment and control households. See table 4.41.

Regarding knowledge and practices, it is essential to note that because the number of beekeepers fell between baseline and expost, increases in average awareness may actually be the result of less skilled beekeepers losing their hives and becoming omitted from the sample. To the degree that treatment villages fare better than control villages, it may be that the program training reduced this type of loss.

## 4.3 Food Security and Consumption

Because the RALP program was still in progress at the time of the follow-up survey, it is not expected to have had an immediate impact on food security. In fact, we did not find evidence of impact on food security in the data. These questions on food security are directly comparable to questions in the evaluation of the Labor Intensive Works Program, and show that the later program was better at delivering food security in the short term.

We find no significant impact on probability self-reported food shortage, and a positive impact of between 6 and 5 percentage points on the probability of experiencing a money shortage. The increased probability of money shortage can be explained by the fact that RALP projects required part of the initial investment to come from participants, and there are ongoing costs such as feed, water, and medicine for the animals or bees. While well managed projects in good conditions are expected to be profitable, in many projects costs could exceed income particularly during the period of the crisis. Summary statistics are presented in tables 4.42 and 4.43 and regression results in tables 4.44 and 4.45.

The module on food consumption included dry volume measurements of staple grains and sugar consumed in the past two days. Using this information, we estimate average per capita calorie consumption, adjusted for family composition, presence of guests at meals, and inflated by 25% to

account for calories from other sources.[1] Because of the multiple steps involved in calculating the estimated per capita consumption based on the survey data (conversion to standard measuring units, to total calories, and adjustments for age and gender of family members), there are a number of unrealistically high or low values, which we exclude by trimming outliers by percentile. Using the single-step weights, we find negative but non-statistically significant program effects, while using the multi-step weights we find a negative effect on per capita calorie consumption of about 230 calories per day, or almost 10% of baseline calorie consumption. See summary statistics in tables 4.48 and 4.49 and regression results in tables 4.50 and 4.51. These finding underline that not all livestock groups are necessarily profitable, and that increasing ownership of livestock, while beneficial on average and for well-managed groups, is a risky investment. Households that had wealth tied up in animals and were forced to sell them during the crisis, for example, received low prices due to the high costs of transport and increased supply.

We do find some suggestion of positive benefits, however, in another important dimension of food security: access to macronutrients. Looking at the summary statistics for servings per month of high values foods such as meat, chicken, fish, eggs and tuna in tables 4.53 and 4.54, we see that treatment villages had generally higher levels of consumptions of protein sources, but we do not find significant program impacts in the regression results in tables 4.55 and 4.56. While it was not measured at baseline, we do see that at the time of the follow-up survey, and we should be cautious in assuming that treatment and control households started at equal levels, we find in expost that households that participated in RALP goat and sheep groups consumed over 25% more servings of milk per month than control households. See summary statistics in tables 4.57 and 4.58 and regressions in tables tables 4.59 and 4.60.

For the three categories of non-food consumption on which we collected data: qat, tobacco, and medicine, the RALP intervention did not have a statistically significant impact. See summary statistics in tables 4.62 and 4.62 and regression results in tables4.63 and 4.64.

We conclude that the RALP intervention may have increased access to milk, but possibly at the cost of a decrease in grain consumption related to the increased probability of facing money shortages.

## 4.4 Community Solidarity

We find a strong impact of the RALP intervention on measures of perceived community solidarity.

The survey included two questions on attitudes about community solidarity. The first question asked households whether different groups would help them in the event of a personal crisis. The second question asked directly about perceptions of how cooperative the community is based on agreement or disagreement with the statements that "People in the community are mainly concerned about their own welfare" and "People in the community are willing to contribute to common development projects even if they do not personally benefit."

For the question on who would help in the event of a crisis, we find large increases in the share of respondents who were confident in being helped by neighbors, relatives, or the village as whole. There was an dramatic increase between baseline and follow-up in both treatment and control household in positive responses to this question, which may be a result of the economic crisis at the time which made the question less hypothetical. Summary statistics are presented in tables 4.65 and 4.66. We find a positive program impact of 9 percentage points on expectations of help from relatives, 10 or 20 percentage points on expectations of help from friends/neighbors, and 10 or 17 percentage points on expectations of help from other village members generally. The increase in expectation of help from all other villagers is particularly notable, as it represents almost a doubling in treatment households, while there was almost no increase in control households. There was also a marginally significant negative impact on the share of households who responded that no one would help. The full set of regression results can be found in tables 4.67 and 4.68. While all households reached out to relatives and friends/neighbors to adjust to shocks caused

[1]The methodology used is identical to that in the impact evaluation of the LIWP program

by the economic crisis, the RALP program was effective at creating a network that encouraged community wide inter-reliance.

Regarding agreement with statements about the level of cooperativeness in the community, average agreement that people are mainly concerned about their own welfare fell and agreement that people were willing to contribute to common development increased. This pattern occurred in both treatment and control households. The estimated RALP program effect is also negative in the first case and positive in the second case, although relatively small and not statistically significant. See tables 4.69, 4.70 4.71, and 4.72.

## 4.5 Female Empowerment

In the Yemeni context where many communities prefer that women's activities be confined to her own home, the RALP program offered an opportunity for women to meet regularly with a group of women, receive training, cooperate in types of production that may be new to them, and participate in a savings collective.

To test whether the RALP program increased female empowerment, the survey included a module with specific questions related to the ability of women to influence household decision making and their control of assets. The enumerators were instructed to direct these questions to a married woman in the household.

Not all participating households in the treatment sample had woman participating (see table 4.73), but there may have been spillover effects. We calculate the average effect of the program on women in participating households, whether the participant was male or female. We find positive impacts of the program on the share of women that reported involvement in household decisions about large purchases (10 or 14 percentage points) or using family planning (16 or 18 percentage points). See summary statistics in tables 4.74 and 4.75 and regression results in tables 4.76 and 4.77.

We also find a large positive program impact on the ability of married women to access money independently. The estimated program impact is 13 percentage points or 12 percentage points, compared to a baseline value of about 45%. The one sense in which women became "'worse off"' was a decrease in share of women reporting ability to sell assets without permission. Possibly this a reaction to the increase in the share of household assets controlled by women. See summary statistics in tables 4.78 and 4.79 and regression results in tables 4.80 and 4.81.

| | Goats | | Sheep | | Sheep or Goats | |
|---|---|---|---|---|---|---|
| | own | share | own | share | own | share |
| Control Baseline | 0.374 | 0.053 | 0.512 | 0.061 | 0.689 | 0.091 |
| | (0.027) | (0.013) | (0.025) | (0.012) | (0.023) | (0.016) |
| Control Expost | 0.388 | 0.052 | 0.509 | 0.064 | 0.703 | 0.094 |
| | (0.030) | (0.010) | (0.025) | (0.010) | (0.020) | (0.012) |
| Treatment Baseline | 0.460 | 0.036 | 0.507 | 0.070 | 0.739 | 0.094 |
| | (0.044) | (0.013) | (0.038) | (0.018) | (0.034) | (0.021) |
| Treatment Expost | 0.565 | 0.294 | 0.679 | 0.300 | 0.873 | 0.561 |
| | (0.044) | (0.048) | (0.039) | (0.039) | (0.032) | (0.049) |

Table 4.1: Share of households owning animals (single step weights)

| | Goats | | Sheep | | Sheep or Goats | |
|---|---|---|---|---|---|---|
| | own | share | own | share | own | share |
| Control Baseline | 0.358 | 0.057 | 0.490 | 0.062 | 0.661 | 0.095 |
| | (0.027) | (0.013) | (0.024) | (0.012) | (0.025) | (0.016) |
| Control Expost | 0.384 | 0.057 | 0.499 | 0.067 | 0.693 | 0.099 |
| | (0.029) | (0.012) | (0.024) | (0.010) | (0.021) | (0.013) |
| Treatment Baseline | 0.353 | 0.022 | 0.528 | 0.094 | 0.729 | 0.112 |
| | (0.068) | (0.011) | (0.048) | (0.033) | (0.049) | (0.032) |
| Treatment Expost | 0.470 | 0.168 | 0.688 | 0.296 | 0.859 | 0.456 |
| | (0.054) | (0.046) | (0.069) | (0.070) | (0.058) | (0.083) |

Table 4.2: Share of households owning animals (multi-step weights)

| | Goats | | Sheep | | Sheep or Goats | |
|---|---|---|---|---|---|---|
| | own | share | own | share | own | share |
| RALP | 0.091* | 0.259*** | 0.175*** | 0.226*** | 0.121*** | 0.464*** |
| | (0.047) | (0.050) | (0.050) | (0.044) | (0.037) | (0.058) |
| Expost | 0.014 | -0.001 | -0.002 | 0.003 | 0.014 | 0.003 |
| | (0.029) | (0.009) | (0.023) | (0.011) | (0.018) | (0.013) |
| Observations | 2844 | 2844 | 2844 | 2844 | 2844 | 2844 |

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

Table 4.3: RALP program impact on share of households owning at least one sheep or goat (single step weights)

| | Goats | | Sheep | | Sheep or Goats | |
|---|---|---|---|---|---|---|
| | own | share | own | share | own | share |
| RALP | 0.091* | 0.146*** | 0.152** | 0.198** | 0.098** | 0.340*** |
| | (0.049) | (0.045) | (0.060) | (0.083) | (0.046) | (0.102) |
| Expost | 0.026 | -0.000 | 0.009 | 0.005 | 0.032* | 0.004 |
| | (0.029) | (0.010) | (0.023) | (0.011) | (0.018) | (0.013) |
| Observations | 2480 | 2480 | 2480 | 2480 | 2480 | 2480 |

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

Table 4.4: RALP program impact on share of households owning at least one sheep or goat (multi-step weights)

| | Goats | | Sheep | | Sheep or Goats | |
|---|---|---|---|---|---|---|
| | own | share | own | share | own | share |
| Control Baseline | 1.452 | 0.428 | 2.418 | 0.332 | 1.662 | 0.760 |
| | (0.152) | (0.137) | (0.191) | (0.079) | (0.257) | (0.191) |
| Control Expost | 1.791 | 0.289 | 2.650 | 0.454 | 1.840 | 0.743 |
| | (0.250) | (0.072) | (0.191) | (0.095) | (0.212) | (0.153) |
| Treatment Baseline | 1.668 | 0.376 | 2.236 | 0.538 | 1.985 | 0.914 |
| | (0.272) | (0.220) | (0.256) | (0.178) | (0.412) | (0.275) |
| Treatment Expost | 2.314 | 0.874 | 3.449 | 1.016 | 3.326 | 1.890 |
| | (0.276) | (0.215) | (0.404) | (0.191) | (0.487) | (0.264) |

Table 4.5: Average number of animals in households owning animals (single step weights)

| | Goats | | Sheep | | Sheep or Goats | |
|---|---|---|---|---|---|---|
| | own | share | own | share | own | share |
| Control Baseline | 1.394 | 0.550 | 2.371 | 0.390 | 1.603 | 0.940 |
| | (0.150) | (0.156) | (0.201) | (0.090) | (0.258) | (0.226) |
| Control Expost | 1.832 | 0.358 | 2.628 | 0.468 | 1.862 | 0.827 |
| | (0.266) | (0.093) | (0.196) | (0.101) | (0.224) | (0.177) |
| Treatment Baseline | 1.313 | 0.260 | 2.518 | 0.982 | 1.371 | 1.242 |
| | (0.308) | (0.191) | (0.512) | (0.377) | (0.473) | (0.386) |
| Treatment Expost | 2.298 | 0.515 | 4.031 | 1.056 | 3.066 | 1.572 |
| | (0.556) | (0.205) | (0.941) | (0.346) | (0.847) | (0.409) |

Table 4.6: Average number of animals in households owning animals (multi-step weights)

| | Goats | | | Sheep | | | Sheep or Goats | | |
|---|---|---|---|---|---|---|---|---|---|
| | own | share | total | own | share | total | own | share | total |
| RALP | 0.307 | 0.637*** | 0.888** | 0.981** | 0.356 | 1.400*** | 1.164** | 0.993*** | 1.850*** |
| | (0.347) | (0.160) | (0.353) | (0.400) | (0.240) | (0.430) | (0.465) | (0.294) | (0.538) |
| Expost | 0.339 | -0.139 | 0.222 | 0.232 | 0.122 | 0.377** | 0.178 | -0.017 | 0.199 |
| | (0.244) | (0.117) | (0.223) | (0.189) | (0.077) | (0.182) | (0.241) | (0.149) | (0.249) |
| Observations | 2844 | 2844 | 2844 | 2844 | 2844 | 2844 | 2844 | 2844 | 2844 |

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

Table 4.7: RALP treatment effect on ownership of sheep and goats (single step weights)

| | Goats | | | Sheep | | | Sheep or Goats | | |
|---|---|---|---|---|---|---|---|---|---|
| | own | share | total | own | share | total | own | share | total |
| RALP | 0.547 | 0.447*** | 0.956* | 1.256 | -0.005 | 1.489* | 1.436* | 0.443 | 2.044** |
| | (0.548) | (0.138) | (0.543) | (0.812) | (0.604) | (0.774) | (0.851) | (0.651) | (0.894) |
| Expost | 0.439* | -0.192* | 0.274 | 0.257 | 0.079 | 0.360* | 0.259 | -0.113 | 0.215 |
| | (0.257) | (0.109) | (0.242) | (0.215) | (0.097) | (0.206) | (0.241) | (0.173) | (0.265) |
| Observations | 2480 | 2480 | 2480 | 2480 | 2480 | 2480 | 2480 | 2480 | 2480 |

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

Table 4.8: RALP program impact on ownership of sheep and goats (multistep weights)

| | (1) Share Lost to Sickness | (2) Share Lost to Any Cause |
|---|---|---|
| Control Baseline | 0.147 | 0.159 |
| | (0.010) | (0.010) |
| Control Expost | 0.140 | 0.150 |
| | (0.010) | (0.010) |
| Treatment Baseline | 0.163 | 0.188 |
| | (0.016) | (0.016) |
| Treatment Expost | 0.139 | 0.152 |
| | (0.012) | (0.012) |

Table 4.9: Share of goats and sheep lost to sickness or other causes (single step weights)

| | (1) Share Lost to Sickness | (2) Share Lost to Any Cause |
|---|---|---|
| Control Baseline | 0.147 | 0.159 |
| | (0.011) | (0.010) |
| Control Expost | 0.143 | 0.152 |
| | (0.009) | (0.009) |
| Treatment Baseline | 0.150 | 0.179 |
| | (0.021) | (0.026) |
| Treatment Expost | 0.148 | 0.160 |
| | (0.026) | (0.023) |

Table 4.10: Share of goats and sheep lost to sickness or other causes (multi-step weights)

| | (1) Share Lost to Sickness | (2) Share Lost to Any Cause |
|---|---|---|
| RALP | -0.011 | -0.024 |
| | (0.024) | (0.024) |
| Expost | -0.004 | -0.005 |
| | (0.014) | (0.014) |
| Observations | 2108 | 2108 |

$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

Table 4.11: Impact of RALP program on share of goats and sheep lost to sickness (single step weights)

| | (1) Share Lost to Sickness | (2) Share Lost to Any Cause |
|---|---|---|
| RALP | 0.013 | -0.003 |
| | (0.032) | (0.038) |
| Expost | -0.001 | -0.001 |
| | (0.013) | (0.013) |
| Observations | 1774 | 1774 |

$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

Table 4.12: Impact of RALP program on share of goats and sheep lost to sickness (multi-step weights)

| | (1) Bought Any Animals | (2) Number Animals Bought | (3) Sold Any Animals | (4) Number Sold |
|---|---|---|---|---|
| Control Baseline | 0.113 | 0.256 | 0.410 | 1.628 |
| | (0.013) | (0.036) | (0.028) | (0.184) |
| Control Expost | 0.109 | 0.329 | 0.454 | 1.910 |
| | (0.014) | (0.065) | (0.027) | (0.190) |
| Treatment Baseline | 0.120 | 0.236 | 0.431 | 1.844 |
| | (0.032) | (0.052) | (0.040) | (0.258) |
| Treatment Expost | 0.183 | 0.420 | 0.567 | 2.021 |
| | (0.028) | (0.076) | (0.042) | (0.236) |

Table 4.13: Summary statistics on buying and selling goats and sheep (single step weights)

| | (1) Bought Any Animals | (2) Number Animals Bought | (3) Sold Any Animals | (4) Number Sold |
|---|---|---|---|---|
| Control Baseline | 0.106 | 0.249 | 0.395 | 1.559 |
| | (0.012) | (0.036) | (0.030) | (0.179) |
| Control Expost | 0.105 | 0.326 | 0.450 | 1.900 |
| | (0.014) | (0.068) | (0.026) | (0.186) |
| Treatment Baseline | 0.098 | 0.206 | 0.460 | 2.081 |
| | (0.029) | (0.072) | (0.047) | (0.506) |
| Treatment Expost | 0.137 | 0.303 | 0.575 | 2.088 |
| | (0.035) | (0.087) | (0.057) | (0.353) |

Table 4.14: Summary statistics on buying and selling goats and sheep (multi-step weights)

| | (1) Bought Any Animals | (2) Number Animals Bought | (3) Sold Any Animals | (4) Number Sold |
|---|---|---|---|---|
| RALP | 0.068 | 0.113 | 0.090** | -0.106 |
| | (0.050) | (0.122) | (0.042) | (0.233) |
| Expost | -0.005 | 0.072 | 0.044* | 0.283* |
| | (0.017) | (0.073) | (0.025) | (0.155) |
| Observations | 2841 | 2841 | 2841 | 2841 |

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

Table 4.15: Impact of RALP program on buying and selling goats and sheep (single step weights)

| | (1) Bought Any Animals | (2) Number Animals Bought | (3) Sold Any Animals | (4) Number Sold |
|---|---|---|---|---|
| RALP | 0.040 | 0.021 | 0.060 | -0.336 |
| | (0.042) | (0.127) | (0.050) | (0.463) |
| Expost | -0.001 | 0.076 | 0.055** | 0.343** |
| | (0.016) | (0.076) | (0.026) | (0.156) |
| Observations | 2464 | 2464 | 2464 | 2464 |

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

Table 4.16: Impact of RALP program on buying and selling goats and sheep (multi-step weights)

| | (1) Graze | (2) Hours of Grazing | (3) Number of Feeds Mentioned |
|---|---|---|---|
| Control Baseline | 0.811 | 4.644 | 2.584 |
| | (0.025) | (0.184) | (0.071) |
| Control Expost | 0.811 | 4.916 | 2.774 |
| | (0.025) | (0.222) | (0.065) |
| Treatment Baseline | 0.832 | 4.963 | 2.750 |
| | (0.044) | (0.367) | (0.094) |
| Treatment Expost | 0.938 | 6.012 | 3.495 |
| | (0.019) | (0.241) | (0.121) |

Table 4.17: Summary statistics on probability of taking animals to graze, hours of grazing per day, and number of different types of supplemental feeds that the respondent could mention in an open question. (single step weights)

| | (1) Graze | (2) Hours of Grazing | (3) Number of Feeds Mentioned |
|---|---|---|---|
| Control Baseline | 0.804 | 4.613 | 2.552 |
| | (0.026) | (0.191) | (0.064) |
| Control Expost | 0.820 | 4.973 | 2.764 |
| | (0.025) | (0.212) | (0.063) |
| Treatment Baseline | 0.885 | 5.452 | 2.709 |
| | (0.036) | (0.366) | (0.102) |
| Treatment Expost | 0.952 | 6.084 | 3.295 |
| | (0.019) | (0.357) | (0.128) |

Table 4.18: Summary statistics on probability of taking animals to graze, hours of grazing per day, and number of different types of supplemental feeds that the respondent could mention in an open question. (multi-step weights)

| | (1) Graze | (2) Hours of Grazing | (3) Number of Feeds Mentioned |
|---|---|---|---|
| RALP | 0.120** | 0.947** | 0.551*** |
| | (0.052) | (0.374) | (0.158) |
| Expost | -0.011 | 0.131 | 0.220*** |
| | (0.024) | (0.220) | (0.082) |
| Observations | 2111 | 2103 | 2108 |

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

Table 4.19: RALP program impact on grazing animals and knowledge of supplemental feeds. (single step weights)

| | (1) Graze | (2) Hours of Grazing | (3) Number of Feeds Mentioned |
|---|---|---|---|
| RALP | 0.065* | 0.230 | 0.295* |
| | (0.039) | (0.371) | (0.150) |
| Expost | 0.007 | 0.223 | 0.248*** |
| | (0.021) | (0.200) | (0.070) |
| Observations | 1778 | 1769 | 1774 |

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

Table 4.20: RALP program impact on grazing animals and knowledge of supplemental feeds. (multi-step weights)

| | (1) Fatten Animals | (2) Number of Animals Fattened |
|---|---|---|
| Control Baseline | 0.111 | 0.443 |
| | (0.018) | (0.101) |
| Control Expost | 0.122 | 0.332 |
| | (0.017) | (0.059) |
| Treatment Baseline | 0.108 | 0.522 |
| | (0.018) | (0.115) |
| Treatment Expost | 0.404 | 1.326 |
| | (0.047) | (0.244) |

Table 4.21: Summary statistics for probability of being involved in fattening animals and number of animals fattened (single step weights)

| | (1) Fatten Animals | (2) Number of Animals Fattened |
|---|---|---|
| Control Baseline | 0.083 | 0.363 |
| | (0.013) | (0.098) |
| Control Expost | 0.123 | 0.349 |
| | (0.019) | (0.066) |
| Treatment Baseline | 0.071 | 0.276 |
| | (0.024) | (0.087) |
| Treatment Expost | 0.338 | 0.994 |
| | (0.065) | (0.286) |

Table 4.22: Summary statistics for probability of being involved in fattening animals and number of animals fattened (multi-step weights)

| | (1) Fatten Animals | (2) Number of Animals Fattened |
|---|---|---|
| RALP | 0.283*** | 0.891*** |
| | (0.049) | (0.234) |
| Expost | 0.011 | -0.111 |
| | (0.022) | (0.093) |
| Observations | 2841 | 2841 |

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

Table 4.23: RALP program impact on probability of being involved in fattening animals and number of animals fattened (single step weights)

| | (1) Fatten Animals | (2) Number of Animals Fattened |
|---|---|---|
| RALP | 0.228*** | 0.732*** |
| | (0.061) | (0.270) |
| Expost | 0.040* | -0.014 |
| | (0.020) | (0.094) |
| Observations | 2464 | 2464 |

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

Table 4.24: RALP program impact on probability of being involved in fattening animals and number of animals fattened (multi-step weights)

| | (1) Quarantine | (2) Vaccinate | (3) Vet Treats | (4) No one treats |
|---|---|---|---|---|
| Control Baseline | 0.570 | 0.345 | 0.387 | 0.253 |
| | (0.028) | (0.030) | (0.032) | (0.033) |
| Control Expost | 0.640 | 0.315 | 0.476 | 0.168 |
| | (0.027) | (0.038) | (0.034) | (0.027) |
| Treatment Baseline | 0.669 | 0.502 | 0.460 | 0.237 |
| | (0.050) | (0.044) | (0.050) | (0.053) |
| Treatment Expost | 0.850 | 0.763 | 0.802 | 0.022 |
| | (0.023) | (0.038) | (0.032) | (0.008) |

Table 4.25: Summary statistics on practices related to animal health: (1) Probability that report separating sick animals from others (2) Probability that report vaccinating animals (3) Probability that report that if an animal is sick, a vet will treat them (4) Probability that report that if an animal is sick, no one is able to treat it (Other possible answers, not reported, are that the respondent would treat the animal him or herself, or someone else in the village would treat the animal. (single step weights)

| | (1) Quarantine | (2) Vaccinate | (3) Vet Treats | (4) No one treats |
|---|---|---|---|---|
| Control Baseline | 0.581 | 0.357 | 0.403 | 0.229 |
| | (0.028) | (0.032) | (0.037) | (0.031) |
| Control Expost | 0.648 | 0.321 | 0.491 | 0.156 |
| | (0.027) | (0.039) | (0.037) | (0.024) |
| Treatment Baseline | 0.701 | 0.582 | 0.572 | 0.178 |
| | (0.060) | (0.073) | (0.084) | (0.052) |
| Treatment Expost | 0.840 | 0.727 | 0.702 | 0.026 |
| | (0.040) | (0.046) | (0.049) | (0.011) |

Table 4.26: Summary statistics on practices related to animal health: (1) Probability that report separating sick animals from others (2) Probability that report vaccinating animals (3) Probability that report that if an animal is sick, a vet will treat them (4) Probability that report that if an animal is sick, no one is able to treat it (Other possible answers, not reported, are that the respondent would treat the animal him or herself, or someone else in the village would treat the animal. (multi-step weights)

| | (1) Quarantine | (2) Vaccinate | (3) Vet Treats | (4) No one treats |
|---|---|---|---|---|
| RALP | 0.112* | 0.286*** | 0.255*** | -0.128** |
| | (0.063) | (0.055) | (0.070) | (0.064) |
| Expost | 0.056** | -0.020 | 0.087** | -0.087** |
| | (0.027) | (0.040) | (0.042) | (0.036) |
| Observations | 2170 | 2169 | 2178 | 2178 |

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

Table 4.27: RALP program impact on practices related to animal health: (see previous table for description) (single step weights)

| | (1) Quarantine | (2) Vaccinate | (3) Vet Treats | (4) No one treats |
|---|---|---|---|---|
| RALP | 0.066 | 0.198*** | 0.051 | -0.080 |
| | (0.066) | (0.073) | (0.095) | (0.063) |
| Expost | 0.055* | -0.029 | 0.085** | -0.072** |
| | (0.028) | (0.035) | (0.040) | (0.034) |
| Observations | 1813 | 1809 | 1818 | 1818 |

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

Table 4.28: RALP program impact on practices related to animal health: (see previous table for description) (multi-step weights)

| | Baseline | Expost |
|---|---|---|
| Control | | |
| — Own beehives | 82 | 41 |
| — Sell honey | 17 | 29 |
| Treatment | | |
| Members of Beekeeping Groups | 174 | 174 |
| — Own beehives | 94 | 54 |
| —- Sell honey | 21 | 26 |

Table 4.29: Sample size for beekeepers and members of beekeeping groups

| | Number of Beehives | | Share of Households | |
|---|---|---|---|---|
| | own | share | own | share |
| Control Baseline | 0.392 | 0.055 | 0.077 | 0.005 |
| | (0.094) | (0.043) | (0.015) | (0.003) |
| Control Expost | 0.397 | 0.065 | 0.061 | 0.003 |
| | (0.106) | (0.058) | (0.013) | (0.002) |
| Treatment Baseline | 0.372 | 0.024 | 0.105 | 0.004 |
| | (0.099) | (0.018) | (0.026) | (0.003) |
| Treatment Expost | 1.213 | 0.600 | 0.282 | 0.112 |
| | (0.373) | (0.404) | (0.063) | (0.053) |

Table 4.30: Summary statistics on beehive ownership (single step weights)

| | Number of Beehives | | Share of Households | |
|---|---|---|---|---|
| | own | share | own | share |
| Control Baseline | 0.486 | 0.030 | 0.076 | 0.003 |
| | (0.174) | (0.021) | (0.016) | (0.002) |
| Control Expost | 0.414 | 0.071 | 0.064 | 0.003 |
| | (0.109) | (0.062) | (0.013) | (0.002) |
| Treatment Baseline | 0.396 | 0.025 | 0.108 | 0.005 |
| | (0.112) | (0.017) | (0.028) | (0.003) |
| Treatment Expost | 0.858 | 1.209 | 0.275 | 0.118 |
| | (0.237) | (1.005) | (0.067) | (0.062) |

Table 4.31: Summary statistics on beehive ownership (multi-step weights)

| | Number of Beehives | | Share of Households | |
|---|---|---|---|---|
| | own | share | own | share |
| Control Baseline | 0.248 | 0.023 | 0.046 | 0.002 |
| | (0.067) | (0.016) | (0.008) | (0.001) |
| Control Expost | 0.245 | 0.075 | 0.042 | 0.003 |
| | (0.061) | (0.066) | (0.009) | (0.002) |
| Treatment Baseline | 1.489 | 0.115 | 0.351 | 0.017 |
| | (0.309) | (0.089) | (0.055) | (0.010) |
| Treatment Expost | 1.816 | 0.494 | 0.351 | 0.138 |
| | (0.503) | (0.149) | (0.053) | (0.038) |

Table 4.32: Summary statistics on beehive ownership (no weights)

| | Number of Beehives | | | Share HHs with Beehives | |
|---|---|---|---|---|---|
| | own | share | total | own | share |
| RALP | 0.835* | 0.567 | 1.402* | 0.193** | 0.835* |
| | (0.387) | (0.411) | (0.563) | (0.067) | (0.387) |
| Expost | 0.005 | 0.009 | 0.014 | -0.016 | 0.005 |
| | (0.109) | (0.073) | (0.112) | (0.010) | (0.109) |
| *N* | 2318 | 2318 | 2318 | 2318 | 2318 |

Table 4.33: RALP program impact on ownership of beehives (single step weights)

| | Number of Beehives | | | Share HHs with Beehives | |
|---|---|---|---|---|---|
| | own | share | total | own | share |
| RALP | 0.534 | 1.144 | 1.677 | 0.180** | 0.534 |
| | (0.295) | (1.009) | (0.948) | (0.058) | (0.295) |
| Expost | -0.072 | 0.041 | -0.031 | -0.012 | -0.072 |
| | (0.169) | (0.066) | (0.183) | (0.010) | (0.169) |
| *N* | 2076 | 2076 | 2076 | 2076 | 2076 |

Table 4.34: RALP program impact on ownership of beehives (multistep weights)

| | (1) Traditional | (2) Improved | (3) Modern |
|---|---|---|---|
| Control Baseline | 4.244 | 0.098 | 0.000 |
| | (0.589) | (0.077) | (.) |
| Control Expost | 5.390 | 1.829 | 0.000 |
| | (0.967) | (0.894) | (.) |
| Treatment Baseline | 4.638 | 0.170 | 0.170 |
| | (0.650) | (0.170) | (0.170) |
| Treatment Expost | 5.787 | 0.685 | 0.222 |
| | (1.148) | (0.243) | (0.094) |

unweighted

Table 4.35: Beehive type- unweighted summary statistics for beekeepers only

| | (1) Production | (2) Sales |
|---|---|---|
| Control Baseline | 0.203 | 340.737 |
| | (0.052) | (111.364) |
| Control Expost | 0.312 | 1259.715 |
| | (0.117) | (596.811) |
| Treatment Baseline | 0.381 | 1303.020 |
| | (0.126) | (573.854) |
| Treatment Expost | 0.715 | 1247.212 |
| | (0.212) | (455.320) |

unweighted, beekeepers only

Table 4.36: Honey production and sales- unweighted summary statistics for beekeepers only

| | (1) Decrease beehives | (2) Can treat infestation | (3) Ask a specialist about infestation |
|---|---|---|---|
| Control Baseline | 0.625 | 0.316 | 0.455 |
| | (0.101) | (0.110) | (0.157) |
| Control Expost | 0.805 | 0.629 | 0.561 |
| | (0.063) | (0.083) | (0.078) |
| Treatment Baseline | 0.623 | 0.511 | 0.538 |
| | (0.063) | (0.075) | (0.081) |
| Treatment Expost | 0.667 | 0.755 | 0.625 |
| | (0.060) | (0.036) | (0.037) |

Table 4.37: Knowledge about bee health - unweighted summary statistics for beekeepers only

| | Recognize Infestation | | | | | | |
|---|---|---|---|---|---|---|---|
| | (1) Farwa | (2) Hornet | (3) Beetles | (4) Bee wolf | (5) Termites | (6) Bee eating bird | (7) Mites |
| Control Baseline | 0.167 | 0.292 | 0.125 | 0.042 | 0.458 | 0.250 | 0.583 |
| | (0.078) | (0.095) | (0.069) | (0.042) | (0.104) | (0.090) | (0.103) |
| Control Expost | 0.139 | 0.500 | 0.111 | 0.111 | 0.611 | 0.333 | 0.667 |
| | (0.058) | (0.085) | (0.053) | (0.053) | (0.082) | (0.080) | (0.080) |
| Treatment Baseline | 0.049 | 0.230 | 0.016 | 0.016 | 0.295 | 0.344 | 0.492 |
| | (0.028) | (0.054) | (0.016) | (0.016) | (0.059) | (0.061) | (0.065) |
| Treatment Expost | 0.116 | 0.692 | 0.144 | 0.110 | 0.699 | 0.466 | 0.678 |
| | (0.027) | (0.038) | (0.029) | (0.026) | (0.038) | (0.041) | (0.039) |

Table 4.38: Ability to recognize infestation- unweighted summary statistics for beekeepers only

| | (1) Use mask | (2) Use gloves | (3) Use smoke |
|---|---|---|---|
| Control Baseline | 0.250 | 0.125 | 0.458 |
| | (0.090) | (0.069) | (0.104) |
| Control Expost | 0.361 | 0.333 | 0.778 |
| | (0.081) | (0.080) | (0.070) |
| Treatment Baseline | 0.377 | 0.180 | 0.607 |
| | (0.063) | (0.050) | (0.063) |
| Treatment Expost | 0.804 | 0.650 | 0.933 |
| | (0.031) | (0.037) | (0.020) |

Table 4.39: Use of protective equipment when harvesting honey- unweighted summary statistics for beekeepers only

| | (1) Label honey | (2) Price per kilo |
|---|---|---|
| Control Baseline | 0.000 | 3737.778 |
| | (.) | (777.556) |
| Control Expost | 0.042 | 4666.522 |
| | (0.042) | (514.668) |
| Treatment Baseline | 0.125 | 6037.500 |
| | (0.059) | (1674.342) |
| Treatment Expost | 0.161 | 5990.323 |
| | (0.067) | (396.554) |

Table 4.40: Honey extraction and sales- unweighted summary statistics for beekeepers only

| | (1) Plant flowers for bees | (2) Manage natural areas | (3) Move in dry season |
|---|---|---|---|
| Control Baseline | 0.043 | 0.261 | 0.435 |
| | (0.043) | (0.094) | (0.106) |
| Control Expost | 0.073 | 0.537 | 0.463 |
| | (0.041) | (0.079) | (0.079) |
| Treatment Baseline | 0.167 | 0.295 | 0.550 |
| | (0.064) | (0.059) | (0.065) |
| Treatment Expost | 0.214 | 0.639 | 0.710 |
| | (0.038) | (0.037) | (0.035) |

Table 4.41: Practices related to the environment- unweighted summary statistics for beekeepers only

| | (1) Food shortage | (2) Severe Food Shortage | (3) Money Shortage |
|---|---|---|---|
| Control Baseline | 0.595 | 0.021 | 0.841 |
| | (0.025) | (0.005) | (0.015) |
| Control Expost | 0.576 | 0.084 | 0.859 |
| | (0.033) | (0.015) | (0.014) |
| Treatment Baseline | 0.566 | 0.030 | 0.823 |
| | (0.033) | (0.008) | (0.025) |
| Treatment Expost | 0.616 | 0.093 | 0.905 |
| | (0.042) | (0.021) | (0.016) |

Table 4.42: Percentage of households that experienced food insecurity, severe food insecurity (children skipped meals), or money insecurity during past 12 months (single step weights)

| | (1) Food shortage | (2) Severe Food Shortage | (3) Money Shortage |
|---|---|---|---|
| Control Baseline | 0.583 | 0.021 | 0.842 |
| | (0.028) | (0.005) | (0.014) |
| Control Expost | 0.557 | 0.077 | 0.854 |
| | (0.031) | (0.015) | (0.015) |
| Treatment Baseline | 0.520 | 0.040 | 0.828 |
| | (0.051) | (0.019) | (0.032) |
| Treatment Expost | 0.601 | 0.065 | 0.891 |
| | (0.040) | (0.021) | (0.023) |

Table 4.43: Percentage of households that experienced food insecurity, severe food insecurity (children skipped meals), or money insecurity during past 12 months (multi- step weights)

| | (1) Food shortage | (2) Severe Food Shortage | (3) Money Shortage |
|---|---|---|---|
| RALP program | 0.069 | 0.006 | 0.065* |
| | (0.068) | (0.025) | (0.036) |
| Expost | -0.021 | 0.061*** | 0.017 |
| | (0.035) | (0.016) | (0.019) |
| Observations | 3250 | 2708 | 3209 |

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

Table 4.44: RALP program impact on percentage of households that experienced food insecurity, severe food insecurity (children skipped meals), or money insecurity during past 12 months (single step weights)

| | (1) Food shortage | (2) Severe Food Shortage | (3) Money Shortage |
|---|---|---|---|
| RALP program | 0.110 | -0.009 | 0.054 |
| | (0.074) | (0.027) | (0.043) |
| Expost | -0.028 | 0.055*** | 0.012 |
| | (0.037) | (0.015) | (0.018) |
| Observations | 2827 | 2326 | 2793 |

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

Table 4.45: RALP program impact on percentage of households that experienced food insecurity, severe food insecurity (children skipped meals), or money insecurity during past 12 months (multi-step weights)

| | (1) wheat | (2) white flour | (3) sorghum | (4) maize | (5) millet | (6) rice |
|---|---|---|---|---|---|---|
| Control Baseline | 950.496 | 344.693 | 331.064 | 383.012 | 1477.535 | 131.427 |
| | (114.763) | (30.797) | (55.182) | (114.550) | (435.243) | (41.341) |
| Control Expost | 602.093 | 255.089 | 191.023 | 79.451 | 110.889 | 61.426 |
| | (25.179) | (32.368) | (39.454) | (23.530) | (14.159) | (3.177) |
| Treatment Baseline | 847.576 | 412.060 | 567.401 | 199.948 | 863.821 | 73.922 |
| | (49.571) | (48.141) | (192.832) | (94.948) | (175.085) | (4.462) |
| Treatment Expost | 599.583 | 230.686 | 222.167 | 89.928 | 91.196 | 57.514 |
| | (25.171) | (13.638) | (21.786) | (31.838) | (3.654) | (3.426) |

Table 4.46: Per capita calorie consumption: first column is based on all data collected, second column is trimmed from top and bottom 1% and third column is from top and bottom 5% to exclude outliers due to data entry error. (single step weights)

| | (1) calories | (2) calories | (3) calories |
|---|---|---|---|
| Control Baseline | 4190.919 | 3292.680 | 2496.832 |
| | (349.385) | (189.780) | (60.014) |
| Control Expost | 2102.136 | 2127.641 | 2199.495 |
| | (58.302) | (57.025) | (45.365) |
| Treatment Baseline | 6052.447 | 4381.275 | 2738.227 |
| | (725.063) | (527.582) | (86.908) |
| Treatment Expost | 2185.443 | 2201.050 | 2199.331 |
| | (101.370) | (102.601) | (78.176) |

Table 4.47: Per capita calorie consumption: first column is based on all data collected, second column is trimmed from top and bottom 1% and third column is from top and bottom 5% to exclude outliers due to data entry error. (multi- step weights)

| | (1) calories | (2) calories | (3) calories |
|---|---|---|---|
| Control Baseline | 4004.196 | 3274.499 | 2513.912 |
| | (268.403) | (163.158) | (61.647) |
| Control Expost | 2098.542 | 2123.153 | 2195.183 |
| | (58.898) | (57.613) | (42.021) |
| Treatment Baseline | 5189.447 | 3959.333 | 2696.183 |
| | (559.473) | (346.613) | (76.002) |
| Treatment Expost | 2233.868 | 2240.549 | 2226.494 |
| | (69.207) | (69.446) | (61.315) |

Table 4.48: Per capita calorie consumption: first column is based on all data collected, second column is trimmed from top and bottom 1% and third column is from top and bottom 5% to exclude outliers due to data entry error. (single step weights)

| | (1) calories | (2) calories | (3) calories |
|---|---|---|---|
| Control Baseline | 4190.919 | 3292.680 | 2496.832 |
| | (349.385) | (189.780) | (60.014) |
| Control Expost | 2102.136 | 2127.641 | 2199.495 |
| | (58.302) | (57.025) | (45.365) |
| Treatment Baseline | 6052.447 | 4381.275 | 2738.227 |
| | (725.063) | (527.582) | (86.908) |
| Treatment Expost | 2185.443 | 2201.050 | 2199.331 |
| | (101.370) | (102.601) | (78.176) |

Table 4.49: Per capita calorie consumption: first column is based on all data collected, second column is trimmed from top and bottom 1% and third column is from top and bottom 5% to exclude outliers due to data entry error. (multi-step weights)

| | (1) calories | (2) calories | (3) calories |
|---|---|---|---|
| RALP Program | -834.243 | -572.935 | -79.729 |
| | (597.570) | (409.789) | (124.511) |
| Expost | -1904.654*** | -1186.160*** | -362.356*** |
| | (280.726) | (180.729) | (86.069) |
| Observations | 3194 | 3132 | 2880 |

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

Table 4.50: RALP program impact on per capita calorie consumption: first column is based on all data collected, second column is trimmed from top and bottom 1% and third column is from top and bottom 5% to exclude outliers due to data entry error. (single-step weights)

| | (1) calories | (2) calories | (3) calories |
|---|---|---|---|
| RALP Program | -1711.808** | -1073.425* | -231.022* |
| | (850.923) | (592.134) | (131.664) |
| Expost | -2081.081*** | -1197.381*** | -342.815*** |
| | (360.134) | (202.828) | (85.766) |
| Observations | 2776 | 2719 | 2494 |

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

Table 4.51: Per capita calorie consumption: first column is based on all data collected, second column is trimmed from top and bottom 1% and third column is from top and bottom 5% to exclude outliers due to data entry error. (multi-step weights)

| | (1) calories | (2) calories | (3) calories |
|---|---|---|---|
| RALP Program | 23.965 | -47.509 | -67.234 |
| | (455.583) | (247.448) | (94.525) |
| Expost | -1976.099*** | -1169.460*** | -335.237*** |
| | (303.868) | (174.302) | (64.909) |
| Observations | 3555 | 3485 | 3201 |

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

Table 4.52: Per capita calorie consumption: first column is based on all data collected, second column is trimmed from top and bottom 1% and third column is from top and bottom 5% to exclude outliers due to data entry error. (no weights)

| | meat | chicken | fish | eggs | tuna | all protein | honey |
|---|---|---|---|---|---|---|---|
| Control Baseline | 0.973 | 2.294 | 4.427 | 1.755 | 0.777 | 10.23 | 1.305 |
| | (8.34) | (14.68) | (7.40) | (7.85) | (7.05) | (16.75) | (5.02) |
| Control Expost | 0.850 | 2.177 | 3.133 | 3.704 | 0.918 | 10.78 | 3.681 |
| | (8.93) | (13.09) | (6.50) | (10.05) | (6.05) | (16.92) | (12.99) |
| Treatment Baseline | 1.249 | 2.489 | 3.832 | 2.602 | 1.239 | 11.41 | 1.283 |
| | (7.84) | (12.19) | (4.95) | (6.39) | (6.20) | (11.11) | (5.48) |
| Treatment Expost | 1.184 | 2.374 | 2.285 | 5.083 | 1.743 | 12.67 | 4.261 |
| | (7.60) | (11.48) | (4.01) | (9.42) | (6.13) | (13.10) | (13.96) |
| Observations | 3074 | 3074 | 3074 | 3074 | 3074 | 3074 | 3074 |

Table 4.53: Consumption of high value foods (times consumed in past month). Protein Consumption is sum of all preceding categories. (single step weights)

| | meat | chicken | fish | eggs | tuna | all protein | honey |
|---|---|---|---|---|---|---|---|
| Control Baseline | 0.972 | 2.302 | 4.053 | 1.982 | 0.775 | 10.08 | 1.422 |
| | (8.38) | (15.08) | (7.69) | (6.43) | (7.34) | (16.88) | (5.25) |
| Control Expost | 0.880 | 2.197 | 3.053 | 3.896 | 0.996 | 11.02 | 3.738 |
| | (9.15) | (12.68) | (5.33) | (10.10) | (6.00) | (16.20) | (13.90) |
| Treatment Baseline | 1.367 | 2.547 | 4.697 | 2.933 | 1.389 | 12.93 | 1.645 |
| | (4.85) | (8.17) | (3.29) | (3.77) | (4.76) | (10.12) | (3.47) |
| Treatment Expost | 1.415 | 2.232 | 2.702 | 6.572 | 1.228 | 14.15 | 4.726 |
| | (4.86) | (7.15) | (2.68) | (4.52) | (4.67) | (6.98) | (11.39) |
| Observations | 2663 | 2663 | 2663 | 2663 | 2663 | 2663 | 2663 |

Table 4.54: Consumption of high value foods (times consumed in past month). Protein Consumption is sum of all preceding categories. (multi-step weights)

| | (1) meat | (2) chicken | (3) fish | (4) eggs | (5) tuna | (6) all protein | (7) honey |
|---|---|---|---|---|---|---|---|
| RALP Program | 0.026 | -0.010 | -0.281 | 0.649 | 0.126 | 0.510 | 0.520 |
| | (0.137) | (0.233) | (0.538) | (0.709) | (0.380) | (1.053) | (0.475) |
| Expost | -0.051 | -0.010 | -1.114*** | 1.879*** | 0.231 | 0.936 | 2.635*** |
| | (0.083) | (0.147) | (0.356) | (0.296) | (0.153) | (0.590) | (0.308) |
| Observations | 3074 | 3074 | 3074 | 3074 | 3074 | 3074 | 3074 |

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

Table 4.55: RALP program impact on consumption of high value foods. (single step weights)

| | (1) meat | (2) chicken | (3) fish | (4) eggs | (5) tuna | (6) all protein | (7) honey |
|---|---|---|---|---|---|---|---|
| RALP Program | 0.103 | -0.243 | -1.117 | 1.943 | -0.547 | 0.139 | 0.672 |
| | (0.153) | (0.272) | (0.841) | (1.957) | (0.389) | (2.205) | (0.771) |
| Expost | -0.011 | -0.025 | -0.759 | 1.859*** | 0.320** | 1.384** | 2.592*** |
| | (0.080) | (0.163) | (0.484) | (0.296) | (0.141) | (0.630) | (0.332) |
| Observations | 2663 | 2663 | 2663 | 2663 | 2663 | 2663 | 2663 |

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

Table 4.56: RALP program impact on consumption of high value foods. (multi-step weights)

| | milk | leban (yoghurt) |
|---|---|---|
| Control Expost | 19.73 | 1.183 |
| | (16.23) | (4.55) |
| Treatment Expost | 25.54 | 1.503 |
| | (14.52) | (2.98) |
| Observations | 1618 | 1618 |

Table 4.57: Consumption of high value foods (times consumed in past month). (single step weights)

| | milk | leban (yoghurt) |
|---|---|---|
| Control Expost | 21.23 | 1.215 |
| | (16.22) | (3.89) |
| Treatment Expost | 27.07 | 1.448 |
| | (14.00) | (2.29) |
| Observations | 1406 | 1406 |

Table 4.58: Consumption of high value foods (times consumed in past month). (multi-step weights)

| | (1) milk | (2) leban (yoghurt) |
|---|---|---|
| RALP | 5.804*** | 0.320 |
| | (2.139) | (0.567) |
| Observations | 1618 | 1618 |

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

Table 4.59: RALP program impact consumption of high value foods. (single step weights)

| | (1) milk | (2) leban (yoghurt) |
|---|---|---|
| RALP | 5.842** | 0.233 |
| | (2.336) | (0.705) |
| Observations | 1406 | 1406 |

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

Table 4.60: RALP program impact on consumption of high value foods. (multi-step weights)

| | (1) Qat | (2) Tobacco | (3) Medicine |
|---|---|---|---|
| Control Baseline | 8220.8 | 1277.6 | 17073.7 |
| | (811.9) | (114.6) | (1829.2) |
| Control Expost | 7276.5 | 1419.0 | 15659.4 |
| | (565.4) | (133.5) | (2306.1) |
| Treatment Baseline | 5721.4 | 1174.1 | 14796.3 |
| | (610.9) | (123.0) | (1889.9) |
| Treatment Expost | 7620.5 | 1749.9 | 9695.2 |
| | (755.0) | (158.9) | (755.2) |

Table 4.61: Consumption of major non-food items (single step weights)

| | (1) Qat | (2) Tobacco | (3) Medicine |
|---|---|---|---|
| Control Baseline | 8324.5 | 1289.1 | 18056.8 |
| | (985.1) | (137.8) | (1817.8) |
| Control Expost | 7466.8 | 1468.4 | 15484.4 |
| | (588.1) | (144.4) | (2030.5) |
| Treatment Baseline | 6209.8 | 1186.0 | 13481.2 |
| | (826.5) | (274.5) | (1782.4) |
| Treatment Expost | 8167.2 | 1831.9 | 9736.6 |
| | (897.8) | (286.5) | (1036.3) |

Table 4.62: Consumption of major non-food items (multi-step weights)

| | Qat | Tobacco | Medicine |
|---|---|---|---|
| RALP program | 893.0 | 220.4 | -3521.3 |
| | (1131.7) | (236.2) | (4000.0) |
| Expost | 1315.8 | 317.2** | 39.6 |
| | (825.6) | (154.0) | (3485.7) |
| Observations | 1730 | 1754 | 1764 |

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

Table 4.63: RALP program impact on consumption of major non-food items (single step weights)

| | Qat | Tobacco | Medicine |
|---|---|---|---|
| RALP program | 85.4 | 70.7 | 741.4 |
| | (1169.1) | (313.0) | (3454.6) |
| Expost | 1784.9** | 380.1** | -2087.4 |
| | (894.2) | (157.4) | (3055.9) |
| Observations | 1476 | 1497 | 1535 |

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

Table 4.64: RALP program impact on consumption of major non-food items (multi-step weights

| | (1) No one | (2) Relatives | (3) Neighbors | (4) All the village | (5) Sheikh | (6) Merchant |
|---|---|---|---|---|---|---|
| Control Baseline | 0.258 | 0.009 | 0.007 | 0.120 | 0.028 | 0.237 |
| | (0.023) | (0.003) | (0.003) | (0.016) | (0.008) | (0.022) |
| Control Expost | 0.194 | 0.594 | 0.601 | 0.114 | 0.031 | 0.277 |
| | (0.023) | (0.026) | (0.029) | (0.019) | (0.008) | (0.028) |
| Treatment Baseline | 0.144 | 0.003 | 0.005 | 0.151 | 0.003 | 0.342 |
| | (0.041) | (0.003) | (0.003) | (0.034) | (0.003) | (0.062) |
| Treatment Expost | 0.106 | 0.698 | 0.634 | 0.219 | 0.034 | 0.342 |
| | (0.028) | (0.056) | (0.050) | (0.051) | (0.024) | (0.052) |

Table 4.65: Who Will Help in Crisis: Share of Households Mentioning Each Category (single step weights)

| | (1) No one | (2) Relatives | (3) Neighbors | (4) All the village | (5) Sheikh | (6) Merchant |
|---|---|---|---|---|---|---|
| Control Baseline | 0.244 | 0.008 | 0.007 | 0.134 | 0.027 | 0.241 |
| | (0.021) | (0.003) | (0.003) | (0.021) | (0.008) | (0.021) |
| Control Expost | 0.206 | 0.577 | 0.586 | 0.106 | 0.026 | 0.273 |
| | (0.029) | (0.028) | (0.030) | (0.019) | (0.007) | (0.030) |
| Treatment Baseline | 0.169 | 0.000 | 0.004 | 0.177 | 0.000 | 0.338 |
| | (0.080) | (.) | (0.003) | (0.047) | (.) | (0.077) |
| Treatment Expost | 0.106 | 0.795 | 0.764 | 0.284 | 0.014 | 0.280 |
| | (0.042) | (0.040) | (0.052) | (0.072) | (0.008) | (0.064) |

Table 4.66: Who Will Help in Crisis: Share of Households Mentioning Each Category (multi-step weights)

| | (1) No one | (2) Relatives | (3) Neighbors | (4) All the village | (5) Sheikh | (6) Merchant |
|---|---|---|---|---|---|---|
| RALP program | -0.089** | 0.104* | 0.033 | 0.104* | 0.003 | -0.003 |
| | (0.036) | (0.062) | (0.058) | (0.054) | (0.026) | (0.002) |
| Expost | -0.041 | 0.586*** | 0.594*** | -0.012 | 0.008 | 0.003 |
| | (0.032) | (0.026) | (0.029) | (0.022) | (0.010) | (0.002) |
| Observations | 2354 | 2354 | 2354 | 2354 | 2354 | 2353 |

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

Table 4.67: Regression Results for Who Will Help in Crisis: Program Impact on Share of Households Mentioning Each Category (single step weights)

| | (1) No one | (2) Relatives | (3) Neighbors | (4) All the village | (5) Sheikh | (6) Merchant |
|---|---|---|---|---|---|---|
| RALP program | -0.099* | 0.218*** | 0.178*** | 0.178** | -0.012 | -0.003 |
| | (0.051) | (0.049) | (0.060) | (0.074) | (0.010) | (0.002) |
| Expost | -0.018 | 0.572*** | 0.580*** | -0.040 | 0.006 | 0.003 |
| | (0.041) | (0.029) | (0.030) | (0.028) | (0.008) | (0.002) |
| Observations | 2290 | 2290 | 2290 | 2290 | 2290 | 2289 |

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

Table 4.68: Regression Results for Who Will Help in Crisis: Program Impact on Share of Households Mentioning Each Category (multi-step weights)

| | (1) Agree that people are selfish | (2) Agree that people will contribute |
|---|---|---|
| Control Baseline | 2.279 | 1.776 |
| | (0.056) | (0.066) |
| Control Expost | 2.181 | 2.301 |
| | (0.038) | (0.077) |
| Treatment Baseline | 2.196 | 1.799 |
| | (0.078) | (0.166) |
| Treatment Expost | 2.217 | 2.407 |
| | (0.082) | (0.181) |

Table 4.69: Summary statistics (1) Average agreement with statement that people are mainly concerned about their own welfare; (2) Average agreement with statement that people contribute to common development projects (4 point scale, low=disagree) (single step weights)

| | (1) Agree that people are selfish | (2) Agree that people will contribute |
|---|---|---|
| Control Baseline | 2.294 | 1.813 |
| | (0.060) | (0.064) |
| Control Expost | 2.164 | 2.339 |
| | (0.041) | (0.077) |
| Treatment Baseline | 2.269 | 1.866 |
| | (0.080) | (0.288) |
| Treatment Expost | 2.237 | 2.347 |
| | (0.074) | (0.251) |

Table 4.70: Summary statistics (1) Average agreement with statement that people are mainly concerned about their own welfare; (2) Average agreement with statement that people contribute to common development projects (4 point scale, low=disagree) (multi-step weights)

| | (1) Agree that people are selfish | (2) Agree that people will contribute |
|---|---|---|
| RALP program | 0.036 | 0.106 |
| | (0.091) | (0.196) |
| Expost | -0.081 | 0.520*** |
| | (0.056) | (0.096) |
| Observations | 2315 | 2139 |

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

Table 4.71: Regression Results for Program Impact on (1) Average agreement with statement that people are mainly concerned about their own welfare; (2) Average agreement with statement that people contribute to common development projects (4 point scale, low=disagree) (single step weights)

| | (1) Agree that people are selfish | (2) Agree that people will contribute |
|---|---|---|
| RALP program | 0.073 | 0.009 |
| | (0.085) | (0.263) |
| Expost | -0.123** | 0.510*** |
| | (0.062) | (0.117) |
| Observations | 2251 | 2080 |

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

Table 4.72: (1) Average agreement with statement that people are mainly concerned about their own welfare; (2) Average agreement with statement that people contribute to common development projects (4 point scale, low=disagree) (multi-step weights)

| | (1) |
|---|---|
| Male | 434 |
| Female | 551 |

Table 4.73: Gender distribution of RALP participants in sample of participating households

| | (1) Large purchase | (2) Daily purchase | (3) Visit | (4) Meal plan | (5) Family planning | (6) Enroll girls |
|---|---|---|---|---|---|---|
| Control Baseline | 0.349 | 0.463 | 0.706 | 0.963 | 0.644 | 0.503 |
| | (0.025) | (0.030) | (0.022) | (0.010) | (0.032) | (0.031) |
| Control Expost | 0.463 | 0.627 | 0.835 | 0.982 | 0.622 | 0.585 |
| | (0.031) | (0.032) | (0.019) | (0.006) | (0.036) | (0.028) |
| Treatment Baseline | 0.320 | 0.454 | 0.680 | 0.977 | 0.678 | 0.493 |
| | (0.033) | (0.038) | (0.033) | (0.008) | (0.042) | (0.042) |
| Treatment Expost | 0.519 | 0.629 | 0.839 | 0.982 | 0.838 | 0.698 |
| | (0.032) | (0.033) | (0.021) | (0.007) | (0.028) | (0.033) |

Table 4.74: Share of married women who are involved (alone or with husband) in decision making regarding: (1) Purchasing major items for household; (2) Purchasing everyday things; (3) Visiting friends and relatives; (4) Type of food cooked; (5) Family planning; (6) Enrolling daughters in school (single step weights)

| | (1) Large purchase | (2) Daily purchase | (3) Visit | (4) Meal plan | (5) Family planning | (6) Enroll girls |
|---|---|---|---|---|---|---|
| Control Baseline | 0.341 | 0.473 | 0.719 | 0.970 | 0.654 | 0.504 |
| | (0.025) | (0.032) | (0.022) | (0.009) | (0.031) | (0.030) |
| Control Expost | 0.475 | 0.640 | 0.840 | 0.984 | 0.639 | 0.579 |
| | (0.029) | (0.030) | (0.019) | (0.005) | (0.034) | (0.028) |
| Treatment Baseline | 0.316 | 0.456 | 0.700 | 0.979 | 0.756 | 0.496 |
| | (0.056) | (0.069) | (0.033) | (0.011) | (0.032) | (0.043) |
| Treatment Expost | 0.565 | 0.653 | 0.852 | 0.980 | 0.869 | 0.723 |
| | (0.046) | (0.047) | (0.028) | (0.011) | (0.036) | (0.050) |

Table 4.75: Share of married women who are involved (alone or with husband) in decision making regarding: (1) Purchasing major items for household; (2) Purchasing everyday things; (3) Visiting friends and relatives; (4) Type of food cooked; (5) Family planning; (6) Enrolling daughters in school (multi-step weights)

| | (1) Large purchase | (2) Daily purchase | (3) Visit | (4) Meal plan | (5) Family planning | (6) Enroll girls |
|---|---|---|---|---|---|---|
| RALP Program | 0.107* | 0.028 | 0.019 | -0.006 | 0.158** | 0.081 |
| | (0.057) | (0.063) | (0.046) | (0.017) | (0.067) | (0.057) |
| Expost | 0.106*** | 0.152*** | 0.142*** | 0.020 | -0.028 | 0.086** |
| | (0.040) | (0.035) | (0.028) | (0.013) | (0.045) | (0.036) |
| Observations | 2916 | 2881 | 3105 | 2949 | 2035 | 2217 |

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

Table 4.76: RALP program impact on share of married women who are involved (alone or with husband) in decision making regarding: (1) Purchasing major items for household; (2) Purchasing everyday things; (3) Visiting friends and relatives; (4) Type of food cooked; (5) Family planning; (6) Enrolling daughters in school (single step weights)

| | (1) Large purchase | (2) Daily purchase | (3) Visit | (4) Meal plan | (5) Family planning | (6) Enroll girls |
|---|---|---|---|---|---|---|
| RALP Program | 0.141* | 0.030 | 0.020 | -0.004 | 0.084 | 0.098 |
| | (0.080) | (0.107) | (0.047) | (0.020) | (0.064) | (0.076) |
| Expost | 0.126*** | 0.158*** | 0.130*** | 0.016 | -0.018 | 0.090*** |
| | (0.038) | (0.036) | (0.025) | (0.012) | (0.047) | (0.034) |
| Observations | 2534 | 2507 | 2694 | 2560 | 1762 | 1918 |

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

Table 4.77: RALP program impact on share of married women who are involved (alone or with husband) in decision making regarding: (1) Purchasing major items for household; (2) Purchasing everyday things; (3) Visiting friends and relatives; (4) Type of food cooked; (5) Family planning; (6) Enrolling daughters in school (multi-step weights)

| | (1) Access money | (2) Sell assets | (3) Save own money |
|---|---|---|---|
| Control Baseline | 0.561 | 0.236 | 0.502 |
| | (0.026) | (0.022) | (0.023) |
| Control Expost | 0.648 | 0.309 | 0.597 |
| | (0.022) | (0.025) | (0.024) |
| Treatment Baseline | 0.463 | 0.301 | 0.510 |
| | (0.032) | (0.037) | (0.034) |
| Treatment Expost | 0.684 | 0.228 | 0.646 |
| | (0.029) | (0.026) | (0.030) |

Table 4.78: Share of married women who are able to (1) access money independently; (2) sell own assets (jewelry etc) ; (3) save own money (single step weights)

| | (1) Access money | (2) Sell assets | (3) Save own money |
|---|---|---|---|
| Control Baseline | 0.570 | 0.241 | 0.520 |
| | (0.029) | (0.022) | (0.023) |
| Control Expost | 0.643 | 0.322 | 0.600 |
| | (0.021) | (0.023) | (0.025) |
| Treatment Baseline | 0.445 | 0.304 | 0.506 |
| | (0.061) | (0.045) | (0.049) |
| Treatment Expost | 0.641 | 0.222 | 0.618 |
| | (0.069) | (0.047) | (0.049) |

Table 4.79: Share of married women who are able to (1) access money independently; (2) sell own assets (jewelry etc) ; (3) save own money (multi-step weights)

| | (1) Access money | (2) Sell assets | (3) Save own money |
|---|---|---|---|
| RALP Program | 0.131*** | -0.142*** | 0.041 |
| | (0.048) | (0.053) | (0.054) |
| Expost | 0.086*** | 0.070** | 0.095*** |
| | (0.031) | (0.028) | (0.029) |
| Observations | 3240 | 3235 | 3261 |

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

Table 4.80: RALP program impact on share of married women who are able to (1) access money independently; (2) sell own assets (jewelry etc) ; (3) save own money (single step weights)

| | (1) Access money | (2) Sell assets | (3) Save own money |
|---|---|---|---|
| RALP Program | 0.120* | -0.162** | 0.032 |
| | (0.066) | (0.076) | (0.071) |
| Expost | 0.073** | 0.078*** | 0.080** |
| | (0.032) | (0.030) | (0.031) |
| Observations | 2818 | 2814 | 2836 |

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

Table 4.81: RALP program impact on share of married women who are able to (1) access money independently; (2) sell own assets (jewelry etc) ; (3) save own money (multi-step weights)

# Chapter 5

# Conclusion

The Rainfed Agriculture and Livestock Project allowed villagers to self-select into participation in project groups to make joint investments in agricultural production with support from the Social Fund. While there was high interest among poor and very poor households in participating in the project, the actual participation rates were slightly higher among the poor than among the better-off.

We find that the RALP livestock groups increased ownership of goats and sheep and increased access to veterinary services. Among beekeeping groups, our sample size is too small to make statistically valid conclusions, but we see suggestive evidence that the program increased knowledge of use of protective devices for harvesting honey, although beehive ownership remained low even within beekeeping groups.

We do not find evidence that the program has improved food security or consumption for participants. Rather, participation may have increased money shortages and possibly decreased staple grain consumption, which we believe is due to the uncertain profitability of the projects, especially in the context of the economic crisis of 2011.

We do find strong program impacts on increasing community solidarity and some measures of female empowerment.

While a final round of surveys will be necessary to measure the full impact of the program on participants' livelihoods, these intermediate results suggest that the program has improved the capacity of individuals and communities to develop agricultural production in rainfed areas.

# Bibliography

[1] Egel, Daniel and Tareq Yeslam. March, 2011. “Conditions in Rural Yemen: Findings from the RALP Baseline Survey.”